To the Graduate Council:

I am submitting herewith a thesis written by Valerie C. Sigmon entitled “The Benefits of Integrating Math Content into the Elementary Art Curriculum.” I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Teacher Education.

________________________________________________________________________
E. Stephanie Cramer, Major Professor

We have read this thesis and recommend its acceptance:

________________________________________________________________________
Dr. Patricia Davis-Wiley

________________________________________________________________________
Dr. Ralph Brockett

Acceptance for the Council:

________________________________________________________________________
Carolyn R. Hodges, Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)
THE BENEFITS OF INTEGRATING
MATH CONTENT STANDARDS
INTO THE ELEMENTARY ART CURRICULUM

A Thesis
Presented for the
Master of Science
Degree
University of Tennessee, Knoxville

Valerie C. Sigmon
May 2008
For K.R.,
and the other children
who deserve a chance
ACKNOWLEDGEMENTS

I am fortunate to enjoy the friendship and support of many good people. Sincere thanks go to these individuals who taught, advised, counseled, and sustained me during this study: my advisor and friend, Dr. Stephanie Cramer; thesis committee members Dr. Patricia Davis-Wiley and Dr. Ralph Brockett; professor Dr. John McCook; Art Supervisor Dr. Fred Patterson; Principals Lisa Light and Brenda Reliford; teachers Karen Anderson, Angela Ballard, Tanya Coats, Frances Frazor, Brenda Hitchcock, Nancy Lindsay, Myra Pickett, Amy Pipkin, Liz Sims and Debra Thompson; Math specialist Micki Dunn; Curriculum Instruction Facilitator Susan Thayer; Evaluation Specialist John Beckett; Thesis Consultant Jennifer Spirko; Brenda S. Lawson from the University of Tennessee Office of Research; husband Tim; sons Andy and Perry; mother, Thera Carr; and friends David and Linda Dietz.
ABSTRACT

School accountability has become critical under the No Child Left Behind Act. As struggling schools strive to reach mandated proficiency levels, is it possible for an art teacher to contribute toward students’ success by integrating math content into art lessons? This study attempts to show that without schedule changes, additional funding, or added training, an art teacher can support the efforts of classroom teachers as evidenced by increased scores on standardized math tests. The research used a Non-Equivalent Groups Design and examined pre-test and post-test scores for two groups of students. The population for this study is 3,800 elementary school children who attend Project GRAD schools. The experimental group which received integrated instruction is a convenience sample. It is comprised of 360 students who attend the 3rd, 4th, and 5th grades at two of the Project GRAD schools. The control group is made up of 3,440 students who did not receive the experimental instruction. The test scores were analyzed using t-test for normal distribution of scores, and a confidence level of .05 was selected. The results of this research indicate positive results from integrating math content into the elementary art curriculum.
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CHAPTER ONE

SURVEY OF THE SPECIFIC PROBLEM AREA

1. INTRODUCTION

Cross-curricular integration is widely used in today’s schools, and many reports show that it can successfully improve student learning. The visual arts are closely connected to most, if not all, other disciplines taught in an elementary school curriculum. The National Content Standards for Visual Arts Education end with Standard 6 which addresses the importance of “making connections between visual arts and other disciplines” (http://artsedge.kennedycenter.org). The second achievement standard for Standard 6 for grades Kindergarten through 4th grade is: “Students identify connections between the visual arts and other disciplines in the curriculum” (http://artsedge.kennedy-center.org). In the state of Tennessee, the Content Standards for Art in grades 1 through 12 and for Art History include a standard entitled Interdisciplinary Connections. It reads: “Students will make connections between visual arts and other disciplines” (www.state.tn.us/education/ci). Cross curricular concerns are, therefore, an integral part of visual art education.

The scope of an integrated art curriculum can vary extensively. Some programs, such as the Tennessee Arts Council’s Value Plus Schools, involve all teachers in a school. Every teacher in these schools incorporates art activities into the regular classroom instruction. Conversely, the particular study done for this thesis lies at the other end of
the spectrum. It involved only one instructor, the art teacher, who integrated math into the art curriculum at two inner city Project GRAD schools, Lawnville Elementary and Martin Elementary. It involved every art student in every grade at the two participating schools. No additional funds, scheduling changes, or paid training were utilized.

The idea for this study of art-math integration came from three basic areas: the existing art curriculum, the challenges of the No Child Left Behind Act, and the philosophical tenets of Toyota’s lean production system.

The first of these, the existing art curriculum, made it possible to teach integrated curriculum in art class. Art instruction had been scheduled, funded, and staffed in the subject elementary schools, as it has in most of today’s schools. Indeed, art is included in the national, state, and county curricula.

Secondly, The No Child Left Behind Act has set strict and challenging goals for student performance in math and reading. The U.S. Education Department has set standards for schools that dictate how many students must score at the proficient or advanced level. Each year the number of students that is expected to be proficient increase by small increments. Schools that do not meet proficiency quotas may have sanctions placed against them. However, a low performing school may escape sanctions if it can show that it is making adequate progress toward reaching the prescribed proficiency goal. The subject schools have had success in recent years making the Adequate Yearly Progress needed to meet these goals. The staff at these schools puts considerable effort and extreme focus on helping students reach the proficiency standards set for them.

Third, in an efficient organization, such as the Toyota Production System, every part of the process contributes to the final product (TOYOTA: Company> Vision/Philosophy from
This philosophy dictates that there are no parts of a process that do not aid the completion of the process. Operations that add no value are deemed to be “inappropriate processing,” and any movement that does not add value is an “unnecessary motion” (http://vorne.com). Consideration of all three of these concepts led to the basic goal of this study. Further discussion follows.

First, art instruction is part of our national curriculum and has been a part of American public schools since the late 1800s. In the subject schools, and in other elementary schools in the county system, art educators are employed to give art instruction to students. These county art educators must be certified by the state of Tennessee, and they must be highly qualified according to national standards. Clear standards for art instruction are provided by the state, and the county school district also has visual art content standards that align with state and national standards. There is ample funding for the art program in the subject schools, making it possible to purchase the supplies and materials needed to explore all kinds of art processes. The schedule at the subject schools allows students to participate in an art class every fourth school day. Art classes for first through fifth graders last for forty minutes; kindergarten art classes meet for thirty minutes.

Art-making experiences are valuable to children from an assessment viewpoint because they increase general academic skills. Skills learned and practiced in art class can translate to general academic success for students. Engaging the intellect is “an activity of the whole organism…which begins with direct experience of facts, events, and ideas, and it involves the emotions” (Taylor, 1960, p. 12). Making art can promote thinking, questioning, answering, and feeling as much as engaging in traditional classroom
activities can. From a child development point of view, art activities engage a child on an emotional level. Children express a range of emotions in their work and are drawn into conversations about those emotions. Children love to create, and then they love their creations, showing them, sharing them, and sometimes playing with them. In short, the arts trigger the emotions, and this is a valuable component of a student’s overall education.

In addition, it has been observed that the coincidental overlap of art and math is frequent and natural. A review of the Tennessee State Content Standards for math grades Kindergarten through 5 underscores the fact that many math concepts are also art concepts. Even young learners recognize the interconnection of art and math as evidenced by a third grader’s exclamation during a math test at Lawnville, “Symmetry?! Our art teacher taught us that” (Thompson, 2005)! It is natural for math concepts to appear in art lessons. However, even though the art program is established, scheduled, staffed, funded, beneficial to children, and connected to tested curriculum, it is not included in the proficiency testing now required by the federal law called the No Child Left Behind Act. This federal law, dubbed NCLB, is our second consideration.

NCLB has created a situation where achievement on standardized tests is the ultimate measure of a school’s worth. Test scores are publicized in media reports. Failure to reach NCLB standards can result in sanctions against a school. Achievement levels can vary widely from school to school. A comparison of the third grade test scores within the subject district illustrates this. One of the Project GRAD schools found that in 2007 only 64% of their third graders were proficient or advanced in Math; at the same time, there were three elementary schools in the district whose third graders were 100%
proficient/advanced. System-wide the overall proficiency rate for all third graders was 87% (http://edu.warehouse.state.tn.us). NCLB has created an atmosphere in all schools where it is not unusual to hear this anxious question: “How did we do?”

The third consideration for this study is a system of accountability in the private sector called the Toyota Production System (TPS). It was developed in Japan after World War II. The TPS is often called lean production because the product is made to flow through the manufacturing system without wasted time (http://vorne.com). The term value stream is used as well, and it refers to the steps of the production process, each one of which adds value to the product. An analogy to the value stream is a small natural spring bubbling up from the ground, widening to become a creek which grows into a broad stream that feeds into a river which flows into an ocean. In other words, the value of the product is directed to grow every time it is touched by anyone in the system. All the people involved in the production process is necessary; if they were not necessary, they would not be a part of the process (Stecher, 1999, pp. 35-39).

A synthesis of these three considerations, the existing and functioning art curriculum, the NCLB and the TPS, leads to a plausible conclusion that all activities of children at school, even art class, should further students’ opportunities to be proficient readers and mathematicians. We know that art instruction is an established and important part of the national curriculum, but in the current educational atmosphere, it must be asked, How can art instruction best add value to a school? And if a school’s goal is to meet proficiency standards, should it not also be the goal of the art program to meet those same standards?
2. STATEMENT OF THE PROBLEM

Low achieving schools, such as Project GRAD schools, are struggling to meet federally mandated proficiency standards in reading and math. However, the traditional elementary art instruction taught in these schools does not systematically contribute to a child’s acquisition of tested knowledge in reading and math.

3. PURPOSE OF THE STUDY

The purpose of this study is to determine if the teaching of an inflated elementary art curriculum that systematically integrates math content standards will help children better acquire math knowledge.

The following question is the main focus of this study. Does the integration of math content standards into the art curriculum help children better learn math standards as demonstrated by

I. achievement of higher scores on standardized math tests in Probability, Measurement, and Geometry as compared to the scores achieved by the same school in the year prior to the experiment?

II. achievement of higher scores on standardized math tests in Probability, Measurement, and Geometry as compared to the scores achieved by a matched sample of students who did not receive the integrated instruction?

III. achievement of greater gains on standardized math tests in probability, measurement, and geometry as compared to the gains made by a matched sample of students who did not receive the integrated instruction?
4. SIGNIFICANCE OF THE STUDY

This study is important in that it examines curriculum integration on a small scale. There is much reported research on school wide or district wide integration programs; however, there is a paucity of published material regarding integration efforts that work within the parameters of an existing art program and involve a sole teacher. Also, the cost of curriculum integration can be high. For example, in 2006, when the Tennessee Arts Commission launched an arts integration program in six schools, they called for an investment of $2,001,600 and an estimated 9,600 man-hours of teacher training. The results of this study may show that curriculum integration can be effectively accomplished without sweeping schedule changes, expensive budgets, or additional training. Integrating math concepts or other class content into existing art classes is free. It requires only the readiness of art teachers to pull math or other classroom content into their lessons, the willingness to do the research and collaborative planning, and the ability to implement an integrated curriculum. It is anticipated that this study will instigate dialog about how art education can best contribute to schools that struggle in the current climate of educational testing.

5. LIMITATIONS OF THE STUDY

The summary, implications, and recommendations drawn from this study are limited by the following:

1. The scores reported are aggregate, non-identifiable data.; therefore, they reflect only school wide averages instead of individual student scores. Some changes in population were experienced during the course of the study due to student
mobility. Therefore, some student scores that were included in the school wide averages were earned by students who did not fully participate in the integrated art instruction. However, the decision was made to look at the group scores, accepting the reality that the changes in group composition would skew the results somewhat.

2. The lessons were taught by only one teacher instead of several art educators. The results of the experimental curriculum would be more credible if the study had been done in several locations with many teachers teaching the lessons.

3. The study lasted for the duration of only one school year. A longitudinal study that tracked student progress over the course of several years could better illustrate the benefits of the integrated curriculum.

4. A fourth limitation of this study is the marginal position of art in the subject schools’ curriculum. Reading and math form the center of our dynamic education system, much like the sun in our solar system around which all else revolves. Art might be likened to a dwarf planet, present but insignificant. A comparison of instruction time illustrates art’s relative non-importance (Figure 1).

Comparison of on-time attendance also illustrates the perceived non-importance of elementary art (Figure 2). In the two subject schools, the reported on-time attendance for 2006-07 was 95% and 94.3%. However, the on-time attendance for art classes was only 85%. It was pointed out by one teacher at a participating school that that if students are not actively engaged in a lesson, the length of that lesson is inconsequential (Pickett, 2008). However, minutes in class must be tallied, and art minutes are woefully few. There is no question that reading, math, science, and social studies skills are critical to student development and adult self-sufficiency. A review of test scores can lead to no
Figure 1. Comparison of instructional time allotted per week

Figure 2. Subject school attendance rates and Art class attendance rates.
other conclusion than students at Lawnville and Martin must catch up in order to be competitive when in 2015 they join the college admission and job markets. Focused teaching, accelerated learning, and long academic classes are called for. This comparison between the time scheduled for academic instruction and the time scheduled for art instruction is drawn only to illustrate that art instruction’s place on the hierarchy of school subjects is relatively low.

Finally, the study is limited because elementary art teachers do not often interface or collaborate with classroom teachers. They operate a program which is parallel to other curricula and rarely intersects with other areas of study. Classroom teachers’ plan time is usually scheduled when their classes are attending art class or another special area class such as music, library, or physical education. Ronald Neperud writes that collaboration that is compulsory and administratively regulated is “contrived” (1995, p. 74), but unless collaboration time is not hardwired into the schedule, it may not occur.

6. ASSUMPTIONS

It was intrinsically understood that during this study, the art curriculum was not to be sacrificed or diluted for the sake of math; that art is an important and valuable component of the elementary curriculum; that art, by itself, is a worthwhile and valid endeavor; and that art activities contribute to children’s learning. Care was taken to ensure that there were no detrimental effects on learning. This study attempted to simply “connect different bodies of knowledge, while enhancing the integrity of each field of study” (www.cew.wisc.edu). This study also assumed that “interest in the non-arts benefits of the arts in our society” will not “undermine the ‘true place’ of the arts in our
society” (Catterall, 2002, www.newhorizons.com). It is also assumed that during the course of this study, the art program will not be significantly altered: that the time scheduled for art instruction will not be diminished from 40 minutes every four days; that the teaching duties will not drastically change; and that student attendance rates in art class will not fall below the usual 85%.

7. PROCEDURES

This investigation is a quantitative study. The technique used was comparison of pre-tests and post-tests. The experimental integrated curriculum was developed by the researcher. The testing instrument used was the Tennessee Comprehensive Assessment Program which was administered by the Knox County School District and graded by the Tennessee State Department of Education.

The Experimental Group was a convenience sample consisting of the 3rd, 4th, and 5th graders whom the researcher was hired to teach. The sample was drawn from a population of 3rd, 4th, and 5th graders who attend ten Project GRAD elementary schools in Knoxville.

8. DEFINITION OF TERMS

1. Adequate Yearly Progress – “an individual state’s measure of progress toward the goal of 100 percent of students achieving to state academic standards in at least reading/language arts and math; it sets the minimum level of proficiency that the state, its school districts, and schools must achieve each year on annual tests and related academic indicators” (http://answers.ed.gov).
2. AYP – see Adequate Yearly Progress

3. content standard – a specific piece of knowledge that is earmarked for learning in a certain course of study taught to a particular level of student

4. economically disadvantaged – a term used by government institutions to categorize school populations that qualify for free lunch or reduced lunch

5. integrated curriculum – lessons that provide learners with a unified view of commonly held knowledge and help learners to perceive new relationships and create new models (Dressel, 1958, pp. 3-25)

6. inflated curriculum – a curriculum which remains rooted in one discipline while inflating the class content with material from one or more other disciplines

7. integrated study – a study in which “children broadly explore knowledge in various subjects related to certain aspects of their environment” (Humphreys, Post, and Ellis, 1981)

8. interdisciplinary curriculum – “a curriculum organization which cuts across subject-matter lines to focus upon comprehensive life problems or broad based areas of study that brings together the various segments of the curriculum into meaningful association” (Good 1973 Dictionary of Education)

9. lean production – making a product in such a way that excludes all non-productive actions; one facet of the Toyota Production System which is a philosophy of manufacturing

10. multidisciplinary curriculum – a curriculum that relates to or makes use of several disciplines at once

11. probability – the chances that something will happen; in statistics, the chances that the
same results will be achieved if an experiment is conducted over and over again

12. Project GRAD – a national organization that works with a public school system to “ensure a quality public school education for all at risk children in economically disadvantaged communities so that high school graduation rates increase and graduates are prepared to enter and be successful in college” (www.projectgrad.org).

13. sequenced integration - a curriculum that combines two areas of content and in which “similar ideas are taught in concert, although two subjects are separate” (Fogarty, 1991)

14. synergistic teaching – collaborative teaching in which two or more instructors cooperatively work together toward a common end

15. TCAP – see Tennessee Comprehensive Assessment Program

16. Tennessee Comprehensive Assessment Program – a timed, multiple choice test given to all students in grades 3-8 in the state of Tennessee on the same days under the same conditions; an assessment that measures skills in math, reading, language arts, science, and social studies; a standardized test

17. thematic curriculum – “education that cuts across subject-matter lines, bringing together various aspects of the curriculum into meaningful association to focus upon broad areas of study” (Shoemaker, 1989, p. 5)

18. transdisciplinary curriculum – a curriculum that cuts across two or more disciplines and brings them together
9. ORGANIZATION OF THE STUDY

There were three major components of this study: planning and research; teaching; and analyzing data. The thesis is divided into five chapters. Chapter One includes the introduction, statement of problem, purpose of the study, limitation, assumptions, procedures, definition, and organization. Chapter Two is a review of related literature. Chapter Three includes methods and procedures used to collect the data. The presentation and analysis of the data is included in Chapter Four. Chapter Five is a summary resulting from the study and recommendation for further research. The appendix includes Tennessee State Content Standards for Visual Art and Math for Kindergarten through Grade 5, selected lesson plans, and a teacher journal outlining the teaching of the integrated lessons.
CHAPTER TWO

REVIEW OF LITERATURE

In this chapter, literature concerning curriculum integration, visual arts education, the No Child Left Behind Act, and the Toyota Production System is reviewed.

1. CURRICULUM INTEGRATION AND THE VISUAL ARTS

The 1870 Massachusetts Free Instruction in Drawing Act was designed to give lessons in drawing, mainly for the purpose of encouraging industrial competition with Europe, and Walter Smith supervised that effort in the Boston school system in 1871 (Bolin, 1985; Stankiewicz, 2001). Thus began the history of art education in America. Since that time art classes have taken many forms and focused on various things such as feminine endeavors, progressive reforms for the lower classes, ways to bring aesthetics and culture into the home, developing creativity, gauging children’s cognitive development, and teaching the four disciplines of studio art, aesthetics, art history, and art criticism (Amburgy, 1990; Chalmers, 2001; Freedman, 1989; Hamblen, 1997; Kern, 1985; Parks, 1997).

The content of art curriculum has changed in recent years, as it should, for its “content is historically and culturally situated” (Neperud, 1995, p. 9). Recent efforts to reform schools have begun to support the idea of the arts being a more substantial part of school instruction through integrated instruction. Curriculum integration demonstrates to students the interconnections of content areas, and numerous researchers believe that this
can prepare students to enter a highly interdependent adult world (Manner, 2002, p. 18; Webb, 1996, p. 1). Gail Burnaford wrote in 2001 that arts integrations can “play a key role in the development of learner’s capacities to negotiate between multiple spheres, between the self and the world, between realms of experience, between types of achievement” (p. 9). She has described arts integration as an approach or a philosophy to teaching and learning about art along with content areas (p. 6).

There are a myriad of terms that describe curricular integration, such as *interdisciplinary*, *multidisciplinary*, and *transdisciplinary*. More terms such as these are included in *Definition of Terms* in Chapter One. These terms vary only slightly in definition, and all are used to describe the philosophy that knowledge fragmentation hinders student learning. Sometimes in an integrated curriculum, the arts can be the main focus, or at other times they can be a support. In the lessons taught for this study, art was always the main focus and never comprised less than 51% of the focus. For that reason, the curriculum taught for this study is called an *inflated curriculum*, that is, a curriculum that remains rooted in one discipline while introducing material from other content areas. Krug and Cohen-Evron identified four types of curriculum integration in their 2000 study: 1) using the arts as a resource for other disciplines, 2) enlarging organizing centers through the arts, 3) interpreting subjects, ideas, or themes through the arts, and 4) understanding life-centered issues. The opportunities to integrate other curricula with art learning are boundless, and the ways to do so are vast. As stated before, curriculum integration is a way of thinking about education rather than a way of doing it.

One integration effort is the Arts-Infused Summer School program implemented by the Tacoma, Washington School District and Arts Impact. This was a five-week, 60-
hour summer school program for 105 students in the second, third, and fourth grades.

“Evaluation efforts for the Arts Impact Arts-Infused Summer School focus on three areas: the collection and analysis of evidence of student learning, comparisons with control classes at three other sites through standardized testing, and review of program dynamics related to student achievement as reported by teachers, artist-mentors, programs staff, and key family members” (Watts, www.newhorizon.org/strategies). Some researchers believe that the best assessment of integrated curricula is done with a multiple-method research design using qualitative and quantitative methods (Hurley, p.1).

As educators develop today’s curriculum, and art instruction is woven into the fabric of the core curriculum, there is a real danger of getting sidetracked. Elliott Eisner warns about being diverted by “focusing efforts on outcomes that other fields can claim to serve equally well” or by making research claims about the effects of art education on “academic forms of performance for which there is little or weak research evidence” (2002, p. 42).

The type of curriculum integration used here is called “sequenced integration,” a term used by Robin Fogarty in A Mindful School (http://nwrel.org). Sequenced integration involves the teaching of ideas in one class as similar ideas are taught in separate classes. Two advantages of sequenced integration are that it facilitates transfer of learning across content areas, and no changes in class schedule are required (Lake, 1994, www.nwrel.org).

Readings in art education indicate that art teachers commonly become “isolated in their own school” (Burnaford, 2001, p. xxvi). Ronald Neperud of Columbia University writes, “If teachers do not work or talk together often, there is little shared understanding
of the meanings they attach to art” (1995, p. 73). When implementing integrated curricula, “teachers must first form intrapersonal relationships within the school” (Krug, 2000, p. 258). This is difficult to do when art is given such “marginal position and status” (Neperud, 1995, p. 81). If parts of the curriculum were viewed as “discrete pigeonholes, such as one might find in a roll-top desk…the arts would likely occupy the smallest chamber of all” (Manner, 2002, p. 18). Of course, curriculum organization represents the interests of educators, and the classes that are taught in school are the ones whose “knowledge is of most worth” (Krug, 2000, p. 261).

Research results have made it clear that art class experiences contribute to general academic success because such experiences offer opportunities to develop “focus, concentration, expression, persistence, imagination, creativity, and inclinations to tackle problems with zeal” (Catterall, www.newhorizons.org/strategies). There are a myriad of reports that state that art students have heightened academic achievement, score higher on SATs, participate more in school activities, and have better school attendance (Burnaford, 2001, p. xliii; Cornett, 2003, pp. 3, 4, 6; National Endowment, 2002, p. 2; Washington State Arts Commission, 2003, p. 6).

Art work “provides the means for the human brain to function at its highest capacities” (Dickinson, www.newhorizons.org/strategies). In fact, the evidence is very strong linking the arts to basic learning, and some “researchers refer to the arts as the fourth R” (Cornett, 2003, p. 7). “Arts integration consistently reveals unrecognized abilities in learners formerly perceived as a problem by teachers and other students” (Burnaford, 2001, p. 19).

The arts encourage children to access their emotions. When emotion is part of
learning, the brain will physically change most extensively and powerfully (Zull, www.newhorizons.org/neuro). Brain research shows that early stimulus in visual activities is necessary for complete development (Cornett, 2003, p. 14). Art class can give a student “experience” (Taylor, 1960, p.11), and “experience is the medium of education” (Eisner, 2002, p. 3). “Children often learn best by being absorbed in tasks that require the incidental use of skills and ideas, rather than focusing on them in a detached way” (Burnaford, 2001, p. xx). The arts help us notice, imagine, tolerate ambiguity, stabilize ideas, and discover our capabilities (Eisner, 2002, p. 5). Art classes promote “the education of vision” and “artistic intelligence” (Eisner, 2002, p. 43), and making art is an “act of intelligence” as much as reading and multiplying are (Fowler, www.newhorizons.org/future). Also, we know that art speaks to our inherent human qualities because even pre-historic civilizations have beautiful artistic heritage (Fowler, www.newhorizons.org/future; Manner, 2002, p 18).

Finally “parallel concepts found in math and the arts include: fractions, equations, number strings, symmetry, approximate measurement, and geometric shapes” (Watts, www.newhorizons.org/strategies). Math questions such as these might be explored in art class: “How are painting and drawing different from sculpture? How many dimensions does each represent? How does art relate to proportion and scale? What do I have to do with an image of a whole person to make it fit on my paper? How can I use printmaking to create multiples that are the same” (Manner, 2002, p. 19)?
2. NO CHLD LEFT BEHIND

The No Child Left Behind Act (NCLB) is a federal law which was authorized in December 2001 by a bi-partisan Congress.

It “requires schools to establish learning standards; create annual assessments to measure student progress in reading and math in grades 3-8 and once in high school; set a level or cut-off score at which students are called proficient; and report to the public on what percentage of students are proficient, with the information broken down by race, income, disability, language proficiency, and gender subgroups” (pureparents.org).

The cornerstone of the law is performance based accountability or students’ test results; its goal is that all students will be proficient readers and mathematicians by 2014. The three elements of the law are: 1) Goals: performance standards that guide curriculum and instruction, 2) Assessment: the standardized test and 3) Consequences: rewards and sanctions (Stecher, 2004, p xiii).

The only measure of school success made by No Child Left Behind is scores achieved on standardized tests; the law does not even consider such things as citizenship or enjoyment of learning. The law’s call to measurement echoes a marketplace mentality where schools are pushed to make each student equivalently acceptable and of homogenous quality. The existence of NCLB has changed the circumstances of education; schools now resemble factories which are challenged to generate uniformly proficient children. It has, of course, been contested that test scores alone can not
accurately or adequately describe a school’s performance. It is constructive to ask what cannot be measured by test scores. Many important things do not show up on a reading and math test. Some things that schools should foster but that cannot be measured on a standardized test include friendship, curiosity, respect, caring, cooperation, imagination, and communication. However, whatever arguments against NCLB exist, it appears that “educational measurement seems to have won the day” (Holland, 2004, p. xiv).

The consequences of non-performance can be dire.

“If a school’s students don’t score high enough on their state’s No Child Left Behind tests, the school can (1) be placed on a sanction-laden improvement track capable of ‘improving’ it into nonexistence, (2) be publicly embarrassed in local newspapers, or (3) be slammed simultaneously with both of these consequences” (Popham, 2006, p. 32).

“Schools everywhere are under pressure to raise academic standards. Too often they think this means working within tightly defined subject boundaries, dropping the arts and focusing only on conventional academic learning” (Burnaford, 2001, p. xix). Academic concerns that are driven by test performance may force educators to look at reading and math in isolation rather than in ways that help students connect content areas. School curricula can become warped as “teachers may spend more time on specific test content, reducing the time spent on other topics – effectively narrowing the curriculum” (Stecher, 2004, p. 60).
4. TOYOTA PRODUCTION SYSTEM

As mentioned earlier, the Toyota Production System (TPS) was developed in Japan after World War II. Its lean production methods include just-in-time inventories, the paring of indirect labor, many cross-trained employees, everyone’s dedication to continuous improvement, product tied to demand, and the one practice that is considered in this study, making the product flow through the system without wasted time. TPS methods pare down the production practices so the product in progress is never touched by hands that do not add to its value. If an action does not count towards the end result, it is excluded from the process.

If a parallel is drawn between manufacturing and education, teachers are the manufacturing workers and “the final product is not a car, but rather the learning of students over the course of their K-12 careers” (Stecher, 1999, p. 43). Of course, it is extreme and contrived to draw a direct parallel between manufacturing a car and educating a student. However, the notion of lean production does tie in with the concept of teamwork and the idea that all staff in a school should work together to educate the population of that school. A football team does not field ten players who are trying to score a touchdown and one that is trying to hit a homerun. And a crew does not seat some rowers who are trying to row north, some who are trying to row northeast, and one is not rowing at all. Likewise, a school should not employ teachers who are not trying to move the students toward academic success. It may be arguable whether proficiency on standardized tests equates with academic success. However, in a school that is struggling to meet proficiency standards and is striving to stay off the list of “failing schools,” there can be no argument that academic success means that enough students are proficient.
A common Japanese term used in the TPS is *jidoka* which loosely translated means *don’t pass along problems to others*. It makes each worker responsible for his own part and for the whole or the final product. Looking at art education through the lens of the Toyota Production System raises some questions. Do art teachers feel responsible, in part, for the outcome of standardized tests? Do they take responsibility for a school passing or failing to meet the standards of NCLB? Do they eagerly anticipate or dread the publication of the test scores? Do they rejoice at the successes and grieve at the shortcomings? The answers to these questions are surely as diverse as art educators themselves. This study does not attempt to give an answer for every art teacher, nor does it even assume that there is one correct answer. Rather, this study is made with the presumption that *in a school that is struggling to meet proficiency standards the art teacher should become a productive contributor to that cause.*
CHAPTER THREE
METHOD AND PROCEDURES

This chapter describes the different procedures used to do this study. First, the population and the sample drawn from it are described. Second, the source of data and the testing instrument are explained. Next, the procedures for developing the integrated curriculum, implementing the curriculum, and comparing test results are described. Finally, the methods for analyzing the data are discussed.

1. POPULATION

The population of the study was comprised of the students who attend ten inner-city Project GRAD elementary schools. The experimental group was comprised of students from two of those elementary schools served by Project GRAD, Lawnville and Martin. Demographically, the Experimental Group closely resembles the Control Group, with slightly higher percentages of African-American and Hispanic students and a slightly lower percentage of economically disadvantaged students. Demographic characteristics are described in Tables 1 and 2. Economic disadvantage, as used by government institutions, is determined by a student’s qualified participation in the free- or reduced-lunch program and “is often used as a measure of family income levels at a school” (http://www.greatschools.net/definitions). The students of Martin and Lawnville Elementary Schools were taught the math-in-art curriculum during the 2006-07 school year. The students at the other Project GRAD elementary schools were not.
Table 1. Characteristics of students at experimental schools.

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group (Combined schools)</th>
<th>Lawnville</th>
<th>Martin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Total Students</td>
<td>366</td>
<td>100</td>
<td>208</td>
</tr>
<tr>
<td>African-American</td>
<td>244</td>
<td>66.7</td>
<td>110</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>1</td>
<td>.3</td>
<td>1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>51</td>
<td>13.9</td>
<td>48</td>
</tr>
<tr>
<td>Native American/Alaskan</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>70</td>
<td>19.1</td>
<td>49</td>
</tr>
<tr>
<td>Economically disadvantaged</td>
<td>312</td>
<td>85</td>
<td>154</td>
</tr>
<tr>
<td>Female</td>
<td>176</td>
<td>48</td>
<td>102</td>
</tr>
<tr>
<td>Male</td>
<td>190</td>
<td>52</td>
<td>106</td>
</tr>
</tbody>
</table>

Table 2. Characteristics of students at Control schools.

<table>
<thead>
<tr>
<th></th>
<th>Control Group (Combined Schools)</th>
<th>School A</th>
<th>School B</th>
<th>School C</th>
<th>School D</th>
<th>School E</th>
<th>School F</th>
<th>School G</th>
<th>School H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Total Students</td>
<td>3593</td>
<td>100</td>
<td>420</td>
<td>11.9</td>
<td>447</td>
<td>12.4</td>
<td>519</td>
<td>14.4</td>
<td>361</td>
</tr>
<tr>
<td>African-American</td>
<td>1582</td>
<td>44</td>
<td>178</td>
<td>4.9</td>
<td>122</td>
<td>3.4</td>
<td>158</td>
<td>4.4</td>
<td>158</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>18</td>
<td>0.5</td>
<td>3</td>
<td>0.1</td>
<td>1</td>
<td>0.1</td>
<td>3</td>
<td>0.1</td>
<td>2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>176</td>
<td>5</td>
<td>24</td>
<td>0.7</td>
<td>27</td>
<td>0.7</td>
<td>42</td>
<td>1.2</td>
<td>45</td>
</tr>
<tr>
<td>Native American/Alaskan</td>
<td>19</td>
<td>0.5</td>
<td>4</td>
<td>0.1</td>
<td>3</td>
<td>0.1</td>
<td>2</td>
<td>0.1</td>
<td>2</td>
</tr>
<tr>
<td>White</td>
<td>1865</td>
<td>52</td>
<td>239</td>
<td>6.6</td>
<td>312</td>
<td>8.8</td>
<td>354</td>
<td>10.3</td>
<td>354</td>
</tr>
<tr>
<td>Economically disadvantaged</td>
<td>3227</td>
<td>90</td>
<td>359</td>
<td>10.0</td>
<td>361</td>
<td>10.2</td>
<td>478</td>
<td>13.8</td>
<td>601</td>
</tr>
<tr>
<td>Female</td>
<td>1743</td>
<td>48</td>
<td>220</td>
<td>6.2</td>
<td>227</td>
<td>6.2</td>
<td>279</td>
<td>8.1</td>
<td>324</td>
</tr>
<tr>
<td>Male</td>
<td>1917</td>
<td>52</td>
<td>228</td>
<td>6.4</td>
<td>238</td>
<td>6.6</td>
<td>280</td>
<td>8.1</td>
<td>395</td>
</tr>
</tbody>
</table>
The students taught the math-in-art curriculum comprise a convenience sample because the researcher is the art teacher at Lawnville and Martin. There was a combined enrollment of 366 total students at these two schools.

2. SOURCE OF THE DATA

The State of Tennessee administers a standardized test, the Tennessee Comprehensive Assessment Program (TCAP) to all 3rd through 5th grade students in the spring of each school year. This achievement test is a timed, multiple choice assessment that measures skills in Mathematics, as well as in Reading, Language Arts, Science and Social Studies. Only the Reading and Mathematics scores are reported to federal agencies as part of the No Child Left Behind Act. The last three portions of the math test are Mathematics Sub-Test 5: Data Analysis and Probability, Sub-test 6: Measurement, and Sub-test 7: Geometry. The math concepts that were integrated into art class mostly involved geometry, and some attention was also given to data analysis and probability and measurement. Therefore, to evaluate the impact the integrated art lessons had on the students’ math learning, the scores from Math Sub-Tests 5, 6, and 7 were appraised. The students who were in 3rd, 4th, and 5th grade during the 2007 school year were included in the test score analysis.

The 3rd, 4th, and 5th grade scores for the Experimental Group on three sub-tests of the 2007 TCAP Math test were compared to the scores earned by these same grades in 2006 when Lawnville and Martin students received traditional art instruction. Also the 2007 Lawnville and Martin scores were compared to 2007 scores from a control group.
taken from other Project GRAD elementary schools which used traditional art curriculum. Third, the gains made by the Experimental Group were compared to the gains made by the Control Group.

All scores report the Average Reporting Category Performance Index (RCPI). The RCPI is an estimate of the number of items the student would be expected to answer correctly if there had been 100 items for that category. By applying a RCPI to the test results, it becomes easier to compare the results of longer tests with those of tests which have fewer items.

3. PROCEDURES

The procedures for the study include the following.

1. The art teacher discussed the idea for the study with several administrators and county school system supervisors, including the Art Supervisor and school principals. Any change in curriculum can not be undertaken without the approval and cooperation of leaders of the schools involved. It was agreed by all parties that the proposed changes in curriculum would not interrupt the general art education of each student and would not require additional funds, increased instructional time, or changes in schedule. It was intrinsically understood that no students would be put at risk as a result of this study.

2. The art teacher wrote the plan of this study and requested written permission to implement the plan from Knox County Director of Curriculum and Assessment and the Institutional Review Board (IRB) at the University of Tennessee. Prior to the commencement of the study, a request was made of the school district for access to data from all ten of the Project GRAD elementary schools. The district’s Office of Evaluation,
Research, and Curriculum granted the researcher permission to review the non-
identifiable, aggregate data for Math from Project GRAD elementary schools. The IRB
granted approval of the study.

3. The art teacher reviewed Tennessee State Content standards for Visual Art for
each grade level Kindergarten - 5 (Appendices 1-6); National Content Standards for
Visual Art for each grade level Kindergarten – 4 (Appendix 7); and Tennessee State
Content standards for Math for each grade level K-5 (Appendices 8-13). Art teacher
discussed the Tennessee State Math Content Standards with an experienced classroom
teacher of each grade level, kindergarten through 5th grade. The review served to
prioritize the content standards and attempted to answer: What standards are most vital?
The pre-teaching, or re-teaching, of which ones is most likely to benefit the students?
Which ones fit better and more naturally with the content standards for art?

Only a few of the math standards were selected for inclusion in art integration,
and by necessity other standards were excluded. Also, not all math standards could be
easily taught in an art lesson. Therefore, consultation was made with principals of both
schools as well as math specialists from Project GRAD and six classroom teachers of
Martin and Lawnville Elementary Schools. Input was also given by the Curriculum
Instructional Facilitator at Martin. It is noteworthy that all the collaboration between the
art teacher and the classroom teachers took place in the form of written notes. There was
simply not enough time in the school day for face-to-face conferencing. As choices were
made, it was kept in mind that content standard selection must depend on “identifying the
viable, independent existence of each concept in both an arts discipline and in math”
4. The art teacher planned the art curriculum and acquired or wrote lesson plans which included the teaching of all art standards as well as selected math content standards for all grades kindergarten through 5th grade. Some of these detailed lesson plans are found in Appendices 14 - 42. As math was integrated into art, the lesson plans were carefully written so it was not disruptive for the children to learn math along with art. In fact, the instruction was carefully planned so children would be unaware that an experiment was taking place. The art lessons for this study continued to encompass all the art content standards and to use many different art media and processes such as liquid tempera paint, cake tempera paint, watercolor paint, colored pencils, crayons, markers, ebony pencil, cut and torn paper, art tissue, paper, clay, glaze, papier mâché, weaving, beads, wire sculpture, portraiture, mask making, and still life drawing.

5. The art teacher taught the integrated lessons during the school year in a timely manner, roughly using concepts from math at about the same time the concepts were taught in math classes, and collaborating with classroom teachers to determine the scheduling of art lessons.

6. A matched sample of students from other Project GRAD elementary schools was formed. The demographic information from the eight schools in the Control Sample was collapsed into one profile.

7. The students took their standardized tests in the spring, as they do each year, but there was no stated connection of the math test to projects done in art class.

8. Test results were sent to the Knox County Schools district office from the Tennessee State Department of Education.

9. Scores from Math sub-tests 5, 6, and 7 of the 2007 TCAP/Terra Nova for the
Experimental Group’s (Lawnville and Martin) 3rd, 4th, and 5th graders were obtained and compared to the 2006 test scores from those schools. The test scores were provided by an Evaluation Specialist working in the Knox County Schools Office of Research and Evaluation. The scores were discussed during an initial conference and subsequent phone conversations. Independent t-tests were done to seek statistical significance of findings.

10. Scores from Math sub-tests 5, 6, and 7 of the 2007 TCAP/Terra Nova for the Experimental Group’s (Lawnville and Martin) 3rd, 4th, and 5th graders were obtained and compared to the 2007 scores earned by the Control Group. Independent t-tests were done to seek statistical significance of findings.

11. Gains made between 2006 and 2007 by the Experimental Group on the Math Sub-tests 5, 6, and 7 were compared to the gains made by the Control Group on the same tests.

Implementation of this study spanned eighteen months. Adjustments to procedure were made when necessary. For example, at the outset of the study, there was interest in measuring how classroom teacher attitudes toward the art program changed after the integrated curriculum was implemented. Also under consideration for inclusion in the study was analysis of changes in art class attendance. It soon became clear that the tasks of developing and implementing curriculum were quite broad, so the decision was made to investigate the other issues at a later time. All six grade levels in the elementary schools were taught the integrated curriculum. However, the quantitative results of the study reflect only the impact of the lessons that were taught to third, fourth, and fifth graders between August 2006 and April 2007.
4. METHODS OF DATA ANALYSIS

The test scores from Lawnville and Martin were collapsed into one score by calculating the weighted mean. Test scores from the other eight Project GRAD schools were also collapsed into one score by calculating the weighted mean. Three test scores for each grade level were assessed: Math Sub-tests 5, 6, and 7. Three post-test comparisons were made: comparison of Experimental Group’s pre-test scores to their post-test scores; comparison of Experimental Group’s post-test scores to the Control Group’s post-test scores; and comparison of the gains made in 2007 by the Experimental Group to the gains made in 2007 by the Control Group. Statistical significance was found using independent $t$-tests.
CHAPTER FOUR

DATA ANALYSIS

In this chapter, the data is presented and analyzed. First, the tests scores and the results of the t-tests are discussed. Then each the test scores are analyzed in direct application to the three parts of the research question.

1. INTRODUCTION

This study analyzed pre-test and post-test scores from an Experimental Group which received integrated art instruction and from a Control Group which received traditional art instruction. The Experimental Group was comprised of students from two of the ten Project GRAD elementary schools in the Knox County Schools system. The Control Group was comprised of students from the remaining eight Project GRAD elementary schools. The test scores analyzed are those from the TCAP Math Sub-tests 5, 6, and 7. Scores for the ten schools are shown in Table 3.

As discussed in Chapter One, the Experimental Group was comprised of Lawnville and Martin students. The scores from these two schools were collapsed into one score, the Experimental Group. The Experimental Groups averaged an $n$ of 59. The Control Group was comprised of all other Project GRAD elementary schools, which are schools A – H. Those eight scores were also collapsed into one score. The Control Groups averaged an $n$ of 581. The total population of all ten Project GRAD schools was collapsed into one score for the purpose of statistical analysis. These collapsed scores are shown in Table 4.
Table 3. RCPI Math Scores on Sub-tests 5, 6, and 7 for all schools, Grades 3, 4, and 5.

<table>
<thead>
<tr>
<th></th>
<th>Lawn-ville</th>
<th>Martin</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
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<tbody>
<tr>
<td><strong>2006 Grade 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Sub-test 5</td>
<td>56</td>
<td>61</td>
<td>56</td>
<td>56</td>
<td>58</td>
<td>56</td>
<td>55</td>
<td>51</td>
<td>56</td>
<td>64</td>
</tr>
<tr>
<td>Math Sub-test 6</td>
<td>64</td>
<td>68</td>
<td>67</td>
<td>65</td>
<td>68</td>
<td>66</td>
<td>65</td>
<td>61</td>
<td>67</td>
<td>71</td>
</tr>
<tr>
<td>Math Sub-test 7</td>
<td>81</td>
<td>83</td>
<td>82</td>
<td>79</td>
<td>84</td>
<td>82</td>
<td>80</td>
<td>79</td>
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<td>85</td>
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<tr>
<td><strong>2006 Grade 4</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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Table 4. RCPI Math Scores on Sub-tests 5, 6, and 7 for all schools, Grades 3, 4, and 5,

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To determine the statistical significance of the testing results, the standard deviation for each test was calculated and then an independent $t$-test was done. The results for the Experimental Group’s test scores are shown in Table 5. Table 6 shows the $t$-test results for the Control Group’s test scores.

2. RESEARCH QUESTION I:

*Does the integration of math content standards into the art curriculum help children better learn math standards as demonstrated by achievement of higher scores on standardized math tests in Probability, Measurement, and Geometry as compared to the scores achieved by the same school in the year prior to the experiment?*

The Experimental Group’s scores were compared with the scores earned by last year’s students at the same schools. This allowed a comparison of the experimental schools’ performances before and after the integrated art curriculum was taught. When looking at this comparison, the grade level of the students remained constant and the test was the same; however, the individual students taking the test in 2007 were, of course, different than the ones tested in 2006.

First, the scores achieved by the third graders are shown. Math Sub-test 5 (Figure 3) shows that the Grade 3 Experimental Group scored *1.9 lower* in 2007 than they did in 2006. Next, the scores for Math Sub-test 6 were reviewed (Figure 4). The third graders’ post-test was compared to their pre-test on Math Sub-test 6, and this showed that they
Table 5. T-tests results for Experimental Group test scores.

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Table 6. T-tests results for Control Group test scores.

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Figure 3. Comparison of scores, Grade 3, Sub-test 5, Experimental Group 2007 to Experimental Group 2006.

Figure 4. Comparison of scores, Grade 3, Sub-test 6, Experimental Group 2007 to Experimental Group 2006.
scored 3.1 points higher in 2007 than they did in 2006. Finally, the scores on Math Sub-test 7 were compared (Figure 5). The results were that the third graders scored 2.1 points higher on Sub-test 7. It is beneficial to see a summary of the third grade test scores from 2007 compared to the test scores achieved on the pre-test in 2006 (Figure 6).

Second, the tests scores for Grade 4 were reviewed to make comparisons between the achievement of the Experimental Group before and after the integrated instruction. The pre-test scores on 4th Grade Sub-test 5 were compared to the post-test scores (Figure 7). Post-test scores were 4.3 lower. The comparison of Sub-test 6 scores showed that the post-test was 1.7 lower (Figure 8). On Sub-test 7, the fourth graders scored 2.9 higher on the post-test than they did on the pre-test (Figure 9). An overview of the fourth grade test scores shows a comparison of all three pre-test scores next to all three post-test scores (Figure 10).

Figure 5. Comparison of scores, Grade 3, Sub-test 7, Experimental Group 2007 to Experimental Group 2006.
Figure 6. Summary of comparison of scores, Grade 3, Sub-tests 5, 6, and 7, Experimental Group 2007 to Experimental Group 2006.

Figure 7. Comparison of scores, Grade 4, Sub-test 5, Experimental Group 2007 to Experimental Group 2006.
Figure 8. Comparison of scores, Grade 4, Sub-test 6, Experimental Group 2007 to Experimental Group 2006.

Figure 9. Comparison of scores, Grade 4, Sub-test 7, Experimental Group 2007 to Experimental Group 2006.
Third, the comparisons were made for the fifth graders’ test scores, once again reviewing how well they did on Math Sub-tests 5, 6, and 7. On Sub-test 5, the post-test scores for grade 5 were 0.6 higher (Figure 11). On Sub-test 6, the scores were 5.2 higher (Figure 12). The scores comparison for Sub-test 7 showed that the scores were 0.4 points lower (Figure 13). A fourth chart shows the summary of the fourth graders’ pre-test and post-test score comparisons (Figure 14).
Figure 11. Comparison of scores, Grade 5, Sub-test 5, Experimental Group 2007 to Experimental Group 2006.

Figure 12. Comparison of scores, Grade 5, Sub-test 6, Experimental Group 2007 to Experimental Group 2006.
Figure 13. Comparison of scores, Grade 5, Sub-test 7, Experimental Group 2007 to Experimental Group 2006.

Figure 14. Summary of Comparison of scores, Grade 5, Sub-tests 5, 6, and 7, Experimental Group 2007 to Experimental Group 2006.
3. RESEARCH QUESTION II:

*Does the integration of math content standards into the art curriculum help children better learn math standards as demonstrated by achievement of higher scores on standardized math tests in Probability, Measurement, and Geometry as compared to the scores achieved by a matched sample of students who did not receive the integrated instruction?*

To answer this research question, the Experimental Group’s scores were compared with the scores earned by the students in the Control Group. This provided a comparison of the experimental schools’ performance to the achievement of the students at similar schools who did not receive integrated art instruction. As stated before the Experimental Group was not selected randomly but rather a convenience sample. The Experimental Group had more African-American and Hispanic students than did the Control Group but closely resembled them in socio-economic status.

First, the scores achieved by the third graders were reviewed. Math Sub-test 5 scores showed that the Grade 3 Experimental Group scored 1.9 lower than the Control Group (Figure 15). On Math Sub-test 6, the Experimental Group scored 3.9 higher than the Control Group (Figure 16). On Math Sub-test 7, the Experimental Group’s achievement was 4.0 higher than that of the Control Group (Figure 17). An overview of the comparisons between the Experimental Group and the control Group is made in Figure 18.

Second, the tests scores for Grade 4 were reviewed to make comparisons between the achievement of the Experimental Group and that of the Control Group. The test
Figure 15. Comparison of scores, Grade 3, Sub-test 5, Experimental Group 2007 to Control Group 2007.

Figure 16. Comparison of scores, Grade 3, Sub-test 6, Experimental Group 2007 to Control Group 2007.
Figure 17. Comparison of scores, Grade 3, Sub-test 7, Experimental Group 2007 to Control Group 2007.

Figure 18. Summary of comparison of scores, Grade 3, Sub-tests 5, 6, and 7, Experimental Group 2007 to Control Group 2007.
scores on Sub-test 5 were compared (Figure 19). Experimental test scores were *1.6 lower* than those achieved by the Control Group. The comparison for Sub-test 6 showed that the Experimental Group’s test score was *1.6 lower* than the control Group’s (Figure 20). On Sub-test 7, the fourth graders in the Experimental Group scored *2.0 higher* than the Control Group (Figure 21). Figure 22 shows a summary of the comparisons between the fourth graders’ test scores in the Experimental Group and those in the Control Group.

Third, the comparisons were made for the fifth graders’ test scores, once again reviewing how well they did on Math Sub-tests 5, 6, and 7, as compared to the students in the Control Group. On Sub-test 5, the Experimental test scores were *2.6 higher* than those achieved by the Control Group (Figure 23). On Sub-test 6, the Experimental scores were *0.6 higher* (Figure 24). The scores comparison for Sub-test 7 showed that the Experimental scores were *2 points higher* (Figure 25). In Figure 26 the comparisons...
Figure 20. Comparison of scores, Grade 4, Sub-test 6, Experimental Group 2007 to Control Group 2007.

Figure 21. Comparison of scores, Grade 4, Sub-test 7, Experimental Group 2007 to Control Group 2007.
Figure 22. Summary of comparison of scores, Grade 4, Sub-tests 5, 6, and 7, Experimental Group 2007 to Control Group 2007.

Figure 23. Comparison of scores, Grade 5, Sub-test 5, Experimental Group 2007 to Control Group 2007.
Figure 24. Comparison of scores, Grade 5, Sub-test 6, Experimental Group 2007 to Control Group 2007.

Figure 25. Comparison of scores, Grade 5, Sub-test 7, Experimental Group 2007 to Control Group 2007.
Figure 26. Summary of comparison of scores, Grade 5, Sub-tests 5, 6, and 7, Experimental Group 2007 to Control Group 2007.

between the fifth graders’ scores can be seen.

4. RESEARCH QUESTION III:

Does the integration of math content standards into the art curriculum help children better learn math standards as demonstrated by achievement of greater gains on standardized math tests in Probability, measurement, and geometry as compared to the gains made by a matched sample of students who did not receive the integrated instruction?

To answer this third research question, the gains made by the Experimental Group were compared with the gains made by the students in the Control Group. Analyzing the gains made by the Experimental Group allowed the study to better know how effective
the curriculum was. A relatively low score does not automatically signify a poorly
designed curriculum. Nor does a relatively high test score signify that progress or
improvement was made. It is only by looking at the gains made by a student that
effectiveness of instruction can be assessed.

First, the gains made by the third graders were reviewed. Math Sub-test 5 scores
showed that the Grade 3 Experimental Group made gains that were \(3.7\) less than those
made by the Control Group (Figure 27). On Math Sub-test 6, the Experimental Group
gained \(3.2\) more points than did the Control Group (Figure 28). On Math Sub-test 7, the
Experimental Group’s gains were \(2.3\) more than that of the Control Group (Figure 29).
Figure 30 shows an overall view of the comparisons of gains made by the third graders.

Figure 27. Comparison of gains made, Grade 3, Sub-test 5, Experimental Group 2007 to
Control Group 2007.
Figure 28. Comparison of gains made, Grade 3, Sub-test 6, Experimental Group 2007 to Control Group 2007.

Figure 29. Comparison of gains made, Grade 3, Sub-test 7, Experimental Group 2007 to Control Group 2007.
Second, the tests scores for Grade 4 were reviewed to make comparisons between the gains achieved by the Experimental Group and those made by the Control Group. The gains made on Sub-test 5 were compared (Figure 31). The Experimental Group had gains made that were 1.6 lower than those achieved by the Control Group. The comparison for Sub-test 6 showed that the Experimental Group’s gains were 0.1 lower (Figure 32). On Sub-test 7, the fourth graders in the Experimental Group gained 2.6 more points than did the Control Group (Figure 33). Figure 34 illustrates the overall differences between the fourth grader’s gains.

Third, the comparisons were made for the fifth graders’ test scores, once again reviewing how much they gained on Math Sub-tests 5, 6, and 7, as compared to the students in the Control Group. On Sub-test 5, the Experimental test scores showed gains
Figure 31. Comparison of gains made, Grade 4, Sub-test 5, Experimental Group 2007 to Control Group 2007.

Figure 32. Comparison of gains made, Grade 4, Sub-test 6, Experimental Group 2007 to Control Group 2007.
Figure 33. Comparison of gains made, Grade 4, Sub-test 7, Experimental Group 2007 to Control Group 2007.

Figure 34. Summary of comparison of gains made, Grade 4, Sub-tests 5, 6, and 7, Experimental Group 2007 to Control Group 2007.
that were 0.6 less than those achieved by the Control Group (Figure 35). On Sub-test 6, the Experimental Group’s gains were 0.2 less (Figure 36). The scores comparison for Sub-test 7 showed that the Experimental Group’s gains were 1.6 greater (Figure 37). Figure 38 summarizes the comparisons between the fifth graders in the Experimental Group and those in the control Group.

H. SUMMARY OF ANALYSES

It is also beneficial to look at the three sets of test scores as one unit and to investigate what, if any, patterns emerge in the test results that show higher performance.

Figure 35. Comparison of gains made, Grade 5, Sub-test 5, Experimental Group 2007 to Control Group 2007.
Figure 36. Comparison of gains made, Grade 5, Sub-test 6, Experimental Group 2007 to Control Group 2007.

Figure 37. Comparison of gains made, Grade 5, Sub-test 7, Experimental Group 2007 to Control Group 2007.
Figure 38. Summary of comparison of gains made, Grade 5, Sub-tests 5, 6, and 7, Experimental Group 2007 to Control Group 2007.

by the Experimental Group. This is shown in Table 7. The areas in which the Experimental Group had higher performance are marked with a star. It is clear that the area where the students in the Experimental Group performed the best was in geometry. Therefore, this experiment supports the thesis that integrated curriculum can boost learning.

It is not surprising to see the impact on the Geometry test scores since much time was spent on lessons that integrated geometry concepts into the art lessons. Also, there is a natural overlap of geometry and art content which made it is easy to emphasize the math in art. The Experimental Group’s performance on Subtest 5 (Data Analysis and Probability) and Subtest 6 (Measurement) showed little or no better performance than the Control Group.
Table 7. Summary of test results indicating the tests on which the Experimental Group outperformed the Control Group.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sub-test 5 Data Analysis &amp; Probability</th>
<th>Sub-test 6 Measurement</th>
<th>Sub-test 7 Geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>Experimental Group 2007 compared to itself in 2006</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Experimental Group 2007 compared to Control Group 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Experimental Group 2007 Gains made compared to Control Group Gains made 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Experimental Group 2007 compared to itself in 2006</td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td>Experimental Group 2007 compared to Control Group 2007</td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td>Experimental Group 2007 Gains made compared to Control Group Gains made 2007</td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>Grade 5</td>
<td>Experimental Group 2007 compared to itself in 2006</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Experimental Group 2007 compared to Control Group 2007</td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>Grade 5</td>
<td>Experimental Group 2007 Gains made compared to Control Group Gains made 2007</td>
<td></td>
<td>★</td>
</tr>
</tbody>
</table>
During the statistical analysis of the data, a confidence level of $p=.05$ was selected as the desired goal. This was achieved in the $t$-tests for twelve of the eighteen Experimental Groups’ test scores and for seven of the Control Groups’ test scores. A further look at the seemingly successful Geometry scores reveals that for only two of these scores does the $t$-test attain a confidence level of 95%. These are marked with a circled red star in Table 8. The $t$-tests results do not achieve the statistical significance needed to state with confidence that the same success in raising test scores could be enjoyed in subsequent implementations of this inflated curriculum. Perhaps if this quasi-experiment were to be repeated, the results could be duplicated and a confidence level of 95% could be achieved. Tracking the progress of individual students rather than group progress will yield more reliable data.
Table 8. Summary of test results indicating the tests on which the Experimental Group outperformed the comparison group and a confidence level of 95% was achieved.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sub-test 5 Data Analysis &amp; Probability</th>
<th>Sub-test 6 Measurement</th>
<th>Sub-test 7 Geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experimental Group 2007 compared to itself in 2006</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Experimental Group 2007 compared to Control Group 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Experimental Group 2007 Gains made compared to Control Group Gains made 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experimental Group 2007 compared to itself in 2006</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Experimental Group 2007 compared to Control Group 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Experimental Group 2007 Gains made compared to Control Group Gains made 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experimental Group 2007 compared to itself in 2006</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Experimental Group 2007 compared to Control Group 2007</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Experimental Group 2007 Gains made compared to Control Group Gains made 2007</td>
<td>★</td>
<td>★</td>
</tr>
</tbody>
</table>
CHAPTER FIVE

CONCLUSION AND RESEARCH IMPLICATIONS

1. SUMMARY

This research study strove to show that integrating math content into elementary art classes could have a positive impact on standardized math test scores. The population studied was 3rd, 4th, and 5th graders who attend ten Project GRAD elementary schools in Knoxville, Tennessee. Two of the schools received the experimental curriculum, and the other eight did not. While implementing the study, the researcher continued in her present teaching position and taught within the existing parameters of her post. There was no additional funding, instruction time, or training.

Research and collaboration allowed the art teacher to develop an art curriculum that was systematically inflated with math content. These integrated lessons were used during the course of an entire school year. Some concessions of instructional time were made to important school events, such as Hispanic Heritage Month and Black History Month; however, as much time as possible was given to the integrated lessons. The participants of the Experimental Group saw no change in their art class schedule or in the operation of their art lessons. Efforts were made to discreetly introduce the math content into art class and to maintain the integrity of the art instruction. Scores on math tests taken before the integrated instruction were compared with scores on post-tests. The test results showed a strong impact in the area of Geometry, but a confidence level of $p \leq .05$ was not found.
2. CONCLUSIONS

There are many variables that bear on student achievement; therefore, the research done in this study can only lead to provisional results and not definite conclusions. However, at the end of the study, three distinct inferences can be reached. First, this experiment showed that a sole teacher can indeed plan and implement an inflated curriculum without making changes to schedule or funding. There are only three key ingredients for a successful cross-curricular integration of this sort: 1) an administration that will allow the integration to go forward; 2) classroom teachers who will collaborate with the art educator; and 3) an art educator who is willing to research, plan, and teach. These three crucial factors do not include large budgets and broad schedule changes.

Second, the strength and unique qualities of art activities are not lost in an inflated curriculum. At the conclusion of analyzing the data presented here, the study was discussed with one fifth grade art class who had participated in the experiment while they were fourth graders. The class was composed of students who were fourth graders during the experiment. The students were surprised to learn that the teacher had incorporated math into art. They said they were unaware they were learning math concepts in art. The art work produced in this inflated curriculum did not look like math projects. When displayed in a district-wide art show along side work from many other elementary schools, the pieces did not stand out as being math-related.

And third, the results certainly support the thesis that systematically teaching geometry concepts in art class can increase student learning as evidenced by achievement on standardized tests. Eight of the nine comparisons done on the geometry test scores showed that the Experimental Group outperformed the other students. Even though it can
not be stated with confidence that similarly successful results can be achieved the next 
time an integrated curriculum is taught, there is no doubt that this particular study ended 
successfully.

3. RECOMMENDATIONS FOR FURTHER STUDY

This study opens up some promising possibilities for integration of math in the 
elementary art curriculum. It clearly illustrates that an impact can be made by individual 
teachers working outside of an official or wide sweeping integration program. A tool we 
already have at hand is the sole teacher initiated, inflated curriculum. Further 
investigation should be made into the impact this kind of integration can achieve. A study 
of longer duration, perhaps three years, that tracks the progress of students would better 
pinpoint the effect on learning. As more study is done about the impact of inflated 
curricula, it will also be beneficial to track the progress of individual students.

The amount of time given to art instruction at the subject schools made it difficult 
to heavily impact learning. In a different situation there might be more time scheduled for 
art class, and efforts to integrate curriculum might then prove to be of greater 
consequence. Involvement of more art teachers at more schools including greater 
numbers of students will reveal much about what can be accomplished with integrated 
curriculum.

It is indisputable that there will always be integration in art classes, for art is about 
life. It is impossible to engage in worthwhile art activities without touching on something 
that is taught in another classroom. In an art classroom there will continue to be 
incidental learning about math, science, and language arts, as well as history, social
studies, geography, and foreign language. The challenge lies in building bridges across
the curriculum in a systematic, coordinated, and productive way.

Burnaford asserts that, “Arts integration means that the artist provides a resource,
not a recess, for teachers” (2001, p. 10). Indeed, the art teacher provides a recess for no
one, but it is not a resource for teachers either; it is a resource for students. Art class
provides a hub of learning for students, a place that welcomes every idea, every word
read in text books, every concept taught in all classes, every question asked, and every
emotion experienced inside of school and out. Art class is a place where knowledge is not
fragmented into unrecognizable and counterproductive bits and pieces but where it is
woven together in a comprehensible whole.

Art educators must always work to preserve the integrity of art for it has inherent
value and an important body of knowledge in and of itself. As experiments in curriculum
integration are considered and tested, care must be taken to sustain the strength of the art
program. Even though “an integrated curriculum unit should meet course requirements
for each discipline involved” (www.cew.wisc.edu), it is an art educators’ imperative to
guard their scarce and precious time. It is possible that the art portion of an integrated
curriculum could become so small that it cannot even be recognized. The value of
creating artworks must never be sacrificed for the sake of improving test scores.

Those who have chosen art education as their vocation know of the value that
infuses the creative process. They see and hear and instinctively feel that it is worthwhile
for a child to make art. There can be problems, however, with convincing others of this
truth. Doing quantitative research and sharing the results can help art teachers speak to
the administrators who schedule time for art classes and to the financial directors who
budget money for art supplies. There is real value in being able to meet decision makers and speak to them in their own language. “The creative arts are often given such a minor role in the education process that they are unable to make the intellectual contribution of which they are supremely capable” (Taylor, 1960, p. 11). It is art educators’ mission to enlarge the role that they play in their school. When others are convinced of the value of art, it is likely that instruction time will increase. More time must be given to the arts before their contribution, whatever, it may be, can be significant.

The research discussed here offers a small piece of information that can be viewed from many angles. There is no conclusive evidence presented that calls for widespread integration in the art room. It does, however, raise the question of how art education can best serve students while preserving its own integrity.

Curriculum must be constantly evolving to best suit the needs of the student, in a particular place at a particular time. Sound curriculum development is an organic process and should involve “implementation, evaluation, and modification as well as planning” (Neperud, 1995, p. 55). In some school settings, it is reasonable to implement a full-blown school wide curriculum integration plan. When it is not, teachers may use some form of arts curriculum integration to improve student learning. With this in mind, each teacher must look, think, adapt, and creatively teach to the needs of his or her particular students.
LIST OF REFERENCES


APPENDIX 1

KINDERGARTEN Tennessee VISUAL ARTS Content Standards and Student Performance Indicators

Standard 1.0 Media, Techniques, and Processes Students will understand and apply media, techniques, and processes. The student will
K.1.1 use selected tools and materials in safe manner to create a work of art
K.1.2 apply a variety of techniques and processes to produce original works of art that reflect personal experiences, imagination, and observations

Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- identify selected art materials and tools and describe how to use them in a safe manner.
- use selected techniques and processes to produce an original work of art that reflects personal experience.
Level 2:
- use selected tools and art materials to create a work of art in a safe manner.
- use selected techniques and processes to produce an original work of art that reflects personal experience and imagination.
Level 3:
- choose and explore the use of selected tools and art materials in a safe manner.
- create a work of art using a variety of techniques and processes that reflect personal experiences, observations, and imagination.

SAMPLE PERFORMANCE TASK Magic Paintbrush: Introduce painting techniques with the use of water (not paint) on colored construction paper. Apply water to the paper with a paintbrush. The water will dry and disappear, like magic. It doesn’t stain clothing. Look for and avoid scratching holes into the paper. Teacher will monitor for correct application of water and use of the paintbrush. Vocabulary: painting, dripping, scrubbing, stroke, dab, paintbrush

Integrations/Linkages: Science, Reading, Communication skills, Health and safety

Standard 2.0 Structures and Functions Students will use knowledge of structures and functions. The student will
K.2.1 identify elements of art (e.g. line, shape, color, texture)
K.2.2 identify principles of art (e.g. pattern, repetition)
K.2.3 demonstrate an understanding that anyone can express themselves visually

Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- identify individual elements of art (e.g. lines may be zigzag, curvy).
- identify individual principles of art (e.g. patterns may be AB)
- discuss the personal ideas or moods of others in works of art
Level 2:
- experiment with elements of art.
- experiment with principles of art.
- express personal ideas or moods using selected media.

Level 3:
- employ various elements of art in different works of art.
- employ various principles of art in different works of art.
- interpret the personal ideas or moods expressed by a work of art.

SAMPLE PERFORMANCE TASK The students will create a drawing using chalk pastels and pre-cut shapes on black construction paper. First, discuss and draw a variety of lines and shapes (a line is a dot that goes for a walk, and a shape is a line that goes for a walk and returns home). Then demonstrate how to trace around some pre-cut geometric shapes and then how to draw “crazy” shapes. Students will then create an artwork by tracing around pre-cut shapes and drawing their own “crazy” shapes on construction paper. The shapes should be completely colored in, as well as the entire background. Students will name the types of shapes and colors used in their drawings. Teacher will assess the accuracy of student responses.

Integrations/Linkages: Mathematics, Reading, Writing, Communication skills

**Standard 3.0 Evaluation** Students will choose and evaluate a range of subject matter, symbols, and ideas. The student will

K.3.1 demonstrate an understanding that subject can be real or imaginary.
K.3.2 demonstrate an understanding that symbols are used to convey meaning.
K.3.3 know that pictures tell a story.

Performance Indicators: Evidence Standard is Met The student is able to:

Level 1:
- recognize that some art is created from real subject matter while other art is from the imagination.
- recognize that a symbol can convey meaning
- view an artwork and describe in a story format what s/he sees

Level 2:
- identify and create real and imaginary subject matter in works of art.
- identify and use symbols to convey meaning in a work of art.
- create works of art that illustrate a specified story.

Level 3:
- combine real and imaginary subject matter in works of art.
- explain the meaning of symbols within their own artwork.
- create an artwork that tells a story based on a given subject.

SAMPLE PERFORMANCE TASK The teacher will talk about familiar favorite stories. The teacher will help the students to recognize the sequence of events in the story (beginning, middle, end). Then each student will draw their favorite part of the story using a black crayon to outline their shapes first and then adding color. Teacher will assess by asking each student to identify which part of the story s/he has drawn, and then identify which part of the sequence the drawing represents.

Integrations/Linkages: Reading, Writing, Communication skills

**Standard 4.0 Historical and Cultural Relationships** Students will understand the visual arts in relationship to history and cultures. The student will
K.4.1 identify selected artworks from different cultures.
K.4.2 identify selected artworks from different periods in history.
Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- discuss selected artworks from different cultures.
- discuss selected artworks from different periods in history.
Level 2:
- recognize selected artworks from different cultures.
- recognize selected artworks from different periods in history.
Level 3:
- compare selected artworks from different cultures.
- compare selected artworks from different periods in history.

SAMPLE PERFORMANCE TASK The teacher will provide portraits from different periods in history. Students will discuss what they see in the portraits (e.g. hair and clothing styles, media, background, feelings). Students will be asked to point out differences between the time periods represented.

Integrations/Linkages: History, Social Studies, Communication skills

Standard 5.0 Reflecting and Assessing Students will reflect upon and assess the characteristics of their work and the work of others. The student will
K.5.1 understand that there are various purposes for creating works of visual art.
Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- name two purposes for creating works of art.
Level 2:
- discuss purposes for creating art.
Level 3:
- describe purposes for creating art.

SAMPLE PERFORMANCE TASK The teacher will show artwork (e.g. Miro for fun, a portrait for historical documentation, and Picasso’s Blue Period for moods) and discuss various purposes for creating art. Each student will create a three page book. Each page will represent a different purpose. The teacher will assess by observation.

Integration/Linkages: Reading, Writing, History, Mathematics
APPENDIX 2

GRADE 1 Tennessee VISUAL ART Content Standards and Student Performance Indicators

Standard 1.0 Media, Techniques, and Processes  Students will understand and apply media, techniques, and processes. The student will

1.1.1 use tools and materials in a safe and responsible manner.
1.1.2 demonstrate an understanding of how to use selected tools and materials to create a work of art
1.1.3 explore a variety of techniques and processes to produce original works of art that reflect personal experiences, imagination, and observations

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:

▪ practice the use of selected tools and art materials in a safe and responsible manner (including cleanup procedures).
▪ use selected techniques and processes to create a work of art.
▪ apply selected techniques and processes to produce an original work of art that reflects personal experience or imagination.

Level 2:

▪ explore and experiment with selected art materials and tools in a safe and responsible manner.
▪ choose from selected tools and art materials to create a work of art and explain the choice of material.
▪ create a work of art, using a variety of techniques and processes, that is personally meaningful and drawn from experience, observation, or imagination.

Level 3:

▪ practice and manage the use of selected art materials and tools in a safe and responsible manner.
▪ explore and experiment with a combination of art materials and tools.
▪ compare and contrast a variety of techniques and processes to create a work of art that is personally meaningful and is drawn from experience.

SAMPLE PERFORMANCE TASK  The teacher will demonstrate tracing around pre-cut geometric shapes, using scissors to cut them out, and arranging the shapes on a background. After they trace and cut out their own shapes, students will use the shapes to create familiar objects or use them in a random design. Then the shapes will be glued down. The teacher will explain safety rules for using the tools and glue. The teacher will assess by monitoring the students for safe and appropriate use of tools and materials.

Integrations/Linkages: Science, Mathematics, Health and safety

Standards 2.0 Structures and Functions  Students will use knowledge of structures and functions.  The student will

1.2.1 identify and use elements of art (e.g. line, shape, color, texture)
1.2.2 identify and use principles of art (e.g. pattern, repetition)
1.2.3 demonstrate an understanding that anyone can express ideas and feelings in original works of art.
1.2.4 recognize and create art that is an important part of daily life.

Performance Indicators: Evidence Standard is Met

The student is able to:

Level 1:
- experiment with individual elements of art in different works of art.
- experiment with individual principles of art in different works of art.
- recognize his/her own personal ideas and feelings in works of art.
- recognize that art is an important part of everyday life.

Level 2:
- apply various elements of art in different works of art.
- apply various principles of art in different works of art.
- create works of art that express personal ideas or feelings.
- recognize and create art that is an important part of daily life.

Level 3:
- select from various elements of art, and apply them in an artwork.
- select from various principles of art, and apply them in an artwork.
- compare and contrast his/her own personal ideas and feelings in works of art.
- design and describe a functional work of art that could be used in everyday life.

SAMPLE PERFORMANCE TASK

The student will create a painting of trees with evidence of sensitivity in qualities. The teacher will begin by asking the question, “Have you ever noticed that tree branches are in the shape of V’s and Y’s?” By showing artwork by Cezanne or van Gogh, the teacher will explain that artists see lines in nature. Lines can be thick or thin, long or short, and curvy or straight. Using round brushes that taper to a point, the teacher will show students how the brush can go from fat to thin lines by using heavy or light pressure. The students will use a paintbrush to start at the tree trunk and then taper upward and outward forming V’s and Y’s. They should fill in the trunk with paint. Later, if dry enough, texture can be added with another color of paint. Grass, leaves, animals, and birds may be added to the painting. The teacher will observe the students as they paint and comment on line qualities in the paintings.

Integrations/Linkages: Mathematics, Reading, Writing, Communication skills

Standard 3.0 Evaluation

Students will choose and evaluate a range of subject matter, symbols, and ideas.

The student will

1.3.1 know that subject matter can be real or imaginary.
1.3.2 know that symbols are used to convey meaning.
1.3.3 know that pictures tell a story.

Performance Indicators: Evidence Standard is Met

The student is able to:

Level 1:
- identify and create real and imaginary subject matter in works of art.
- identify and use symbols to convey meaning.
- create works of art that illustrate a specified story.

Level 2:
- combine real and imaginary subject matter in works of art.
- explain the meaning of symbols in their artwork.
create an artwork that tells a story based on a given subject.

Level 3:
- distinguish between real and imaginary subject matter in specified works of art.
- identify, use, and explain the use of symbols within an artwork.
- develop a story, and create an artwork that tells the story.

SAMPLE PERFORMANCE TASK The teacher will begin by explaining to the students that they will be creating an imaginary animal or creature drawing. Half of the image is provided for them. It can be pre-drawn or cut from a magazine. If cut from a magazine, the image is glued to construction paper. They student will draw the second half of the image as strangely as they wish. They will then color and name their creations.

Integrations/Linkages: Science, Reading, Writing, Communication Skills, Mathematics

Standard 4.0 Historical and Cultural Relationships Students will understand the visual arts in relationship to history and cultures. The student will
1.4.1 identify selected artworks from different cultures.
1.4.2 identify selected artworks from different periods in history.

Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- discuss selected artworks from different cultures.
- discuss selected artworks from different periods in history.
Level 2:
- recognize selected artworks from different cultures.
- recognize selected artworks from different periods in history.
Level 3:
- compare selected artworks from different cultures.
- compare selected artworks from different periods in history.

SAMPLE PERFORMANCE TASK The teacher will show and discuss masks from different cultures (e.g. Mexican, African, Native American, Eskimo). The discussion will include various reasons why different cultures create masks (e.g. religion, celebration, disguise, protection). Determine whether the masks are based on a human or animal form. The student will create a paper mask that represents one of the three cultures discusses. (Materials are limited only by the teacher’s imagination and budget.) The teacher will assess the students by asking each student to describe the function and culture of his/her mask.

Integrations/Linkages: Mathematics, History, World Cultures, Geography, Communication Skills, Reading, Writing

Standard 5.0 Reflection and Assessment Students will reflect upon and assess the characteristics of their work and the work of others. The student will
1.5.1 identify various purposes for creating works of art.
1.5.2 express personal preferences after viewing specific works of art.

Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- name purposes for creating works of art.
- identify personal preferences after viewing specific works of art.
Level 2:
- discuss purposes for creating works of art.
- explain personal preferences after viewing specific works of art.

Level 3:
- describe purposes for creating works of art.
- discuss and relate the reasons for their personal preferences.

SAMPLE PERFORMANCE TASK
This lesson will use the students’ artwork in a class discussion game. The teacher will display individual artwork, one from each student in the class. The game begins when one student chooses an art (no their own) and explains three positive reasons for their choice. Then that artwork is removed. The student whose artwork was discussed will choose next. This process continues until each student has had a turn. The teacher assessment will be based on the student’s ability to verbalize preferences.

Integration/Linkages: Reading, Writing, Interpersonal Communication Skills

Standard 6.0 Interdisciplinary Connections
Students will make connections between visual arts and other disciplines. The student will

1.6.1 make connections between visual arts and other disciplines.

Performance Indicators: Evidence Standard is Met
The student is able to:
Level 1:
- explore connections between visual arts and other disciplines.
Level 2:
- recognize connections between visual arts and other disciplines.
Level 3:
- describe connections between visual arts and other disciplines.

SAMPLE PERFORMANCE TASK
The teacher will show various examples of ordered patterns from math (e.g. AB, ABB). Students will use watercolor paints to cover the entire background of a piece of paper by covering the paper with a layer of water and then dripping the color onto the paper causing the colors to bleed together. Let dry completely. Then, students will use various types of sponge stamps, or other objects to created ordered patterns on top of the painted background. The teacher will check for accuracy of AB, or ABB by observing the artwork of the students. Students will be asked to make connections between the patterns studied in this lesson and patterns they are doing in their math lessons.

Integration/Linkages: Mathematics, Science
APPENDIX 3

GRADE 2 Tennessee VISUAL ART Content Standards and Student Performance Indicators

Standard 1.0 Media, Techniques, and Processes Students will understand and apply media, techniques, and processes. The student will
  2.1.1 consistently use tools and materials in safe and responsible manner.
  2.1.2 demonstrate an understanding of how to use selected tools and materials to create a work of art.
  2.1.3 explore a variety of techniques and processes to produce original works of art that reflect personal experiences, imagination, and observations.

Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
  • use a variety of tools and art materials in a safe and responsible manner (including cleanup procedures).
  • use a variety of tools and materials to create a work of art.
  • apply a variety of techniques and processes to produce an original work of art that reflects personal experience or imagination.
Level 2:
  • practice and maintain a variety of art materials and tools in a safe and responsible manner.
  • choose from a variety of tools and art materials to create a work of art and explain the choice of material.
  • select a variety of techniques and processes to create a work of art that is personally meaningful and is drawn from experience, observation, or imagination.
Level 3:
  • plan and manage the use of a variety of art materials and tools in a safe and responsible manner.
  • design a creative work of art while demonstrating the proper use of a variety of art materials and tools.
  • compare and contrast a variety of techniques and processes used in creating a personal work of art.

SAMPLE PERFORMANCE TASK Portraits Inside and Out: A large paper (18 in x 12 in) is placed horizontally. The left and right sides are folded to meet in the center (it should open like a double door). A self-portrait is drawn in pencil on the front so that half the face is on each side of the fold. A collage is made on the inside of the card using various materials (e.g. ribbon, colored paper, magazine pages) to create a picture of the student’s feelings and personal interests (e.g. moods, hobbies, favorite things, colors). Featured artists may be Frida Kahlo or Picasso. The teacher will assess by looking for a variety of techniques and processes to create a work of art that is personally meaningful and is drawn from experience, observation, or imagination.

Integrations/Linkages: Mathematics, Reading, Writing, Communication Skills
Standards 2.0 Structures and Functions  Students will use knowledge of structures and functions. The student will
2.2.1 identify and use a combination of elements and principles of art to communicate ideas
2.2.2 identify and create functional works of art and describe how they contribute to the quality of daily life
Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
▪ experiment with a combination of elements and principles of art.
▪ discuss the functions of art and how they contribute to the quality of daily life.
Level 2:
▪ apply a combination of various elements and principles of art to communicate ideas.
▪ design and describe a functional work of art that could be used in everyday life.
Level 3:
▪ select from various elements and principles of art, and apply them to communicate ideas in a work of art.
▪ create and evaluate a functional work of art that could be used in everyday life.

SAMPLE PERFORMANCE TASK  In this lesson students will create pinch pots. The teacher will begin with a discussion of how clay is made and where it can be found. While showing various photos or real examples of different types of pottery, the teacher will explain how humans have been making functional forms with clay for thousands of years. The opening of the pot can then be formed into different shapes (e.g. circle, triangle, heart, star, oval). The teacher will discuss using fingers or tools to decorate the pinch pots. Next, the students will create their own functional pots. They type of clay is optional. The teacher will assess by observing the process and by having the students discuss the functions of their pinch pots.

Integrations/Linkages: History, World Cultures, Science, Mathematics

Standard 3.0 Evaluation  Students will choose and evaluate a range of subject matter, symbols, and ideas. The student will
2.3.1 use visual symbols to communicate meaning in works of art.
2.3.2 create works of art using a variety of themes.
Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
▪ identify visual symbols that can be used to communicate meaning in works of art.
▪ discuss works of art that use different themes.
Level 2:
▪ demonstrate the use of visual symbols to communicate meaning in works of art.
▪ create a work of art representing a specified theme.
Level 3:
▪ explain the use of visual symbols to communicate meaning in their own works of art.
▪ discuss and compare individual artworks based upon a specified theme.

SAMPLE PERFORMANCE TASK  American Postage Stamp Design: The student will
design an American postage stamp. The teacher will begin with a discussion about American symbols (e.g. bald eagle, Twin Towers, Washington Monument, Statue of Liberty, Liberty Bell, baseball, apple pie). The teacher will show examples that demonstrate how to lay out the parts of a stamp: border, image, postage cost, country and perforated edge. The students will then design and create their own stamps. First using a pencil, the student will trace a pre-cut two inch strip to create a border. Next, the student draw an American image and postage cost/country, then trace over the pencil lines using a black marker (border, image, and postage/country). The image within the border is now ready to be colored in, leaving the border and edge white. The final step will be to create the perforated edge using special scissors, pennies or stencils. The teacher will assess by observing the use of visual symbols to communicate an American theme.

Integrations/Linkages: History, American Culture, Social Studies, Reading, Writing, Geography

**Standard 4.0 Historical and Cultural Relationships**  
Students will understand the visual arts in relationship to history and cultures. The student will

- 2.4.1 relate characteristics of specific artworks from different cultures.
- 2.4.2 explain how history influenced art.
- 2.4.3 explain how cultures influenced art.

Performance Indicators: Evidence Standard is Met  
The student is able to:

**Level 1:**
- identify characteristics of specific artwork from different cultures
- discuss specific reasons for ways in which history influenced art.
- discuss specific reasons for ways in which culture influenced art.

**Level 2:**
- discuss characteristics of specific artwork from different cultures.
- describe how history influenced art.
- describe how culture influenced art.

**Level 3:**
- compare/contrast characteristics of specific artworks from different cultures.
- create an artwork that is influenced by a specific period in history.
- create an artwork that is influenced by a specific culture.

SAMPLE PERFORMANCE TASK  
Architecture: Houses from Around the World  
The teacher will show and discuss the architecture of houses from different cultures (e.g. Roman villas, Mexican adobe houses, African huts, Native American tee pees, Eskimo igloos). The discussion will include reasons why different cultures build various types of houses (e.g. climate, availability of materials, religion). The student will draw a house from a different culture.

Integrations/Linkages: History, World Cultures, Mathematics, Social Studies, Science

**Standard 5.0 Reflection and Assessment**  
Students will reflect upon and assess the characteristics of their work and the work of others. The student will

- 2.5.1 recognize that artwork is created for a variety of reasons.
- 2.5.2 express personal preferences after talking about his/her own works of art and the works of others.
2.5.3 describe influences on his/her own artwork.

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:
- identify purposes for creating works of art.
- identify personal preferences after viewing specific works of art.
- identify personal reasons for developing a specific artwork.

Level 2:
- describe purposes for creating works of art.
- explain the reasons for their personal preferences.
- list characteristics of their own artwork.

Level 3:
- compare a variety of purposes for creating works of art.
- compare the reasons for their personal preferences in their own artwork and in works of others.
- interpret how specific characteristics influenced the development of their own artwork.

SAMPLE PERFORMANCE TASK  This lesson plan will use the students’ artwork in a class discussion game. The game begins when one student chooses an art (no their own) and explains a positive reason for the choice. The student whose artwork was chosen will then give one reason why they like their artwork and also what they would do differently if allowed to do it again. Then that artwork is removed. The student whose artwork was discussed will choose next. This process continues until each student has had a turn. The teacher assessment will be based on the student’s ability to verbalize preferences.

Integration/Linkages: Reading, Writing, Interpersonal Communication Skills

**Standard 6.0 Interdisciplinary Connections**  Students will make connections between visual arts and other disciplines.  The student will

2.6.1 demonstrate an understanding of similarities and differences between visual arts and other disciplines.

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:
- explore similarities and differences between visual arts and other disciplines.

Level 2:
- recognize similarities and differences between visual arts and other disciplines.

Level 3:
- describe similarities and differences between visual arts and other disciplines.

SAMPLE PERFORMANCE TASK  Illustrating a Story: The teacher will show various Types of familiar book illustrations. Discuss how a story can be understood by pictures alone, words, alone, or a combination of the two. A new short story will then be read to the class and written for the students to see without the pictures being shown. Each student will illustrate his/her favorite part of the story. Students will write a caption for their pictures in their own words. The pictures will be displayed in sequential order and reviewed. (It is fine if not all of the story is portrayed.) The teacher will assess by checking for connections between what was read and what the illustrations convey.

Integration/Linkages: Reading, Writing, Storytelling, Communication Skills

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GRADE 3 Tennessee VISUAL ART Content Standards and Student Performance Indicators

Standard 1.0 Media, Techniques, and Processes  Students will understand and apply media, techniques, and processes. The student will

3.1.1 use a variety of tools and materials to create a work of art.
3.1.2 use a variety of techniques and processes to produce original works of art that reflect personal experiences, imagination, and observations
3.1.3 use tools and manners in a safe and responsible manner.

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:

▪ recognize and use tools and materials to create a work of art.
▪ experiment with techniques and processes to create an artwork that expresses an original idea.
▪ use tools and materials as demonstrated.

Level 2:

▪ choose from a variety of tools and materials to convey personal ideas in a work of art.
▪ create a work of art incorporating ideas from personal experiences, imagination, or observation using selected techniques and processes.
▪ use correctly and maintain tools and materials.

Level 3:

▪ compare and contrast the effectiveness of tools and materials chosen to create a personal work of art.
▪ compose an original work of art that communicates an idea from personal experiences, imagination, or observation using a variety of techniques and processes.
▪ organize and manage tools and materials in a safe and responsible manner.

SAMPLE PERFORMANCE TASK  Students will view reproductions of masks from other cultures, made of clay, wood, and fibers. The class will discuss moods, facial features and expressions found in the examples. Following a demonstration of various clay tools and methods such as coil building, slab construction, scoring and slip techniques, relief, and applied texture, the students will create an original clay mask. Assessment of the assignment will occur in two parts. The teacher will monitor correct use of tools and materials during the work period. After the work has been dried and fired, the student will conduct a self evaluation covering specific set criteria, such as well joined parts, facial expression, and use of detail.

Integrations/Linkages: Health and Safety, Language Arts, Science, Measurement

Standard 2.0 Structures and Functions  Students will use knowledge of structures and functions. The student will

3.2.1 recognize and identify elements and principles of art
3.2.2 use the elements and principles of art to communicate ideas.
3.2.3 develop an awareness of the function of art in their environment
3.2.4 create art with a specific function

Performance Indicators: Evidence Standard is Met

The student is able to:

Level 1:
- recognize some elements and principles in works of art.
- create an artwork using elements and principles of art.
- identify different functions of art in their environment.
- create an assigned artwork with a specific function.

Level 2:
- identify all elements and some principles in works of art.
- create an artwork using the elements and principles to communicate a simple idea.
- identify different functions of art in their environment using assigned vocabulary.
- create an artwork that serves a function in their environment.

Level 3:
- identify all elements and principles in works of art.
- choose art elements and principles to communicate ideas in a work of art.
- consistently identify different functions of art in their environment correctly using assigned vocabulary.
- apply problem-solving skills to create a functional artwork that serves a purpose in their environment.

SAMPLE PERFORMANCE TASK In this art criticism lesson, the students will identify elements and principles of art in a reproduction of Broadway Boogie-Woogie, an abstract painting by Piet Mondrian. Students will view the work and will trace with their fingers the vertical and horizontal lines found in the work. Students will name the colors in the work and identify the color families. Students will also identify evidence of other elements such as texture (flat), space, and shapes. Students will then discuss balance emphasis and rhythm in the art work.

Integrations/Linkages: Color Theory, Science, Measurement, Music, Physical Education, History, Geometry

Standard 3.0 Evaluation Students will choose and evaluate a range of subject matter, symbols, and ideas. The student will

3.3.1 explore and understand content in works of art by others.
3.3.2 select subject matter and content in their own artworks.

Performance Indicators: Evidence Standard is Met

The student is able to:

Level 1:
- list what is seen in a work of art.
- choose a subject or theme to be incorporated in their artwork.

Level 2:
- discuss the content of what is seen in a work of art.
- choose subject matter, symbols and ideas that support the main idea of their own artwork.

Level 3:
• interpret the ideas, meanings, and the mood reflected in the artwork.
• utilize subject matter, symbols, and ideas to communicate meaning in their artwork.

SAMPLE PERFORMANCE TASK  The students will view the work *Peaceable Kingdom* by Edward Hicks. The teacher will allow the students to describe what they see in the work. The teacher should encourage every student to respond. Students can create a listing of subjects seen in the painting. After writing the title of the work on the board, the teacher will use open ended questions to guide the students in interpreting meanings from the work. Any student responses should be encouraged and not judged as right or wrong. For example, “Why do you think the artist titled the work *Peaceable Kingdom*?” “Who are the people in the background?” “What might they be doing?” “Why did the artist place the children in the foreground with these particular animals?” The teacher will observe student responses and monitor to ensure participation by all students.


**Standard 4.0 Historical and Cultural Relationships**  Students will understand the visual arts in relationship to history and cultures. The student will

3.4.1 relate works of art to different times, civilizations and places.
3.4.2 discuss how art, history, and culture influence each other.

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:

• discuss art created by people from selected cultures and selected historical periods.
• define connections between art, cultures, and history.

Level 2:

• recognize that art reflects characteristics of different periods in history.
• identify connections between art, cultures, and history.

Level 3:

• relate historical events to changes in art styles and methods.
• compare and contrast connections between art, cultures, and history.

SAMPLE PERFORMANCE TASK  In this lesson the students will view images of Ancient Egyptian artifacts and discuss the discovery of King Tutankhamen’s tomb in the 1920’s by Howard Carter. The artifacts toured world wide influencing architects, designers, and other artists. During the discussion, the teachers should guide the student to understand the impact of this discovery on the popular styles of clothing, furniture, and artwork of the early twentieth century Art Nouveau and Art Deco movements. The teacher will show the student images of popular culture items of the time such as magazine advertisement, china patterns, home décor, and jewelry that take imagery from the ancient Egyptian culture. As an assessment of their learning, the students will design a modern day piece of clothing or jewelry influenced by the Egyptian culture.

Integrations/Linkages: History, Geography, Social Studies, World Cultures, Industry and Design
Standard 5.0 Reflection and Assessment  Students will reflect upon and assess the characteristics and merits of their work and the work of others. The student will

3.5.1 recognize that artists create work for a variety of purposes.
3.5.2 discuss the characteristics and merits of their work and the work of others.
3.5.3 understand that viewers have different responses to artworks.

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:
- relate an artwork to the purpose intended by the artist.
- list characteristics of their own artwork and the work of others.
- express and respect various opinions in response to viewing artwork.

Level 2:
- describe the purposes intended by the artist for a work of art.
- discuss how characteristics of art works fit specific criteria.
- explain different opinions during discussion of artwork.

Level 3:
- interpret the purpose intended by the artist for a work of art.
- interpret how their work and the work of others meet intended criteria.
- interpret various viewpoints when responding to an artwork.

SAMPLE PERFORMANCE TASK  In groups of two, students will view Grant Wood’s American Gothic. The students will discuss with their partner the following questions, “Who are these people?” “Where are they?” “How are they feeling?” Tell a story about these characters and prepare a short skit to perform for your classmates. After all teams have presented their skits, the class will discuss differences in the responses to the artwork. Assessment is based on class participation and acceptance of other interpretations of the artwork.

Integration/Linkages: History, Social Studies, Literature, Communication Skills, Interpersonal and Social Skills, Guidance, Career Goals

Standard 6.0 Interdisciplinary Connections  Students will make connections between visual arts and other disciplines. The student will

3.6.1 experience similarities and differences between visual arts and other disciplines.
3.6.2 identify connections between the visual arts and other disciplines in the curriculum

Performance Indicators: Evidence Standard is Met  The student is able to:

Level 1:
- participate in activities which combine the visual arts and other arts disciplines.
- explore connections between the visual arts and other disciplines in the curriculum

Level 2:
- list similarities and differences in the visual arts and works from other arts disciplines.
- recognize connections between other disciplines and visual arts.

Level 3:
- recognize similarities and differences in visual arts and works from other arts
disciplines.

- employ visual arts skills in connection with other disciplines.

SAMPLE PERFORMANCE TASK  Students will examine the connection between music and Wassily Kandinsky’s abstract paintings. The teacher will provide background information on Kandinsky including the fact that he studied piano and cello as a child living in Russia. His paintings were titled with parallel art and music terms, such as “improvisation” and “composition”. Students are provided this quote from Kandinsky, “I applied streaks and blobs of color onto the canvas with a palette knife, and I made them sing with all the intensity I could.” Vocabulary for this lesson includes movement, rhythm, harmony, line and tone. The students will listen to a recording of a composition by a Russian composer and pretend to paint in the air by imagining color, shapes and lines (Suggested listening samples: Peter and the Wolf by Prokofiev, The Nutcracker by Tchaikovsky, Pictures at an Exhibition by Mussorgsky). Then students will listen to a musical composition and create a painting with shapes, lines and colors. The lesson ends with a discussion of student paintings in relation to the music heard during the activity.

APPENDIX 5

GRADE 4 Tennessee VISUAL ART Content Standards and Student Performance Indicators

Standard 1.0 Media, Techniques, and Processes Students will understand and apply media, techniques, and processes. The student will

4.1.1 use a variety of tools and materials to create a work of art.
4.1.2 use a variety of techniques and processes to produce original works of art that reflect ideas, concepts, symbols and themes.
4.1.3 use tools and materials in a safe and responsible manner
4.1.4 demonstrate levels of craftsmanship

Performance Indicators: Evidence Standard is Met The student is able to:
Level 1:
- explore a variety of tools and materials to convey ideas in a work of art.
- use techniques and processes to create an artwork that expresses ideas, concepts, symbols, and themes.
- use correctly and maintain tools and materials.
- recognize levels of craftsmanship.
Level 2:
- choose from a variety of tools and materials to convey ideas in a work of art.
- practice techniques and processes to communicate original ideas, concepts, symbols, and themes.
- organize and manage tools and materials in a safe and responsible manner.
- demonstrate improved craftsmanship.
Level 3:
- compare and contrast the effectiveness of tools and materials chosen to convey ideas in a work of art.
- compose an original work of art that clearly communicates ideas, concepts, and themes using a variety of techniques and processes.
- assume responsibility for the safe management of tools and materials.
- Demonstrate consistently improvement in craftsmanship.

SAMPLE PERFORMANCE The students will view portraits created by Faith Ringgold and will discuss the variety of materials and techniques Ringgold used in her works. As an outside assignment, the students will write a narrative of their own lives to be included in their work. In succeeding class periods, each student will sketch a self-portrait on muslin leaving a two inch border around the edges for a frame. Using acrylic, paint the self-portrait with a patterned background. To complete the frame, the students will collage the border with paper, photos, fabric, portions of their narrative or other materials. The finished works will be exhibited with copies of their original narratives. Students will participate in a class critique emphasizing the use of tools and materials in their work.

Integrations/Linkages: Social Studies, Health and Safety, Writing, Mathematics, Storytelling
Standards 2.0  Structures and Functions  Students will use knowledge of structures and functions. The student will
  4.2.1 consistently recognize and identify elements and principles of art.
  4.2.2 use the elements and principles of art to communicate ideas.
  4.2.3 discuss the functions of art in different environments
  4.2.4 create art works to meet various functions.

Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
  ▪ recognize most elements and principles in works of art.
  ▪ create an artwork using select elements and principles of art to communicate ideas.
  ▪ list different functions of art in various environments.
  ▪ create an artwork with a specific function.

Level 2:
  ▪ identify all elements and most principles in works of art.
  ▪ create an artwork using multiple elements and principles of art to communicate ideas.
  ▪ identify different functions of art in various environments using assigned vocabulary.
  ▪ create an artwork to serve various functions.

Level 3:
  ▪ identify all elements and principles in works of art.
  ▪ choose elements and principles of art to communicate ideas in a work of art.
  ▪ compare and contrast different functions of art in various environments correctly using targeted vocabulary.
  ▪ apply problem-solving skills to create various functional artworks to serve a purpose in an environment.

SAMPLE PERFORMANCE TASK  In this lesson, include the vocabulary of functional and non-functional art by using Meret Oppenheim’s Fur Tea Cup in comparison to a Victorian fine china tea cup and saucer. Discuss the practical use of both tea cups and why they are considered functional or non-functional. Show the students an image of Claes Oldenberg and Coosje van Bruggen’s Spoonbridge and Cherry in comparison to San Francisco’s Golden Gate Bridge by Joseph B. Strauss. Discuss the practical use of one versus the other. After discussing functional versus non-functional art, the students will recall and record examples of each art they have seen in the past. The teacher will monitor student input throughout the discussion.


Standard 3.0  Evaluation  Students will choose and evaluate a range of subject matter, symbols, and ideas. The student will
  4.3.1 discuss subject matter, symbols, and ideas in works of art by others.
  4.3.2 utilize subject matter, symbols, and idea in their own artworks.

Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
• describe what is seen in a work of art.
• choose subject matter, symbols and ideas that support the main idea of the work.

Level 2:
• interpret the content of what is seen in a work of art.
• utilize subject matter, symbols, and ideas to communicate meaning in their artwork.

Level 3:
• analyze the ideas, meanings, and the mood reflected in the artwork.
• experiment with subject matter, symbols, and ideas to communicate meaning in their artwork.

SAMPLE PERFORMANCE TASK The student will create a personal coat of arms based on medieval history. The teacher will introduce the lesson by sharing information found in seals and coat of arms including the national flag of Spain, the state seal of Tennessee, and the British family royal crest. The students will decide what original symbols represent themselves, their family, their hobbies and interests. Popular and commercial trademarks and symbols should be avoided. Students will outline a symmetrical shield shape on paper and sketch their ideas. Colored pencils, crayons, markers, and other similar materials may be used.


Standard 4.0 Historical and Cultural Relationships Students will understand the visual arts in relationship to history and cultures. The student will
4.4.1 relate works of art to different times, civilizations, and places.
4.4.2 demonstrate how art, history, and culture influence each other.
4.4.3 demonstrate how art, history, and culture influence each other. Performance Indicators: Evidence Standard is Met The student is able to:

Level 1:
• identify art created by people from a variety of cultures and historical periods.
• recognize art as a visual language understood by most cultures.

Level 2:
• relate historical events to changes in art styles and methods.
• discuss historical connections between art, cultures, and history.

Level 3:
• categorize artworks according to different times, civilizations, and places.
• compare and contrast connections between art, cultures, and history.

SAMPLE PERFORMANCE TASK In this lesson, students will study the effect of world War II on the work of Pablo Picasso, specifically in his 1937 mural Guernica. The students will view images of Picasso’s early works such as Old Guitarist, 1903, or any work from his blue or rose period. They will contrast the comparatively realistic style and mood of these early works with the style and mood of his Guernica. The student will verbally express feelings about the subject matter of this work and how Picasso shows the effects of war on a community. During World War II, many civilians were hurt and killed because of new war tactics such as air strikes. Reading about the attack on the small
Spanish town of Guernica, Picasso was moved to create this painting. The students can respond to the questions, “How is this painting different from Picasso’s previous work?” “What influenced the changes in the work?”

Integrations/Linkages: History, Geography, World War II, Current Events, Journalism, International Cultures, Communication Skills

**Standard 5.0 Reflection and Assessment** Students will reflect upon and assess the characteristics of their work and the work of others. The student will

4.5.1 understand that artists create work for a variety of reasons.
4.5.2 discuss the characteristics and merits of their work and the work of others.
4.5.3 interpret different responses to art works.

Performance Indicators: Evidence Standard is Met The student is able to:

Level 1:
- identify possible purposes intended by an artist.
- discuss and respond to evidence of artistic merit in a work of art.
- explain and respect various opinions in response to viewing artwork.

Level 2:
- interpret the purpose intended by the artist for a work of art.
- interpret how their work and the work of thers meet intended criteria.
- dramatize different opinions during discussion of artwork.

Level 3:
- analyze the purposes intended by the artist for works of art.
- evaluate the merit of an art work based on intended criteria.
- debate various viewpoints when responding to an artwork.

**SAMPLE PERFORMANCE TASK** The students will participate in an in-progress critique of peer work. Every student will make constructive suggestions for a classmate’s work based on intended criteria for the lesson. Students will be divided into small groups. The critique will be based on a rubric for a specific current assignment. The teacher will model the process for the whole class by asking two students to volunteer their works for a critique. The teacher will verbally recognize the two areas for improvement and two ways in which the work meets the assigned criteria. Students will return to small groups, share suggestions and compliments, and then return to production. Self-assessment, peer assessment, and teacher assessment are embedded in the above activity.

Integration/Linkages: Interpersonal Skills, Analysis Skills, Public Art, Design, Industry, Entertainment, Museum, Writing Skills

**Standard 6.0 Interdisciplinary Connections** Students will make connections between visual arts and other disciplines. The student will

4.6.1 examine characteristics of visual arts and other arts disciplines.
4.6.2 practice making connections between the visual arts and other disciplines in the curriculum.

Performance Indicators: Evidence Standard is Met The student is able to:

Level 1:
- describe similar vocabulary between visual arts and other arts disciplines.
recall activities in which connections occur between the visual arts and other disciplines in the curriculum.

Level 2:
- compare similarities and differences in the visual arts and works from other arts disciplines.
- employ visual art skills in connections with other disciplines.

Level 3:
- propose activities that combine the visual arts and other disciplines.
- plan a visual art activity that makes connections to another discipline in the curriculum.

SAMPLE PERFORMANCE TASK  The student will view work by M.C. (Maurits Cornelius) Escher such as *Day and Night* or *Sky and Water* and make note of the repeating shapes that gradually change in the works. Students will observe how Escher used geometric grids and transformed shapes into repeating designs called tessellations. Relevant vocabulary includes visual symmetry, polygons, positive and negative space, translation (slide), rotation (turn), and reflection (flip). Samples of simple tessellating shapes and how they are modified will be provided by the teacher. The teacher can refer to the *Tessellmania* CD Rom. The student will develop an Escher image by tracing the tile onto a paper grid. Color will be added later with crayons, pencils, or markers. Assessment of the student work can occur with a class critique to determine whether the student design tessellates.

APPENDIX 6

GRADE 5 Tennessee VISUAL ART Content Standards and Student Performance Indicators

Standard 1.0 Media, Techniques, and Processes  Students will understand and apply media, techniques, and processes. The student will
   5.1.1 demonstrate an understanding of a variety of tools and materials used to create a work of art.
   5.1.2 develop skills in a variety of techniques and processes to produce original works of art that reflect ideas, concepts, symbols and themes.
   5.1.3 use tools and materials in a safe and responsible manner.
   5.1.4 demonstrate levels of craftsmanship.

Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
   ▪ use a variety of tools and materials to convey ideas in a work of art.
   ▪ use techniques and processes to create an artwork that expresses ideas, concepts, symbols, and themes.
   ▪ organize and manage tools and materials in a safe and responsible manner.
   ▪ demonstrate improve craftsmanship.
Level 2:
   ▪ compare and contrast the effectiveness of tools and materials chosen to convey ideas in a work of art.
   ▪ compose an original work of art that clearly communicates ideas, concepts, and themes using a variety of techniques and processes.
   ▪ assume responsibility for the safe management of tools and materials.
   ▪ consistently demonstrate improvement in craftsmanship.
Level 3:
   ▪ evaluate the effectiveness of tools and materials chosen to convey ideas in a work of art.
   ▪ analyze an original work of art for its effectiveness in communicating ideas, concepts, and themes.
   ▪ assume responsibility for the safe use and management of tools and materials.
   ▪ demonstrate appropriate levels of craftsmanship.

SAMPLE PERFORMANCE TASK  Introduce patterns, textures, and lines in printmaking through the use of collagraph and styrofoam relief printmaking methods. Discuss line quality and simulated texture using a reproduction of Albrecht Durer’s Rhinoceros. Students will create a preliminary sketch of an animal using lines to show texture and will collect texture rubbings on their sketch. The sketch will be used in both printmaking methods. In succeeding lessons, the students will create a plate by building a collage on poster board with graduated levels of small shapes on top of large shapes. They will also draw their animal on a Styrofoam plate. The teacher will demonstrate the proper use of printmaking tools and ink application. After students have pulled prints from both plates, they will compare the images created from both methods by discussing the
results with a partner or small group. The teacher will monitor the discussions and the studio sessions.

Integrations/Linkages: Social Studies, Health and Safety, Measurement, Writing, Mathematics, Storytelling, Language Arts, Science

Standards 2.0 Structures and Functions Students will use knowledge of structures and functions. The student will

5.2.1 use the elements and principles of art to communicate ideas.
5.2.2 discuss and analyze the functions of art to communicate ideas.
5.2.3 create artworks to meet various functions.

Performance Indicators: Evidence Standard is Met The student is able to:

Level 1:
- create an artwork using some elements and principles of art to communicate ideas.
- identify different functions of art in various environments using assigned vocabulary.
- describe an artwork to serve a function.

Level 2:
- create an artwork using a variety elements and principles of art to communicate ideas.
- examine the different functions of art in various environments using assigned vocabulary.
- design and describe an artwork that serves a specific function.

Level 3:
- choose specific elements and principles in art to communicate ideas clearly.
- compare and contrast different functions of art in various environments using targeted vocabulary.
- design, describe, and create an artwork that serves a specific function.

SAMPLE PERFORMANCE The students will view the domestic architecture by Frank Lloyd Wright, Falling Water. Using both blueprints and exterior reproductions, the students will examine the building as both a work of art and a home. The students will discuss the symbols used by an architect in a blueprint by using a teacher made architectural key. Also, the students will discuss the necessary parts needed in a dwelling. Each student will then design a dream home showing a bird’s eye view (blueprint of the interior) and an exterior façade.


Standard 3.0 Evaluation Students will choose and evaluate a range of subject matter, symbols, and ideas. The student will

5.3.1 discuss artistic intent by evaluating subject matter, symbols and ideas in works of art by others.
5.3.1 experiment with subject matter, symbols, and ideas to create meaning in their own artworks.
Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
- discuss and interpret the artistic intent of a work of art.
- utilize subject matter, symbols, and ideas to communicate meaning in their artwork.
Level 2:
- discuss and interpret specific clues in a work of art to determine artistic intent.
- relate and connect the subject matter, symbols, and ideas to communicate an intended meaning in their artwork.
Level 3:
- analyze and make connections from a work of art to other experiences.
- compose an art work that communicates original meaning through the integrated use of subject matter, symbols, and ideas.

SAMPLE PERFORMANCE TASK  In this lesson, students will discuss the intent of an artist by viewing works of art from the series The Frederick Douglass and Harriet Tubman Series of 1938-40 by African-American artist Jacob Lawrence or Faith Ringgold’s The Sunflower Quilting Bee at Arles. After viewing the art works chosen, have the students name some of the African American heroes and symbols included in the work. Ask the students “Why did Jacob Lawrence and Faith Ringgold choose these symbols as subjects for their art?” What mood is represented in these artworks and what are the clues?” “What is the significance of the colors chosen by the artist?” Additional questions can be asked based on student responses to what they see in the works. The students will write a short paragraph explaining their interpretation of the artist’s intent in these works or create an original painting based on ideas from this lesson.


**Standard 4.0  Historical and Cultural Relationships**  Students will understand the visual arts in relationship to history and cultures.  The student will

- 5.4.1 relate works of art to different times, civilizations, and places.
- 5.4.2 demonstrate how art, history and cultures influence each other.
- 5.4.3 recognize how artists are influenced by cultures, history and movements in art.

Performance Indicators: Evidence Standard is Met  The student is able to:
Level 1:
- recognize connections between historical events and art development.
- research connections between art, cultures, and history.
- explain cultural and historical influences on an artist.
Level 2:
- inventory artworks according to different times, civilizations and places.
- diagram connections between art, cultures, and history.
- describe and place a few artists and works of art in their contexts in culture, time, and place.
Level 3:
- organize artworks according to different times, civilizations and places.
- construct theories of how art is influenced by history and culture.
- compare and contrast a variety of artists and works of art in their contexts within culture, time and place.

SAMPLE PERFORMANCE TASK  
In this lesson, the students will study the effect of inventions on the artistic process of the 1800’s and the style of Impressionism. During this period paints were manufactured and sold in tubes for the first time, allowing artists to more easily transport materials and leave their studios to begin painting outdoors, al fresco. Also at this time, the mass production of cameras and photographic chemistry influenced composition and use of light in painting. An important cultural influence was trade with the Far East. After discussing this information, students will view a pre-Impressionist paint such as Leonardo da Vinci’s Mona Lisa and compare it to paintings by Mary Cassatt and Claude Monet. Students will look for changes in art styles and methods due to historical events. Students will create a time line of these events as an assessment.

Integrations/Linkages: History, Geography, Social studies, World Cultures, Industry and Design History, current Events, Journalism, Communication Skills

Standard 5.0 Reflection and Assessment  
Students will reflect upon and assess the characteristics and merits of their work and the work of others. The student will

- compare multiple purposes for creating works of art.
- appraise the characteristics and merits of their work and the work of others.
- examine different responses to artworks.

Performance Indicators: Evidence Standard is Met  
The student is able to:

Level 1:
- interpret purposes intended by the artist for a work of art.
- interpret how their work and the work of others meet intended criteria.
- examine varied viewer responses to artwork.

Level 2:
- analyze the purposes intended by the artist for works of art.
- evaluate the merit of an artwork based on intended criteria.
- debate various viewpoints when responding to an artwork.

Level 3:
- analyze and compare purposes of works by different artists.
- judge the merit of an artwork based on intended criteria and support the judgment based on characteristics of the artwork.
- collect and organize various viewpoints in response to an artwork.

SAMPLE PERFORMANCE TASK  
The students will role play people from the art community such as artist, art collector, museum curator, art critic, art historian, and the artist’s family. The students will debate from these viewpoints after viewing several works by Marcel Duchamp (Nude Descending a Staircase, Fountain, Bicycle Wheel) and learning about Surrealism and the Dada movement. The focus of the debate will be Marcel Duchamp’s Dada artwork, In Advance of a Broken Arm, a snow shovel. The
students will wear name tags defining their role and the teacher will supply the shovel as a prop as well as definitions for each role. Assessment of the activity will be based on student participation and understanding that viewers have different responses to artworks. Integration/Linkages: History, Social Studies, Literature, Interpersonal and Social Skills, Career Goals, Music, Science, Mathematics, Language, Communication Skills, Art Professions

**Standard 6.0 Interdisciplinary Connections** Students will make connections between visual arts and other disciplines. The student will

5.6.1 find relationships between the visual arts and other arts disciplines.
5.6.2 examine ways in which other disciplines are interrelated with the visual arts.

Performance Indicators: Evidence Standard is Met The student is able to:

**Level 1:**
- compare similarities and differences in the visual arts and works from other arts disciplines using common vocabulary.
- list activities in which connections can be found between the visual arts and other disciplines in the curriculum.

**Level 2:**
- propose activities that combine the visual arts and other arts disciplines.
- plan a visual activity that makes connections to another discipline in the curriculum.

**Level 3:**
- propose and construct a project that combines the visual arts and other arts disciplines.
- view other disciplines from the perspective of the visual arts.

**SAMPLE PERFORMANCE TASK** During art class, students will create a web of other disciplines in the curriculum. Start with a listing of daily subjects, such as math, language, science, social studies, PE, and spelling. Students will list current grade level topics covered in each of these areas. An example would be that in science students are currently studying the rain forest environment. Students will now brainstorm visual art activities that make connections to this area of study. Each student designs a visual art activity for a specific topic. The finished products are displayed, and students are asked to explain the connections between the visual artwork and the chosen subject.

APPENDIX 7

National VISUAL ART Content Standards for Grades K-4

VISUAL ARTS (K-4)
These standards provide a framework for helping students learn the characteristics of the visual arts by using a wide range of subject matter, symbols, meaningful images, and visual expressions, to reflect their ideas, feelings, and emotions; and to evaluate the merits of their efforts. The standards address these objectives in ways that promote acquisition of and fluency in new ways of thinking, working, communicating, reasoning, and investigating. They emphasize student acquisition of the most important and enduring ideas, concepts, issues, dilemmas, and knowledge offered by the visual arts. They develop new techniques, approaches, and habits for applying knowledge and skills in the visual arts to the world beyond school.

The visual arts are extremely rich. They range from drawing, painting, sculpture, and design, to architecture, film, video, and folk arts. They involve a wide variety of tools, techniques, and processes. The standards are structured to recognize that many elements from this broad array can be used to accomplish specific educational objectives. For example, drawing can be used as the basis for creative activity, historical and cultural investigation, or analysis, as can any other fields within the visual arts. The standards present educational goals. It is the responsibility of practitioners to choose appropriately from this rich array of content and processes to fulfill these goals in specific circumstances and to develop the curriculum.

To meet the standards, students must learn vocabularies and concepts associated with various types of work in the visual arts and must exhibit their competence at various levels in visual, oral, and written form. In Kindergarten-Grade 4, young children experiment enthusiastically with art materials and investigate the ideas presented to them through visual arts instruction. They exhibit a sense of joy and excitement as they make and share their artwork with others. Creation is at the heart of this instruction. Students learn to work with various tools, processes, and media. They learn to coordinate their hands and minds in explorations of the visual world. They learn to make choices that enhance communication of their ideas. Their natural inquisitiveness is promoted, and they learn the value of perseverance.

As they move from kindergarten through the early grades, students develop skills of observation, and they learn to examine the objects and events of their lives. At the same time, they grow in their ability to describe, interpret, evaluate, and respond to work in the visual arts. Through examination of their own work and that of other people, times, and places, students learn to unravel the essence of artwork and to appraise its purpose and value. Through these efforts, students begin to understand the meaning and impact of the visual world in which they live.

Content Standard #1: Understanding and applying media, techniques, and processes
Achievement Standard:

Students know the differences between materials, techniques, and processes
Students describe how different materials, techniques, and processes cause different responses
Students use different media, techniques, and processes to communicate ideas, experiences, and stories
Students use art materials and tools in a safe and responsible manner

**Content Standard #2: Using knowledge of structures and functions**
Achievement Standard:
Students know the differences among visual characteristics and purposes of art in order to convey ideas. Students describe how different expressive features and organizational principles cause different responses. Students use visual structures and functions of art to communicate ideas.

**Content Standard #3: Choosing and evaluating a range of subject matter, symbols, and ideas**
Achievement Standard:
Students explore and understand prospective content for works of art. Students select and use subject matter, symbols, and ideas to communicate meaning.

**Content Standard #4: Understanding the visual arts in relation to history and cultures**
Achievement Standard:
Students know that the visual arts have both a history and specific relationships to various cultures. Students identify specific works of art as belonging to particular cultures, times, and places. Students demonstrate how history, culture, and the visual arts can influence each other in making and studying works of art.

**Content Standard #5: Reflecting upon and assessing the characteristics and merits of their work and the work of others**
Achievement Standard:
Students understand there are various purposes for creating works of visual art. Students describe how people's experiences influence the development of specific artworks. Students understand there are different responses to specific artworks.

**Content Standard #6: Making connections between visual arts and other disciplines**
Achievement Standard:
Students understand and use similarities and differences between characteristics of the visual arts and other arts disciplines. Students identify connections between the visual arts and other disciplines in the curriculum.
APPENDIX 8

KINDERGARTEN Tennessee State Content Standards and Student Accomplishments for MATH (Accomplishments considered for inclusion in this study are in bold print.)

Numbers and Operations Content Standard 1.0 The student will develop number and operation sense needed to represent numbers and number relationships verbally, symbolically, and graphically and to compute fluent and make reasonable estimates in problem solving. Accomplishments:

K.1.1.a. count sets of objects up to 20
K.1.1.b. count by ones and tens to 50
K.1.1.c. count backward from 10 to 1
K.1.1.d. match quantities up to twenty with numerals
K.1.1.e. recognize equivalent sets of objects
K.1.1.f write numerals up to 20
K.1.1.g represent quantities up to 20 on ten-frames
K.1.1.h. determine whether an object has been divided in halves
K.1.1.i name and identify coins and their values
K.1.1.j order numbers less than 20
K.1.1.k. express relationship of numbers < 20 using “less than, more than, or equal to”
K.1.1.l identify the position of a whole number less than 20 on a number line
K.1.1.m. apply the language of ordinal numbers up to tenth

K.1.2.a use manipulatives to develop strategies for addition and subtraction of whole numbers
K.1.2.b use a variety of strategies to solve simple verbal story problems involving numbers 0 to 10

K.1.3.a use words, actions, pictures and manipulatives to solve problems
K.1.3.b. use pictures or objects, such as a ten-frame, to show one more or one less than any number to 20
K.1.3.c explain the reasonableness of a solution

Algebra Content Standard 2.0 The student will understand and generalize patterns as they represent and analyze quantitative relationships and change in a variety of contexts and problems using graphs, tables, and equations. Accomplishments:

K.2.1.a. sort objects by color, size, shape, and kind
K.2.1.b. communicate using mathematical terms appropriately

K.2.2.a. identify patterns in the environment, in arrangements of objects, or in pictures
K.2.2.b. recognize and extend concrete, visual, or auditory 2- or 3-part repeating pattern
K.2.2.c. create and describe a simple repeating pattern
K.2.3.a use manipulatives or pictures to demonstrate addition and subtraction sentences written symbolically involving numbers 0 to 5
K.2.4 illustrate general properties of operations (such as combine and separate)
K.2.5 analyze change in various contexts

Geometry Content Standard 3.0 The student will develop an understanding of geometric concepts and relationships as the use of geometric modeling and reasoning to solve problems involving one-, two-, and three-dimensional figures.
Accomplishments:

K.3.1.a. recognize/name circles, squares, triangles, rectangles shown in various positions
K.3.1.b. recognize examples of circles, squares, triangles, rectangles in the environment and as faces of three-dimensional objects
K.3.1.c. recognize basic properties of similarities and differences between simple geometric figures (e.g. numbers of corners)
K.3.1.d. create circles, squares, rectangles, and triangles
K.3.1.e. create structures using three-dimensional shapes
K.3.1.f. combine two-dimensional shapes to make pictures
K.3.2.a. use directional terms in a variety of situations (e.g., over, under, forward, backward, between, right, left)
K.3.3 recognize and apply flips, slide, and turns

Measurement Content Standard 4.0 The student will become familiar with the units and processes of measurement in order to make use of tools, techniques, and formulas to determine and to estimate measurements in mathematical and real-world problems.
Accomplishments:

K.4.1.a. demonstrate understanding of the concept of length
K.4.1.b. compare the length, weight, and capacity of two objects
K.4.1.c. use words to describe time (e.g. day, night, morning, afternoon, yesterday, today, tomorrow)
K.4.1.d. use words to describe temperature (e.g. hot, warm, cool, cold)
K.4.2.a. measure and estimate length using a variety of non-standard units
K.4.2.b. distinguish between light and heavy objects
K.4.2.c tell time to the hour
K.4.2.d recognize a thermometer as a way of measuring temperature
K.4.2.e recognize a calendar as a way of measuring time

Data Analysis Content Standard 5.0 The student will understand and apply basic statistical and probability concepts in order to analyze data and to make predictions and conjectures. (There are no accomplishments for this content standard.)
Learning Expectations:

K.5.1.a develop, select, and use appropriate methods to collect, organize, display and analyze data
K.5.2.a describe events related to students’ experiences as likely or unlikely
APPENDIX 9

FIRST GRADE Tennessee State Content Standards and Student Accomplishments for MATH (Accomplishments considered for inclusion in this study are in bold print.)

Numbers and Operations Content Standard 1.0 The student will develop number and operation sense needed to represent numbers and number relationships verbally, symbolically, and graphically and to compute fluent and make reasonable estimates in problem solving. Accomplishments:

1.1.1.a. count by twos, fives, and tens to 100
1.1.1.b. count a group of objects by ones to 100
1.1.1.c. count a group of objects by twos, fives, and tens up to 30
1.1.1.d. count forward or backward by one beginning with any number less than 100
1.1.1.e. recognize the place value of a digit in numbers to 99
1.1.1.f. read and write numerals up to 100
1.1.1.g count by tens from any number using a hundreds chart
1.1.1.h use manipulatives to model whole numbers to 99
1.1.1.i. identify odd and even whole numbers to 50
1.1.1.j. model halves and fourths of a single object or figure
1.1.1.k. models halves and fourths of a group of objects
1.1.1.l. match the spoken, written, concrete, and pictorial representations of $\frac{1}{2}$ and $\frac{1}{4}$
1.1.1.m. recognize one whole as two halves or four fourths
1.1.1.n count the value of a set of coins up to fifty cents
1.1.1.o order whole numbers less than 100
1.1.1.p represent numbers in flexible ways using a variety of materials
1.1.1.q. apply the language of ordinal numbers up to twelfth
1.1.1.r compare two numbers using the appropriate symbol
1.1.1.s use a number line or hundred grid to determine one more or one less than any number up to 50
1.1.2.a explain the reasonableness of a solution
1.1.2.b solve simple story problems involving addition and subtraction with numbers less than 20
1.1.2.c develop story problems that illustrate basic addition and subtraction facts
1.1.3.a use words, actions, pictures, and manipulatives to solve problems
1.1.3.b use pictures or objects, such as ten frames, to show one more or one less than any number up to 99
1.1.3.c estimate the number of objects in a group and explain the reasoning for the estimate
1.1.3.d explain and justify solutions and strategies in problem solving
1.1.3.e use a variety of strategies to add and subtract two-digit whole numbers

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Algebra Content Standard 2.0  The student will understand and generalize patterns as they represent and analyze quantitative relationships and change in a variety of contexts and problems using graphs, tables, and equations. Accomplishments:

1.2.1.a. sort objects by two attributes
1.2.1.b. describe how objects in a group are alike and how they are different

1.2.2.a. identify/describe growing patterns found in literature, environment, and physical arrangements
1.2.2.b. translate repeating pattern from 1 medium to another (red-blue-blue to snap-clap-clap)
1.2.2.c. create, describe, and extend concrete, visual, auditory, and number patterns
1.2.2.d. identify the unit of a two-part repeating pattern

1.2.3.a. use manipulatives to demonstrate addition and subtraction sentences written symbolically involving numbers
1.2.3.b. communicate and use mathematical terms and symbols appropriately
1.2.3.c. interpret and solve simple open addition sentences

1.2.4.a. apply the commutative property of addition

Geometry Content Standard 3.0  The student will develop an understanding of geometric concepts and relationships of geometric modeling and reasoning to solve problems involving one-, two-, and three-dimensional figures. Accomplishments:

1.3.1.a. recognize basic properties of similarities and differences between simple geometric figures (e.g., number of corners)
1.3.1.b. predict and describe the results of putting together and taking apart two- and three-dimensional geometric forms

1.3.2.a. uses directional terms in a variety of situations (e.g., over, under, forward, backward, between, right, left)
1.3.2.b. apply spatial sense to create a figure from memory
1.3.2.c. identify the position of a whole number on the number line

1.3.3 recognize and apply flips, slides, and turns

Measurement Content Standard 4.0  The student will become familiar with the units and processes of measurement in order to use tools, techniques, and formulas to determine and to estimate measurements in mathematical and real-world
problems. Accomplishments:

1.4.1.a compare and order objects according to length, capacity, and weight
1.4.1.b. recognize the need for standard units of measurement

1.4.2.a. demonstrate understanding of the concept of length
1.4.2.b. measure and estimate length using a variety of non-standard units
1.4.2.c. measure to the nearest inch or centimeter
1.4.2.d. measure weight to the nearest pound or kilogram
1.4.2.e. recognize a calendar as a way of measuring time
1.4.2.f. describe the relationship between days and months
1.4.2.g. read and time to the hour and the half hour
1.4.2.h. compare units of time
1.4.2.i. use a thermometer to measure temperature

Data Analysis Content Standard 5.0 The student will understand and apply basic statistical and probability concepts in order to analyze data and to make predictions and conjectures. Accomplishments:

1.5.1.a. represent and interpret data using concrete objects, pictures, pictographs, and bar graphs

1.5.2.a. describe events related to students’ experiences as likely or unlikely
SECOND GRADE Tennessee State Content Standards and Student Accomplishments for MATH (Accomplishments considered for inclusion in this study are in bold print.)

Numbers and Operations Content Standard 1.0  The student will develop number and operation sense needed to represent numbers and number relationships verbally, symbolically, and graphically and to compute fluent and make reasonable estimates in problem solving. Accomplishments:

2.1.1.a. count a set of objects to 100 using an efficient grouping strategy
2.1.1.b. count forward and backward by ones from any number less than 999
2.1.1.c. read and write numerals to 999
2.1.1.d. recognize the place value of a digit in numbers up to 999
2.1.1.e. identify odd and even numbers to 100
2.1.1.f. use concrete models or pictures to show whether a fraction is less than a half, more than a half, or equal to a half
2.1.1.g. match the spoken, written, concrete, and pictorial representation of halves, thirds, fourths
2.1.1.h. compare the unit fractions $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$
2.1.1.i. count the value of a set of coins up to one dollar
2.1.1.j. order whole numbers less than 1000
2.1.1.k. compare two numbers using the appropriate symbols
2.1.1.l. represent numbers to 999 in flexible ways using a variety of materials
2.1.1.m. apply the language of ordinal numbers up to twentieth

2.1.2.a. develop a story problem that illustrates a given addition or subtraction number sentence
2.1.2.b. use the number line to demonstrate addition and subtraction
2.1.2.c. write and identify number sentences that describe situations involving addition and subtraction
2.1.2.d. write and explain related addition and subtraction sentences

2.1.3.a. solve story problems involving numbers to 100
2.1.3.b. check for the reasonableness of solutions
2.1.3.c. use calculators in problem-solving situations
2.1.3.d. add and subtract efficiently and accurately with single-digit numbers
2.1.3.e. use a variety of strategies and representations to add and subtract two-digit whole numbers
2.1.3.f. explain and justify solution strategies used in problem solving
2.1.3.g. use estimation to justify the reasonableness of a computation

Algebra Content Standard 2.0  The student will understand and generalize patterns as they represent and analyze quantitative relationships and change in a variety of contexts and problems using graphs, tables, and equations. Accomplishments:
2.2.1.a. sort objects by two or more attributes
2.2.1.b. identify the rules by which objects or numbers have been sorted

2.2.2.a. extend a growing pattern
2.2.2.b. identify the unit of a three-part repeating pattern
2.2.2.c. translate repeating pattern from one medium to another (red-blue-blue to snap-clap-clap)
2.2.2.d. determine the output for a particular input given the one-operation function rule involving addition and subtraction

2.2.3.a. interpret and solve open sentences that involve addition or subtraction
2.2.3.b. use the language and symbols of mathematics appropriately to communicate mathematical thinking
2.2.3.c. use manipulatives to demonstrate addition and subtraction sentences written symbolically involving numbers

2.2.4.a. apply the commutative property of addition
2.2.4.b. show that subtraction is not commutative
2.2.4.c. apply the addition and subtraction properties of zero

2.2.5.a. describe qualitative change (e.g., a student growing taller)
2.2.5.b. describe quantitative change (e.g., a student rowing two inches in one year)

Geometry Content Standard 3.0 The student will develop an understanding of geometric concepts and relationships as the "--- geometric modeling and reasoning to solve problems involving one-, two-, and three-dimensional figures."
Accomplishments:

2.3.1.a. recognize, name, build, draw, and compare two- and three-dimensional geometric figures
2.3.1.b. describe attributes and parts of two- and three-dimensional figures
2.3.1.c. recognize shapes that have line symmetry
2.3.1.d. investigate and predict the results of putting together and taking apart two- and three-dimensional geometric figures

2.3.2.a. identify the position of whole numbers on the number line

2.3.3.a. illustrate flips, slides, and turns using concrete and pictorial materials

Measurement Content Standard 4.0 The student will become familiar with the units and processes of measurement in order to use tools, techniques, and formulas to determine and to estimate measurements in mathematical and real-world problems. Accomplishments:

2.4.1.a. compare and order objects according to length, capacity and weight
2.4.1.b. demonstrate understanding of the concepts of perimeter and area
2.4.1.c. identify the measurable attributes of objects in the environment

2.4.2.a. read and write time to the hour, half-hour, and quarter-hour
2.4.2.b. relate days, dates, weeks, and months to a calendar
2.4.2.c. explain the difference between inches and feet
2.4.2.d. measure length to the nearest centimeter, foot, half-inch, and inch
2.4.2.e. use strategies to make estimates of length and time
2.4.2.f. solve problems involving elapsed time in hour intervals
2.4.2.g. measure and estimate weight and capacity using a variety of non-standard units
2.4.2.h. find area and perimeter using non-standard units
2.4.2.1. read thermometers with Fahrenheit and Celsius scales

Data Analysis Content Standard 5.0 The student will understand and apply basic statistical and probability concepts in order to gather and analyze data and to make predictions and conjectures. Accomplishments:

2.5.1.a. pose questions and gather data to answer the questions
2.5.1.b. read, interpret, and create tables using tally marks
2.5.1.c. create pictographs and bar graphs
2.5.1.d. read and interpret tables, bar graphs, and pictographs

2.5.2.a. predict outcomes of events based on data gathered and displayed
2.5.2.b. explain whether an event is likely or unlikely
APPENDIX 11

THIRD GRADE Tennessee Content Standards and Student Accomplishments for MATH (Accomplishments considered for inclusion in this study are in bold print.)

Numbers and Operations Content Standard 1.0 The student will develop number and operation sense needed to represent numbers and number relationships verbally, symbolically, and graphically and to compute fluent and make reasonable estimates in problem solving. Accomplishments:

3.1.1.a count by tens, hundreds, or thousands from any whole number
3.1.1.b skip count by tens from any whole number less than 1000
3.1.1.c read and write whole numbers to 9999
3.1.1.d represent whole numbers to 9999 in flexible ways using a variety of materials
3.1.1.e identify whole numbers as odd or even
3.1.1.f name the place value of a given digit in whole numbers to 10,000
3.1.1.g write whole numbers up to 10,000 in expanded form
3.1.1.h connect the spoken, written, concrete, and pictorial representations of fractions with denominators up to ten
3.1.1.i compare unit fractions with denominators up to ten
3.1.1.j compare and order decimal amounts in the context of money
3.1.1.k count the value of combinations of coins and dollars up to $5
3.1.1.l make change from a transaction that is less than a dollar
3.1.1.m order whole numbers to 10,000
3.1.1.n compare whole numbers to 9999 using the appropriate symbols

3.1.2.a. relate skip counting to multiplication
3.1.2.b. connect division to sharing situations
3.1.2.c. demonstrate multiplication using repeated addition
3.1.2.d. write and identify number sentences that describe real-world situations involving addition, subtraction, and multiplication
3.1.2.e. write and explain related addition and subtraction

3.1.3.a. use a variety of thinking strategies to add and subtract whole numbers
3.1.3.b. explain the reasonableness of a solution
3.1.3.c. relate adding doubles to multiplying by two
3.1.3.d. use known multiplication facts to determine a related product
3.1.3.e. use the multiplication facts with 0, 1, 2, 5, and 10 as a factor
3.1.3.f. explain and justify solution strategies in problem solving
3.1.3.g. select and apply an appropriate problem-solving strategy
3.1.3.h. mentally calculate the sum or difference of any two numbers up to 100
3.1.3.i. use strategies to estimate in problem-solving situations
Algebra Content Standard 2.0 The student will understand and generalize patterns as they represent and analyze quantitative relationships and change in a variety of contexts and problems using graphs, tables, and equations. Accomplishments:

3.2.1.a. sort objects by two or more attributes
3.2.1.b. devise, carry out, and explain a sorting scheme for a group of objects
3.2.1.c. identify the rules by which objects or numbers have been sorted

3.2.2.a. recognize, describe, extend, translate, and create patterns
3.2.2.b. describe a growing pattern
3.2.2.c. determine the output for a particular input given a one-operation function rule involving addition, subtraction, and multiplication

3.2.3.a. describe the commutative properties of addition and multiplication with words or symbols
3.2.3.b. interpret and solve open sentences that involve addition, subtraction, and multiplication
3.2.3.c. use the language and symbols of mathematics appropriately to communicate mathematical thinking
3.2.3.d. demonstrate understanding that an equation is a number sentence stating two qualities are equal

3.2.4.a. apply the commutative property of addition and multiplication
3.2.4.b. show that subtraction is not commutative
3.2.4.c. apply the addition and subtraction properties of zero
3.2.4.d. apply the zero and identity properties of multiplication
3.2.4.e. use arrays to represent the commutative property of multiplication

3.2.5.a. describe qualitative change (e.g., a student growing taller)
3.2.5.b. describe quantitative change (e.g., a student growing two inches in one year)

Geometry Content Standard 3.0 The student will develop an understanding of geometric concepts and relationships as the geometric modeling and reasoning to solve problems involving one-, two-, and three-dimensional figures.

Accomplishments:

3.3.1.a. recognize, name, build, draw, and compare two- and three-dimensional geometric figures
3.3.1.b. recognize congruent geometric figures
3.3.1.c. identify and draw lines of symmetry in two-dimensional designs and shapes
3.3.1.d. identify and draw horizontal and vertical lines
3.3.1.e. identify and draw diagonals of polygons

3.3.2.a identify the position of ½, 1/3, and ¼ on the number line
3.3.2.b. identify a location on a grid using whole number coordinates

3.3.3.a. predict/describe the results of sliding, flipping, and turning in two-dimensional shapes

Measurement Content Standard 4.0 The student will become familiar with the units and processes of measurement in order to make use of tools, techniques, and formulas to determine and to estimate measurements in mathematical and real-world problems. Accomplishments:

3.4.1.a. determine when an estimate of a measurement is sufficient
3.4.1.b. demonstrate understanding of the concepts of perimeter, area, and capacity

3.4.2.a. solve real-world problems using a calendar
3.4.2.b. use strategies to estimate length, perimeter, area, capacity, weight, time, and temperature
3.4.2.c. explain the relationships among inches, feet, and yards
3.4.2.d. measure length to the nearest centimeter, foot, half-inch, and inch
3.4.2.e. measure the capacity of a container in liters, cups, pints, quarts, and gallons
3.4.2.f. measure to the nearest ounce, pound, kilogram, and gram
3.4.2.g. find the perimeter of polygons
3.4.2.h. select and apply appropriate standard units to measure length, area, capacity, weight, time, and temperature
3.4.2.i. solve real-world problems involving measurement and elapsed time to the half-hour
3.4.2.j. read thermometers with Fahrenheit and Celsius scales
3.4.2.k. read and write time up to five minute intervals

Data Analysis Content Standard 5.0 The student will understand and apply basic statistical and probability concepts in order to gather and analyze data and to make predictions and conjectures. Accomplishments

3.5.1.a. pose questions and gather data to answer questions
3.5.1.b. read, interpret, and create tables using tally marks
3.5.1.c. create pictographs and bar graphs
3.5.1.d. read and interpret tables, bar graphs, and pictographs

3.5.2.a. make and justify predictions based on data gathered and displayed
3.5.2.b. identify all possible outcomes of a simple experiment (e.g., spinner, coin toss, number cubes)
3.5.2.c. explain whether an event is certain, possible, or impossible
3.5.2.d. explain whether an event is likely or unlikely
APPENDIX 12

FOURTH GRADE Tennessee State Content Standards and Student Accomplishments for MATH (Accomplishments considered for inclusion in this study are in bold print.)

Numbers and Operations  Content Standard 1.0  The student will develop number and operation sense needed to represent numbers and number relationships verbally, symbolically, and graphically and to compute fluently and make reasonable estimates in problem solving. Accomplishments:

4.1.1.a. read and write numbers from hundredths to hundred-thousands
4.1.1.b. recognize the place value of a given digit from hundredths to hundred-thousands
4.1.1.c. compare and order whole numbers using the appropriate symbols
4.1.1.d. model fractions as parts of unit wholes, as part of a set, as locations on number lines, and as divisions of whole numbers
4.1.1.e. recognize and generate equivalent forms of whole numbers and commonly used fractions and decimals
4.1.1.f. use models to compare and order commonly used fractions
4.1.1.g. use concrete and pictorial representations to compare decimals
4.1.1.h. use various models to represent, order, and compare whole numbers and commonly used fractions
4.1.1.i. communicate and use mathematical language and symbols correctly

4.1.2.a. explain the relationship between addition and subtraction
4.1.2.b. explain the relationship between multiplication and division
4.1.2.c. communicate the effects of addition, subtraction, multiplication, and division on size and order of numbers

4.1.3.a. use strategies to estimate the results of whole-number computations
4.1.3.b. explain the reasonableness of results
4.1.3.c. add and subtract fractions with like denominators
4.1.3.d. multiply and divide efficiently and accurately with single-digit whole numbers
4.1.3.e. add, subtract, and multiply decimals
4.1.3.f. select appropriate methods and tools for computing with whole numbers (e.g., mental computation, estimation, calculators, paper/pencil, guess/check
4.1.3.g. solve real-world problems involving one-step addition, subtraction, and multiplication
4.1.3.h. identify missing information and/or too much information in real-world problems
4.1.3.i. apply logical reasoning to solve real-world problems
4.1.3.j. select the appropriate computational and operational method to solve Problems
4.1.3.k. solve real-world problems using whole numbers, fractions, and decimals

Algebra Content Standard 2.0 The student will understand and generalize patterns as they represent and analyze quantitative relationships and change in a variety of contexts and problems using graphs, tables, and equations. Accomplishments:

4.2.1.a. generalize and extend geometric and numerical patterns
4.2.1.b. represent and analyze patterns and functions using words, tables, and graphs
4.2.1.c. identify and describe a function rule

4.2.2.a. interpret and solve open sentences that involve addition, subtraction, multiplication, and division
4.2.2.b. represent the idea of a variable as an unknown quantity using a letter or a symbol
4.2.2.c. demonstrate an understanding that an equation is a number sentence stating two quantities are equal

4.2.3.a. apply commutative, associative, zero, and identity problems

4.2.4.a. investigate how a change in one variable relates to a change in a second variable

Geometry Content Standard 3.0 The student will develop an understanding of geometric concepts and relationships as the geometric modeling and reasoning to solve problems involving one-, two-, and three-dimensional figures. Accomplishments:

4.3.1.a. identify, compare, and analyze attributes of two- and three-dimensional shapes
4.3.1.b. develop and use mathematical language to describe the attributes of geometric figures
4.3.1.c. draw points, lines, line segments, rays, and angles
4.3.1.d. describe characteristics of lines and angles (e.g., parallel, perpendicular, intersecting, right, acute, obtuse)
4.3.1.e. describe and compare properties of two- and three-dimensional geometric figures
4.3.1.f investigate and describe the results of subdividing and combining two-dimensional geometric figures
4.3.1.g recognize congruent geometric figures
4.3.1.h draw lines of symmetry for two-dimensional geometric figures

4.3.2.a. use appropriate mathematical language to find and specify points on a grid using whole numbers coordinates

4.3.3.a. investigate, predict, and describe the results of transformations of
two-dimensional geometric figures (i.e., slides, flips, and turns)

4.3.3.b. describe a motion that will show that two shapes are congruent

4.3.4.a. construct and draw two- and three-dimensional geometric figures
4.3.4.b. create and describe mental images of objects, patterns, and paths
4.3.4.c. use geometric models to solve real-world problems

Measurement Content Standard 4.0 The student will become familiar with the units and processes of measurement in order to use tools, techniques, and formulas to determine and to estimate measurements in mathematical and real-world problems. Accomplishments:

4.4.1.a. demonstrate understanding of the concepts of length, perimeter, area, weight, capacity, volume, time, and measure
4.4.1.b. apply appropriate estimation strategies using standard units of measure
4.4.1.c. demonstrate understanding that measurements are approximations
4.4.1.d. demonstrate understanding of the relationships among the units with a system of linear measurement
4.4.1.e. explore perimeter and area using a variety of models (e.g., geoboards, graph paper)

4.4.2.a. select and use tools to measure weight and volume
4.4.2.b. measure length to the nearest ¼ inch
4.4.2.c. tell time to the nearest minute
4.4.2.d. read and record temperature using Fahrenheit and Celsius scales
4.4.2.e. develop strategies for estimating the perimeters and areas of geometric figures
4.4.2.f. apply the formula for finding the area of a rectangle
4.4.2.g. solve real-world problems involving measurement and elapsed time to the quarter hour

Data Analysis Content Standard 5.0 The student will understand and apply basic statistical and probability concepts in order to gather and analyze data and to make predictions and conjectures. Accomplishments:

4.5.1.a. collect data using observations, surveys, and experiments
4.5.1.b. understand how data-collection methods affect the nature of the data set
4.5.1.c. represent data using tables, pictographs, line graphs, and bar graphs
4.5.1.d. interpret data displayed in tables, pictographs, line graphs, and bar graphs
4.5.1.e. evaluate how well various representations show the collected data

4.5.2.a. explore measures of central tendency (i.e., mean, median, mode)
4.5.3.a. make predictions based on data
4.5.3.b. design investigations to address a question

4.5.4.a. describe the likelihood or chance of events as certain, possible, or impossible
4.5.4.b. explain whether an event is likely or unlikely
4.5.4.c. predict the probability of outcomes of simple experiments
FIFTH GRADE Tennessee State Content Standards and Student Accomplishments for MATH (Accomplishments considered for inclusion in this study are in bold print.)

Numbers and Operations Content Standard 1.0  The student will develop number and operation sense needed to represent numbers and number relationships verbally, symbolically, and graphically and to compute fluent and make reasonable estimates in problem solving.  Accomplishments:

5.1.1.a read and write numbers from thousandths to millions
5.1.1.b name the place value of a given digit from thousandths to millions
5.1.1.c use various models to show relationships among whole numbers, fractions, mixed numbers, and decimals
5.1.1.d **communicate using mathematical language and symbols**
5.1.1.e model proper fractions, improper fractions, and mixed numbers
5.1.1.f show the relationship between improper fractions and mixed numbers
5.1.1.g recognize and generate equivalent forms of commonly used fractions, decimals, and percents
5.1.1.h recognize relationships among commonly used fractions and decimals

5.1.2.a use commutative, associative, and identity properties
5.1.2.b. **explain and demonstrate the inverse nature of addition and subtraction**
5.1.2.c explain and demonstrate the inverse nature of multiplication and division
5.1.2.d communicate the effects of addition, subtraction, multiplication, and division on the size and order of numbers

5.1.3.a select appropriate methods and tools for computations
5.1.3.b explain why one form of a number might be more useful for computation than another form
5.1.3.c recognize reasonable estimates for operations
5.1.3.d. **add, subtract, multiply, and divide whole numbers and decimals**
5.1.3.e. use models, benchmarks, and equivalent forms to add and subtract commonly used fractions with like denominators
5.1.3.f. **identify missing information and/or too much information in real-world problems**
5.1.3.g. **solve multi-step real-world problems**
5.1.3.h. solve real-world problems using decimals, fractions and percents

Algebra Content Standard 2.0  The student will understand and generalize patterns as they represent and analyze quantitative relationships and change in a variety of contexts and problems using graphs, tables, and equations.  Accomplishments:

5.2.1.a. **generalize and extend geometric and numerical patterns**
5.2.1.b. **represent and analyze patterns and functions using words, tables, and graphs**
5.2.1.c. apply basic function rules
5.2.2.a. demonstrate understanding that an equation is a number sentence stating two quantities are equal
5.2.2.b. solve open sentences using informal methods and knowledge of operations
5.2.2.c. represent the idea of a variable as an unknown quantity using a letter or a symbol
5.2.2.d. express mathematical relationships using equations
5.2.3.a. apply commutative, associative, zero, distributive, and identity properties
5.2.3.b. show that division is not commutative
5.2.4.a. investigate how a change in one variable relates to a change in a second variable
5.2.4.b. use a variety of methods to compare and describe situations involving constant and/or varying rates

Geometry Content Standard 3.0 The student will develop an understanding of geometric concepts and relationships as the geometric modeling and reasoning to solve problems involving one-, two-, and three-dimensional figures.
Accomplishments:
5.3.1.a. identify, compare, and analyze attributes of two- and three-dimensional figures
5.3.1.b. use the attributes of geometric figures to develop definitions
5.3.1.c. draw points, lines, line segments, rays, and angles
5.3.1.d. identify and describe attributes of a circle using appropriate mathematical language (e.g., radius, diameter, center)
5.3.1.e. use properties to classify geometric figures
5.3.1.f. investigate and describe the results of subdividing and combining geometric figures
5.3.1.g. compare and contrast congruent and symmetrical geometric figures
5.3.1.h. describe characteristics of lines and angles (e.g., parallel, perpendicular, intersecting, right, acute, obtuse)
5.3.1.i. make and test hypothesis about geometric properties
5.3.1.j. explore similarity
5.3.2.a. describe location and movement using appropriate mathematical language
5.3.2.b. find and specify points in Quadrant 1 of a coordinate system
5.3.3.a. investigate, predict, and describe the results of transformations of two-dimensional figures (i.e., slides, flips, and turns)
5.3.3.b. describe line and rotational symmetry in two-dimensional figures
5.3.3.c. describe a motion or a series of motions that will show that two
shapes are congruent

5.3.4.a. construct and draw two- and three-dimensional figures
5.3.4.b. create and describe mental images of objects, patterns, and paths
5.3.4.c. build a three-dimensional object from a two-dimensional representation (nets) of that object
5.3.4.d. use visualization and spatial reasoning to solve real-world problems

Measurement Content Standard 4.0 The student will become familiar with the units and processes of measurement in order to use tools, techniques, and formulas to determine and to estimate measurements in mathematical and real-world problems

Accomplishments:

5.4.1.a. demonstrate understanding of the concepts of length, perimeter, circumference, area, weight, capacity, elapsed time, and angle measure
5.4.1.b. demonstrate understanding that measurements are approximations
5.4.1.c. understand how differences in units affect precision
5.4.1.d. demonstrate understanding of the relationships among the units within the same system of measurement
5.4.1.e. explore what happens to measurements of a two-dimensional shape when the shape is changed in some way (e.g., perimeter, area)

5.4.2.a. apply and explain appropriate estimation strategies using standard units of measure
5.4.2.b. select and apply appropriate standard units to measure length, perimeter, area, capacity, volume, weight, temperature and angles
5.4.2.c. select and use appropriate tools for measuring in real-world situations
5.4.2.d. solve real-world problems involving measurement and elapsed time
5.4.2.e. read and record temperature using Fahrenheit and Celsius scales
5.4.2.f. develop, understand, and use formulas to find the area of parallelograms and triangles
5.4.2.g. explain and demonstrate how scale in maps and drawings shows relative size and distance
5.4.2.h. develop informal strategies to determine the surface area and volume of rectangular solids

Data Analysis Content Standard 5.0 The student will understand and apply basic statistical and probability concepts in order to gather and analyze data and to make predictions and conjectures.

Accomplishments:

5.5.1.a. collect data using observations, surveys, and experiments
5.5.1.b. understand how data-collection methods affect the nature of the data set
5.5.1.c. represent data using pictographs, bar graphs, tables, circle graphs,
and line graphs
5.5.1.d. interpret data displayed in pictographs, bar graphs, tables, circle graphs, and line graphs

5.5.2.a. use measures of central tendency (i.e., mean, median, mode)
5.5.2.b. relate mean, median, and mode to a visual representation of a data set
5.5.2.c. find the range of a data set

5.5.3.a. make predictions and justify conclusions based on data
5.5.3.b. design investigations to address a question
5.5.3.c. examine various representations of data to evaluate how accurately the data is depicted
5.5.3.d. explain the importance of sample size in investigations

5.5.4.a. describe the likelihood or chance of events as likely, unlikely, certain, equally likely, or impossible
5.5.4.b. use a sample space to predict the probability of an event
5.5.4.c. understand that the measure of the likelihood of an event can be represented as a number from 0-1
Lesson Plan: Building a Pyramid

1. Lesson Title: Solid Geometric Forms: Building a Team Pyramid (Grade 5)
2. Unit Title: Solid Geometric Forms
3. Instructional Objectives: Fifth grade students will recognize, name, and build the solid geometric form of a pyramid. (Art Standards 5.1.1, 5.1.3, 5.1.4, 5.2.1, 5.4.1; Math Standards 5.3.1.a, 5.3.1.e, 5.3.4.a)
4. Materials/Media: Per student: a piece of white card stock or poster board cut into a triangle whose sides are 8 – 12” in length and with one angle measuring between 30 and 60 degrees; a pencil with eraser; straight edge; markers or colored pencils. Per four person team: a pattern for a pyramid whose triangular faces are equal to the triangle each student has drawn on, scissors, glue and/or clear tape
   Other Resources: pictures of well-known pyramids such as those in Egypt, in Las Vegas, in Memphis
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Discuss personalities; differences between personal likes, dislikes, talents, hobbies, activities, favorite classes, etc. Discuss how a combination of small parts can create a whole, as in 100 pennies making a dollar.
      ● Vocabulary: triangle, square, base, pyramid, team
   B. Key Questions: How many faces are on a pyramid? What are the shapes of the faces of a pyramid? Can you describe the base of a pyramid? Can a pyramid vary in height and slant?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will cut several identical triangles out of white cardstock or cardboard. Teacher will complete a finished example of a triangle that reflects her interests and a finished example of a pyramid constructed of four triangles.
      ● Suggestion: Write a list of categorical questions on the board before the students enter the room, including such questions as What sports do you play? What sports do you like to watch? Do you have a favorite team? Do you like to listen to music? Do you play music? Do you belong to a club or group? Do you have a hobby? What is your favorite color, food, etc.?
      ● Safety: no special concerns
   D. Learner Involvement: 1. Student will create, draw, and color a triangle that reflects their personality. 2. Student will work with other team members to cut out, fold, and glue and/or tape the pattern for the pyramid. 3. Student will glue his/her triangle onto the pyramid. 4. Students can use the pyramid in subsequent classes as a marker (like a flag) for their team.
   E. Practice and Review: the students might be interested in drawing or coloring a picture of an Egyptian pyramid.
   F. Learning Environment: Each student needs a clean flat surface to work on.
6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did the student adequately (or beautifully) decorate his face of the team pyramid? Did the student use symbols to convey his own personality? Did the students correctly assemble the team pyramid?
   Questions from this lesson that could be included on a subsequent unit test are:
   How many faces are on a pyramid? What are the shapes of the faces of a pyramid? Can you describe the base of a pyramid? Can a pyramid vary in height and slant?
   B. Informal: How many faces are on a pyramid? What are the shapes of the faces of a pyramid? Can you describe the base of a pyramid? Can a pyramid vary in height and slant?

7. Re-teaching: It is fun to review this lesson by building a smaller pyramid. When studying the history of Egyptian and Central American art, their pyramids can be discussed in further detail. When studying architectural practices, the pyramids in Memphis and Las Vegas can be discussed.
Lesson Plan: Building a Small Pyramid

1. Lesson Title: Solid Geometric Forms: Building a Personal Pyramid (Grade 5)
2. Unit Title: Solid Geometric Forms
3. Instructional Objectives: Fifth grade students will recognize, name, and build the solid geometric form of a pyramid. (Art Standards 5.1.1, 5.1.3, 5.1.4, 5.2.1, 5.4.1; Math Standards 5.3.1.a, 5.3.1.e, 5.3.4.a)
4. Materials/Media: Per student: a piece of white card stock on which has been printed a pattern for a three-dimensional pyramid, measuring about 2” high; pencil with eraser; straight edge; markers or colored pencils; scissors, glue and/or clear tape
Other Resources: team pyramids and pictures of well-known pyramids such as those in Egypt, in Las Vegas, in Memphis
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Refer to the team pyramids.
      ● Vocabulary: triangle, square, base, pyramid
   B. Key Questions: How many faces are on a pyramid? What are the shapes of the faces of a pyramid? Can pyramids vary in size and form?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will copy the pattern for the small pyramid on white card stock. Teacher will prepare a finished example and an example of the project in progress.
      ● Suggestion: As students start to assemble the pyramids, they will have to hold the glued edges together for about 2 minutes while the glue starts to dry. It is helpful to have a clock with a sweep second hand or an egg timer for them to use when timing the drying process.
      ● Safety: no special concerns
   D. Learner Involvement: 1. Student will create, draw, and color decorations for a pattern for a small pyramid that reflects their personality. 2. Student will cut out, fold, and glue the pattern for the pyramid.
   E. Practice and Review: the students might be interested in drawing or coloring a picture of an Egyptian pyramid.
   F. Learning Environment: Each student needs a clean flat surface to work on.
6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did the student adequately (or beautifully) decorate the faces of the pyramid? Did the student adequately assemble the pyramid?
      Questions from this lesson that could be included on a subsequent unit test are:
   B. Informal: How many faces are on a pyramid? What are the shapes of the faces of a pyramid? Can you describe the base of a pyramid? Can a pyramid vary in height and slant?
7. Re-teaching: This lesson is fun to repeat during the holidays as an in-class assignment or a take-home project. The pattern for the small pyramid can be reproduced on colored
card stock or the student can be given metallic gel markers to use for decorating. Each student makes 2 pyramids, decorated with holiday theme images, such as candy cane stripes or traditional holiday colors. The two pyramids are glued or taped together. Then the base of the first pyramid is glued to the base of the second pyramid. A looped string is attached to point of the first pyramid, and then the construction can be used a holiday ornament.
Lesson Plan: Meeting Mr. Square

1. Lesson Title: Shapes: Meeting Mr. Square (Kindergarten)
2. Unit Title: Shapes
3. Instructional Objectives: Kindergarten students will recognize, name, and draw a square. (Art Standards K.1.1, K.1.2, K.2.1, K.3.1; Math Standards K.1.1.a, K.3.1.a, K.3.1.b, K.3.1.c, K.3.1.d)
4. Materials/Media: Per student: a piece of white drawing paper cut to 6” x 24” on which has been written with marker the letters of their first name and on which is drawn a small cartoon of Mr. Square; several pieces of construction paper cut to 2” x 2” on which has been written the letters of their first name; glue; a pencil with eraser; crayons.
Other Resources: A large picture of Mr. Square can be drawn on the blackboard prior to or during class
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Discuss spelling and writing our names; point out Mr. Square and explain how he is going to help us put our name on our paper; demonstrate matching the 2” squares of construction paper with the letters written on the paper
      ● Vocabulary: triangle, square, base, pyramid, team
   B. Key Questions: What does a square look like? How many corners does a square have? How many sides does a square have? Can you draw a square?
   C. Classroom Strategies
      ● Instructional Preparations: Prior to class, teacher will cut the white drawing paper and several colors of 2” squares. Teacher should double check the spelling of children’s names before doing this project. Teacher will write the letters of each child’s name at 2” intervals along the bottom of the white drawing paper. Teachers will draw a small cartoon of Mr. Square in the upper corner of the white drawing paper.
      ● Suggestion: Draw a large cartoon of Mr. Square on the chalk board and use colored chalk to color him in.
      ● Safety: no special concerns.
   D. Learner Involvement: 1. Student will match letters written on 2” squares of construction paper with letters written on the large white drawing paper. 2. Student will use a dot of glue to attach the construction paper square to the matching letter on the white paper. 3. Student will use the pencil or crayon to write the letters of his/her name above the construction paper squares. 4. Students will color Mr. Square. 5. Student will draw and color some friends or family for Mr. Square.
   E. Practice and Review: Fast workers will use the end of class drawing Mr. Square on the chalkboard.
   F. Learning Environment: Each student will need a clean flat surface to work on, preferably one that is at least 30” wide.
G. Closure
   - Clean up: Store the wet papers on the drying rack if needed; if the glue is not too wet, the papers could be taken home on the same day they are completed. Store the glue and crayons.
   - Ending comments: Ask the children to wave good-by to Mr. Square.

H. Alternative Activities
   - Special Needs Considerations: If children are still learning how to spell their names, lay the 2” squares on their paper in order for them. Show them how to match the letters by looking at the lines and curves of the letter instead of by recognition. If children are more advanced, have them choose the letters of their name from an array of letters on a tray of sectioned box.
   - Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, answer these questions: Did the children spell their name correctly? Did they use the glue correctly and in the right amount? Are the letters glued on with the right side up? Did they draw a square correctly? Did they draw many friends and family for Mr. Square?
      Questions from this lesson that could be included on a subsequent unit test are: Can you draw a square for me? Can you recognize your name? Can you write your name?
   B. Informal: As you observe students working, look for focused work, careful work, and correct sequencing of letters. Look for students who can use a dot of glue.

7. Re-teaching In later classes, Mr. Square can be used to help draw objects and to make the Square Monster.
Lesson Plan: Square Monster

1. Lesson Title: Shapes: Square Monster (Kindergarten)
2. Unit Title: Shapes
3. Instructional Objectives: Kindergarten students will recognize and name a square as well as create an A-B pattern. (Art Standards K.1.1, K.2.2, K.3.1; Math Standards K.1.1.e, K.2.1.a, K.2.2.a, K.2.2.b, K.2.2.c, K.3.1.a, K.4.1.a)
4. Materials/Media: Per student: one oversized chenille stem (24” long); several 1” squares of construction paper which have a hole punched into the center; an equal number of 1” pieces of drinking straw; one 3” square of construction paper onto which an angry face has been drawn.
Other Resources: A finished example of Square Monster.
5. Instructional Procedures and Design:
   A. Set
      - Motivation Strategies: Discuss feelings; point out that sometimes we feel good and sometimes we feel bad; ask children what makes them feel mad; show them Square Monster and explain that Mr. Square, like us, has a bad day sometimes; demonstrate putting the paper squares and straw pieces on the chenille stem in a pattern; talk about how making a pattern is letting the two elements take turns; make a snap-clap pattern with the class
      - Vocabulary: square, feelings, pattern
   B. Key Questions: Do our feelings change? What is an A-B pattern?
   C. Classroom Strategies
      - Instructional Preparations: Teacher will cut 1” squares from colored construction paper, about 20 per child. Using a handheld hole puncher, she will punch a hole in the center of each square. Teacher will cut 3” squares of construction paper, one per child. Teacher will connect the 3” square to the end of the chenille stem by piercing the paper, looping the chenille stem back through another pierced hole, and twisting the chenille stem together. Teacher will cut plastic drinking straws into 1” segments. Teacher will complete an example of a finished project.
      - Suggestions: Demonstrate how Square Monster will “crawl” on the table top by pushing him from the back. As children are working, write their name on the back of the 3” square.
      - Safety: Teacher should be careful that the ends of the chenille stem are trimmed so children will not get scratched.
   D. Learner Involvement: 1. Student will thread the construction paper squares and the straw pieces onto the chenille stem, making an A-B pattern. 2. At the end of the chenille stem, student will curl the last inch or two into a curly tail. 3. Student will draw a mad face on the Square Monster. 4. Student will “play” with his/her Square Monster, making it crawl on the table, and will explain why Mr. Square turned into a Square Monster.
   E. Practice and Review: As students line up, practice making A-B patterns, letting
the children take turns being the leader. As students leave their desk to line up, ask them to make their happy face and then make their monster face for you. This will invariably cause them to giggle.

F. Learning Environment: Each student will need a clean flat surface to work on.

G. Closure
   - Clean up: Collect the unused straw segments and 1” squares to use in another class.
   - Ending Comments: Teacher might express her hopes that nobody in the class turns into a monster today.

H. Alternative Activities
   - Special Needs Considerations: Teacher may begin making a paper-straw-paper-straw pattern for a student who is struggling with the A-B pattern.
   - Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, answer these questions: Did the student place the straws and paper in the chenille stem in an A-B pattern? Did the student fill up the chenille stem with straws and paper? Did they draw a mean face on the 3” square? Questions from this lesson that could be included on a subsequent unit test are: What is an A-B pattern?
   B. Informal: As you observe students working, look for correct A-B patterns and well drawn mean faces.

7. Re-teaching: In later classes, when pieces of art (such as Edvard Munch’s The Scream) are being viewed and discussed, teacher can refer back to Square Monster to open up discussion of emotion.
Lesson Plan: House of Shapes Collaged Picture

1. Lesson Title: House of Shapes Collaged Picture Collage (Kindergarten)
2. Unit Title: Shapes
3. Instructional Objectives: Kindergarten students will recognize and name a square, triangle, and rectangle as well as draw a circle.
4. Materials/Media: Each student will need: an 12” x 18” piece of white drawing paper (or manila paper or light blue construction paper); one 3” x 18” rectangle cut from green construction paper; one 4” x 4” square cut from red construction paper; one isosceles triangle with a 5” base cut from blue construction paper; glue; crayons.
Other Resources: A finished example of a collaged picture of a house.
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Discuss shapes. Point out shapes in the art room. Show the students pictures of objects and ask them what shapes they see. Talk about how artists like to use shapes to make pictures of things. Show an example on the chalkboard of how the combination of 2-3 shapes can create the illusion of a real object. For example, three graduated circles stacked vertically looks like a snowman. Talk about houses and say that Mr. Square is going to help them make a picture of a house. Show how a square and a triangle placed together can make a picture of a house.
      ● Vocabulary: square, triangle, rectangle, circle
   B. Key Questions: What is a square? a triangle? a rectangle? A circle? How can artists use shapes to create a picture of an object?
   C. Classroom Strategies
      ● Instructional Preparations: Before class, teacher will cut green construction paper into 3” x 18” rectangles, red construction paper into 4” x 4” squares, blue construction paper into isosceles triangles with a 5” base. Teacher will complete a finished example of the project.
      ● Suggestions:
      ● Safety:
   D. Learner Involvement: 1. Student will cut fringe along the long side of the green rectangle to create “grass.” 2. Student will glue the green rectangle to the bottom of the paper. 3. Student will glue the square and triangle to the paper to create a house. 4. Student will draw a yellow circle to create a sun. 5. Student will use crayons to add details to the house and yard and to draw the people who live in the house.
   E. Practice and Review: Ask students to draw on the chalk board to create several objects that are constructed of several shapes put together. Examples include a snowman made of three circles; a car made of two circles, a rectangle, and a square; and a robot made of squares and rectangles.
   F. Learning Environment: Each student will need a clean flat surface to work on.
   G. Closure
      ● Clean up: Place the wet papers on the drying rack to allow the glue to dry.
Collect the glue and crayons.

- Ending Comments: Teacher can encourage students to look at the things around them at school and at home, and to think about what shapes they see in those objects.

H. Alternative Activities

- Special Needs Considerations: Some children might need help with their cutting.

- Addressing of Diversity

6. Evaluation Strategies

A. Formal: To grade this project, answer these questions: Did student cut a good fringe of grass on the green paper? Did student create a house with the square and rectangle? Did student draw a circular sun? Did student fill her paper with detailed drawings of the people who live in the house?

Questions from this lesson that could be included on a subsequent unit test are:

What is a square? What is a triangle? What is a rectangle? What is a circle?

B. Informal: As you observe students working, look for correct cutting technique, and correct use of the glue bottle.

7. Re-teaching: In later classes, use shapes to create more complex objects. When looking at reproductions of art, point out the basic shapes that are seen in the art.
Lesson Plan: Glyph Self Portrait

1. Lesson Title: Glyph Self-Portrait (Grade 3)
2. Unit Title: Drawing People
3. Instructional Objectives: Third grade students will visually describe themselves in a realistic self-portrait and then symbolically describe themselves using hieroglyphics. (Art Standards 3.1.1, 3.1.2, 3.2.2; Math Standards 3.4.1.b, 3.5.1.c)
4. Materials/Media: Per student: one 9” x 9” piece of white drawing paper for the self-portrait; pencil; eraser; individual mirror; oil pastels; watercolor paint with water and brushes; one 15” x 15” piece of white drawing paper for the frame; two pieces of 9” x 4¼” brown construction paper for the doors.
Other Resources: A finished example of a Glyph Self-Portrait.
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Discuss self-portraiture and the basic proportions of the human face. Display very large pictures that show examples of the human eye, mouth, and nose. After the self-portrait is complete, in a later class, discuss personal traits such as age, gender, and personal likes and dislikes.
      ● Vocabulary: self-portrait, hieroglyphics
   B. Key Questions: What is a self-portrait? What are hieroglyphics? What are personal traits?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will cut 9” x 9” white drawing paper for the self-portraits, 15” x 15” white paper for the frames, and 9” x 4 ¼” paper for the doors. Teacher will display examples of the human face. Teacher will complete an example of the project.
      ● Suggestions:
      ● Safety: Advise students to be very careful when handling the mirrors.
   D. Learner Involvement: 1. Student will carefully draw a self-portrait using the mirror and the examples to guide them. 2. Student will add color to the self-portrait with paint, crayons, and/or oil pastels. 3. Student will cut out the decorative edges of the frame. 4. Student will decorate the frame using hieroglyphics that describe their personal traits. 5. Student will glue their self-portrait onto the center of the frame. 6. Student will glue two brown doors over their self-portrait, applying flue only to the left edge of the left-hand door and the right edge of the right-hand door.
   E. Practice and Review: As students draw people in their subsequent assignments, remind them of the proportions of the human face.
   F. Learning Environment: Each student needs adequate space for their paper and their mirror. Students need a clean, flat surface to work on.
   G. Closure
      ● Clean up: Store art materials. Carefully gather and store mirrors.
      ● Ending Comments: Discuss this questions: What is more important, a person’s
looks or a person’s behaviors? Which one forms the greater part of a person’s identity?

H. Alternative Activities

- Special Needs Considerations: If a student is hesitant to get started on the self-portrait, teacher may draw a large oval for the shape of the face and make very light, small sketch marks to indicate the placement of the facial features.

- Addressing of Diversity

6. Evaluation Strategies

A. Formal: To grade this project, answer these questions: Did the student draw an adequate self-portrait? Did the student complete the self-portrait with the addition of color? Did the student fill the frame with symbols that described his own personality? Did the student glue doors on the self-portrait?

Questions from this lesson that could be included on a subsequent unit test are: What is a self-portrait? What are hieroglyphics?

B. Informal: As you observe students working, look for students who are carefully drawing the self-portrait while following the guidelines.

7. Re-teaching: In later classes, look at self-portraits of famous artists. Ask the students what they can guess about the artist from the clues given in the picture.
Appendix 20

Lesson Plan: Starburst Drawing

1. Lesson Title: Shapes: Starburst (Grade 5)
2. Unit Title: Geometry
3. Instructional Objectives: 5th grade students will correctly use a ruler to draw many straight lines to create a starburst design.
4. Materials/Media: Per student: one piece of 12” x 18” colored drawing paper; a pencil; a ruler; colored pencils or markers
   Other Resources: An example of a starburst design in progress; a finished example of a starburst design
5. Instructional Procedures and Design:
   A. Set
      - Motivation Strategies: Show the finished example; discuss the proper use of a ruler; demonstrate proper and improper technique, exaggerating the improper technique in a comical way.
      - Vocabulary: ruler; ray; line segment; overlap; intersect
   B. Key Questions: What is a ruler and how is it used in art? What is a line segment? What does it mean to intersect?
   C. Classroom Strategies
      - Instructional Preparations: Teacher will cut the drawing paper and complete a finished example. Teacher will also make several examples of the project at various stages of the work.
      - Suggestions
      - Safety: no special concerns
   D. Learner Involvement: 1. Student will draw a horizontal straight line that measures 10” long and place it near the center of the paper. 2. Student will draw 15 points above the horizontal line, scattering them about at random and covering the entire top of the paper. 3. Student will draw 15 points below the horizontal line, scattering them about at random and covering the entire bottom of the paper. 4. Student will select one point and will connect that point with a straight line to the left end of the horizontal line. 5. Student will then connect the same point with a straight line to the right end of the horizontal line. 6. Student will continue to select one point at a time and connect it with straight lines to both ends of the horizontal line. 7. Student will select a color palette consisting of four colors. 8. Student will color in the shapes that were created by the intersecting lines, using at least two values of each color.
   E. Practice and Review: As other projects are undertaken throughout the year, review the correct way to hold a ruler and observe students as they are working.
   F. Learning Environment: Student should be able to clearly see the examples. Each student needs a clean, flat surface to work on.
   G. Closure
      - Clean up: Gather the rulers, pencils, and colored pencils for storage.
      - Ending Comments:
H. Alternative Activities
   - Special Needs Considerations: Teacher may need to help a child several times if the student is struggling with the proper technique.
   - Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, answer these questions: Did the student draw a horizontal line in the center of the page? Did the student draw 15 pints above and 15 points below the horizontal line? Did the student draw straight lines connecting the points to the end points of the horizontal line? Did the student use a palette consisting of no more than 4 colors? Did the students color in all the shapes created by the intersecting lines?
      Questions from this lesson that could be included on a subsequent unit test are:
      What is the proper technique for using a ruler? What does horizontal mean? What is a line? What is a point? What does intersect mean?
   B. Informal: As you observe students working, look for proper technique when using the ruler.

7. Re-teaching: In later classes, use the ruler to draw straight lines. Review, demonstrate, and then observe techniques used by the students.
Lesson Plan: Seed Mosaic

1. Lesson Title: Seed Mosaic (Grade 2)
2. Unit Title: Seeds
3. Instructional Objectives: 2nd grade students will create a picture by gluing various seeds, rice, and pasta. (Art Standards: 2.1.1, 2.1.2, 2.1.3, 2.2.1; Math Standards 2.2.2.b, 2.2.2.c, 2.4.1.b)
4. Materials/Media: Per student: one 9” x 12” rectangle of cardboard or mat board; permanent marker; pencil; glue; a wide variety of beans, seeds, rice, and pasta.

Instructional Procedures and Design:
A. Set
- Motivation Strategies: View examples of ancient and contemporary mosaics. Explain how each big picture is made of many, many small pieces. Explain that the word for the small pieces is tessara.
- Vocabulary: mosaic, tessara
B. Key Questions: What is a mosaic? What is tessara? What is the perimeter? What is a pattern?
C. Classroom Strategies
- Instructional Preparations: Teacher will cut the cardboard. Teacher will gather 2 pounds each of several choices of tessara such as dried red beans, pinto beans, black beans, split green peas, and butter beans; elbow macaroni; rigatoni; ditalini; pasta shells; white rice; and rice that has been dyed with food color. Teacher will complete examples of the project in progress and a finished example.
- Suggestion: Display reproductions of mosaics and/or actual examples of mosaic top tables, tiles, or wall art.
- Safety: Advise children that even though their tessara is edible, it is uncooked and not clean; it is not to be eaten.
D. Learner Involvement: 1. Student will write their name on the back of their board with a permanent marker. 2. Student will draw a large and simple outline of the object they want to create with the seeds and rice. 3. Student will glue a pattern of seeds and rice around the perimeter of the cardboard placing it very close to the edge of the board. 4. Student will glue his choice of seeds and rice onto the drawn areas. 5. Student will glue his choice of seeds and rice onto the background areas of the picture until all the cardboard is covered. 6. When all the glue is dry, student will paint a coat of clear acrylic medium over the entire picture so as to seal it and secure the small pieces.
E. Practice and Review: A quick way to review the mosaic process is to do a small torn paper mosaic.
F. Learning Environment: Each student needs a clean, flat surface to work on. The tessara should be distributed by the teacher only and should be done in an orderly manner. Small paper or plastic cups in the 3 oz. size commonly called “bathroom
“cups” are handy to scoop the tessara as well as distribute it students.

G. Closure
- Clean up: Make sure that all the extra bits of tessara are carefully poured back into the large supply containers. The floor will need to be swept. Table tops will need to be cleared of debris.
- Ending Comment/s

H. Alternative Activities
- Special Needs Considerations: Some children may need help getting started on the drawing. Teacher may draw some light sketch lines to help.
- Addressing of Diversity

6. Evaluation Strategies
A. Formal: To grade this project, ask these questions: Did student draw a large object on the cardboard? Did student create a pattern around the perimeter of the board? Did student apply tessara to the drawing so as to complete it? Did student completely cover the area of the background? Is the cardboard covered adequately with the tessara? Is the finished mosaic sealed and secured with acrylic medium? Questions from this lesson that could be included on a subsequent unit test are: What is a mosaic? What is tessara? What is the size of a mosaic in relation to the size of the tessara? What is a perimeter? What is area?
B. Informal: As you observe students working, look for drawings that are large and simple enough to complete with tessara. Look also for patterns on the perimeter and adequate coverage of the board.

7. Re-teaching: Look at examples of mosaics in subsequent classes.
Lesson Plan: Native American Headbands

1. Lesson Title: Native American headbands (Grade 1)
2. Unit Title: American History in Art
3. Instructional Objectives: Student will stamp print a pattern on paper to create a Native-American headband. (Art Standards: 1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.2.2, 1.4.1, 1.4.2; Math Standards: 1.2.2.b, 1.3.1.a)

Other Resources:
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Display photos and art of Native-American dress. Point out the beautiful patterns that are created by the beadwork and weaving. Put on a finished headband and wear it as you are teaching. Demonstrate how to stamp print.
      • Vocabulary: pattern, Native-American
   B. Key Questions: What is a pattern? Who is a Native-American?
   C. Classroom Strategies
      • Instructional Preparations: Teacher will prepare the paper for the headbands by cutting 24” lengths of paper. If need be, the paper will be folded and taped on the inside to increase the weight and strength of the paper. Two slots for the feathers will be cut with a craft knife. Teacher will prepare the palettes by covering them with 4-5 thicknesses of damp paper towels. Teacher will fill them with a variety of colors of tempera paint
         • Suggestion: Safety: no special concerns
   D. Learner Involvement: 1. Student will select three items from a variety of stamping materials. 2. Student will stamp print a three-element pattern along the 24” length of the paper. 3. Student will allow teacher to measure her head and staple the two ends of the paper together to form a circle of the appropriate diameter. 4. Student will insert a feather of her choice into the pre-cut slots.
   E. Practice and Review: Students may create three- and four-element patterns with sounds and motions.
   F. Learning Environment: Each student needs a clean, flat surface to work on.
   G. Closure
      • Clean up: Wash stamps. Discard used paper palettes. Place wet paper on the drying rack. Clean students’ hands.
      • Ending Comment/s
   H. Alternative Activities
      • Special Needs Considerations: Teacher may need to further stamping technique to a student if she is struggling.
      • Addressing of Diversity
6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did student produce a three
element pattern? Did student neatly apply the printed image to the paper? Did student fill the entire length of the paper with stamped images?

Questions from this lesson that could be included on a subsequent unit test are:
What is a pattern? Who is a Native-American?

B. Informal: As you observe students working, look for correct patterns and correct stamping techniques.

7. Re-teaching: Use stamp printing again in later projects. Discuss Native-American culture again as they construct a large tipi for the class to use.
APPENDIX 23

Lesson Plan: Large Tipi

1. Lesson Title: Large Tipi (Grade 1)
2. Unit Title: Native American Art
3. Instructional Objectives: Student will decorate a large torn piece of paper with Native American symbols so the paper can be used for a class wide project of constructing a large tipi. (Art Standards: 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.5, 1.4.1, 1.4.2, 1.5.1; Math Standards: 1.3.1.a, 1.3.1.b)
4. Materials/Media: Per student: one large piece of brown craft paper, about 16” x 20”, with irregular torn edges; pencil with eraser; oil pastels.
Other Resources: chart of Native-American symbols
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Use photographs to show an example of a tipi. Compare the geometric form of a tipi to that of an ice cream cone, a traffic cone, and the point of a pencil. Explain what an animal hide is. Show examples of leather, suede, and fur, in both finished products such as belts and in unfinished form. Display a chart that shows several examples of Native-American symbols.
      • Vocabulary: tipi, animal hide, symbol
   B. Key Questions: What is a tipi? What is a cone? What is an animal hide?
   C. Classroom Strategies
      • Instructional Preparations: Teacher will first cut pieces of brown craft paper into pieces that are no smaller than 18” x 22”; then she will tear the edges into irregular formations, making sure that the rectangular piece of paper loses its rectangular shape. Teacher will construct a tipi frame out of small tree branches or dowels. Teacher will cover the tipi frame with a paper backing made from several strips of brown craft paper taped together and cut into a semi-circle. After the students’ animal hides are complete, teacher will attach them with glue to the tipi frame, fitting them together like a puzzle, and completely covering the paper backing.
      • Suggestion: Caution students against using any letters or words from the English language on this project. Only symbols can be used. Students can “sign” their work by tracing their hand and coloring it in. At the end of class, write their name by their handprint in very small, unobtrusive letters.
      • Safety: no special concern
   D. Learner Involvement: 1. Student will select several Native American symbols to use by looking at a chart of commonly used symbols. 2. Student will carefully draw the symbols (perhaps telling a story with the symbols). 3. Student will also draw the outline of their hand. 4. Student will color the symbols and handprint with oil pastels.
E. Practice and Review: Students can practice making a cone tipi by making a small table top tipi for their own use.

F. Learning Environment: Students need a clean, flat surface to work on. Some space will be needed to erect the tipi, about five square feet.

G. Closure
- Clean up: Store the pencils and oil pastels. Students may need to clean their hands.
- Ending Comment/s

H. Alternative Activities
- Special Needs Considerations: Students may need help with the drawing of the symbols.
- Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did student draw Native American symbols? Did student draw a handprint? Did student color the symbols and the handprint?
      Questions from this lesson that could be included on a subsequent lesson are: What is a tipi? What is the geometric form of a tipi? What is a symbol? Can you name one symbol used by Native Americans?
   B. Informal: As you observe students working, look for careful drawing and heavy coloring that produces brilliant colors.

7. Re-teaching: Making a small tipi is a great way to review how to make a cone. Also, students could make other cones such as hats and ice cream cones in subsequent classes.
Lesson Plan: Small Tipi

1. Lesson Title: Small Tipi (Grade 1)
2. Unit Title: Native American Art
3. Instructional Objectives: Student will decorate and construct a small table top tipi. (Art Standards: 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.3, 1.4.1, 1.4.2, 1.5.1; Math Standards: 1.3.1.a, 1.3.1.b)
4. Materials/Media: Per student: one pattern for tipi copied on white construction paper or card stock, 4 bamboo skewers, oil pastels, scissors
Other Resources: A finished example and examples of the project in progress
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Show the students the finished tipi. Review the definition of a cone. Show the finished example of a small tipi. Demonstrate how to insert the bamboo skewers.
      ● Vocabulary: tipi, cone
   B. Key Questions: What is a tipi? What is a cone?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will copy the tipi pattern. Teacher will use a craft knife to cut the small slits for the bamboo skewers. Teacher will complete one tipi and examples of the project in various stages of completion.
      ● Suggestion: Students may take turns going into the large tipi to read with a friend while the class is making the small tipi.
      ● Safety: no special concern
   D. Learner Involvement: 1. Student will decorate and color the small tipi. 2. Student will cut out the tipi. 3. Student will ask teacher to staple the tipi together. 4. Student will insert the bamboo skewers into the pre-cut slits. 5. Student will color and cut out the figure of the Native American.
   E. Practice and Review
   F. Learning Environment: Students need a clean, flat surface to work on.
   G. Closure
      ● Clean up: Paper scraps should be put in the trash. Scissors and oil pastels should be collected for storage.
      ● Ending Comment/s
   H. Alternative Activities
      ● Special Needs Considerations: Some students may need an additional demonstration of how to insert the bamboo skewers.
      ● Addressing of Diversity
6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did the student decorate and color the tipi? Did the student correctly insert the bamboo skewers? Questions from this lesson that could be included on a subsequent unit test are: What is a tipi? What is a cone? How can a cone be made from a flat piece of
B. Informal: As you observe students working, look for careful drawing, coloring, and cutting.

7. Re-teaching: To re-teach this lesson, more items that are cone shaped could be constructed.
Lesson Plan: Ice Cream Cone

1. Lesson Title: Ice Cream Cone (Kindergarten)
2. Unit Title: Geometry Shapes and Forms
3. Instructional Objectives: Kindergarten students will recognize, name, and build an ice cream cone from paper and cotton balls. (Art Standards: K.1.1, K.2.1; Math standards: K.1.1.a, K.3.1.e, K.4.2.b)
4. Materials/Media: Per student: one piece of manila paper on which has been drawn a semi-circle with a 10” diameter; a piece of plastic canvas typically used for needlepoint; brown crayon; scissors; glue; ten cotton balls (either white or a pastel color) one red pom that is ½” in diameter
Other Resources: A finished example and examples of the project in various stages of completion.
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Explain what a cone looks like. Show two or three examples of cone shaped objects. Say that your favorite cone is an ice cream cone and show them an actual waffle cone. Demonstrate doing the texture rubbing to create the waffle texture on the manila paper. Show the students how to cut out the semi-circle, to roll it up, and how you will staple it together to make a pretend ice cream. Demonstrate counting the cotton balls as they are glued into the cone one by one with a dot of glue on the bottom of each. Finish with the “cherry” on top.
      • Vocabulary: square, feelings, pattern
   B. Key Questions
   C. Classroom Strategies
      Instructional Preparations/Suggestion/Safety
   D. Learner Involvement: 1. Student will do a texture rubbing on the manila paper using the plastic canvas underneath the paper. 2. Student will cut out the semi-circle. 3. Student will roll the semi-circle into a cone. 4. Student will ask teacher to staple the cone together. 5. Student will count the cotton balls as they glue them in the cone. 6. Student will glue the red pom on top. 7. As students show their finished work to the teacher, they will compare the weight of a cotton ball to that of a golf ball and a ping pong ball.
   E. Practice and Review: More projects could be done to use constructed cones to make things such as hats.
   F. Learning Environment: Students need a clean, flat surface to work on.
   G. Closure
      • Clean up: Paper scraps should be put in the trash. Crayons, scissors and glue should be collected for storage
      • Ending Comment/s
   H. Alternative Activities
      • Special Needs Considerations: Help students roll their semi-circle into a
cone as needed.

- Addressing of Diversity

6. Evaluation Strategies

A. Formal: To grade this project, ask these questions: Did student create a waffle texture on the manila paper? Did student carefully cut out the semi-circle? Did student carefully glue the cotton balls and red pom into the cone?

Questions from this lesson that could be included on a subsequent unit test are:
What is a cone? Name 2 real objects that are shaped like a cone.

B. Informal: As you observe students working, look for careful coloring, cutting, and cutting.

7. Re-teaching: Other objects could be made from a constructed cone.
Lesson Plan: Symmetrical Paper Dolls

1. Lesson Title: (Kindergarten)
2. Unit Title: All About Me
3. Instructional Objectives: Kindergarten students will create a large, symmetrical paper doll that replicates their own appearance. (Art Standards: K.1.1; Math Standards K.1.1.h)

Other Resources:
4. Materials/Media: Per student: one pattern for half of a paper doll drawn on a folded 18” x 24” piece of white drawing paper; scissors; pencil with eraser; crayons

5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Talk about left and right sides of the body. Point out that we have an eye on the right and an eye on the left, an ear on the right and an ear on the left. Point out that we have a leg on the right and ask, “Do we have a leg on the left?” Continue in this vein with arms, thumbs, etc. Explain that our bodies are the same on both sides, and that the fancy word for that is symmetrical. Say it slowly, pausing between each syllable. Have the children say it back to you. Tell them they are going to make a symmetrical “little person” and show them the example.
      ● Vocabulary: symmetrical, left, right
   B. Key Questions: Is the human body the same on both sides? What is the definition of symmetrical? What is an easy way to cut a symmetrical shape from paper?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will fold 18” x 24” white drawing paper in half vertically. Teacher will trace the outline of half a paper doll next to the fold of the paper. Teacher will prepare a finished example and examples of the project in progress.
      ● Suggestions: Make sure the silhouette of the paper doll(s) fits the actual appearance of the students in the class. For example, if there are both boys and girls in the class, have one paper doll that looks masculine and one that looks feminine. Remember that the edge of the silhouette is the cutting line for the kindergarteners; keep it simple!
      ● Safety: no special concerns
   D. Learner Involvement: 1. Student will cut on the pencil line. 2. Student will unfold the paper doll. 3. Student will color the face, arms, and legs of the paper doll so that it becomes a self-portrait. 4. Student will color the clothing, shoes, and jewelry of the paper doll so it reflects their actual appearance or so it reflects an imaginary outfit.
   E. Practice and Review: Use the word symmetrical in subsequent classes. Fold and cut paper in later classes.
   F. Learning Environment: Each student needs a clean, flat surface to work on.
   G. Closure
      ● Clean up: Gather paper scraps and place in the trash. Collect scissors and crayons
for storage.

- Ending Comment/s: Show photos of other animals in which the view of the animal clearly shows the animal’s symmetry. For example, a front view of a dog shows its symmetry from the left side to the right side whereas a side view of a dog does not show symmetry from front to back. As you show each individual photo, ask the students if the animals is symmetrical. After a few examples, they will begin to see that all the animals they are shown are symmetrical, just like them.

H. Alternative Activities

- Special Needs Considerations: Teacher may need to help with cutting if a student is struggling.
- Addressing of Diversity: If you teach students of various ethnicities, draw the silhouette of the heads so they reflect the children’s hairstyles.

6. Evaluation Strategies

A. Formal: To grade this project, ask these questions: Did the student cut on the line? Did the student draw symmetrical facial features? Did the student adequately present a self-portrait with the skin color, eye color, and hair color? Did student complete the project?

Questions from this lesson that cold be included on a subsequent unit test are: Is the human body the same on both sides? What is the definition of symmetrical? What is an easy way to cut a symmetrical shape from paper?

B. Informal: As you observe students working, look for careful cutting, attention to detail, and slow, careful coloring.

7. Re-teaching: Students could make a whole family of symmetrical people by cutting and coloring several smaller paper dolls. Also, students could make some symmetrical animals; the fold of the paper would be the backbone of the animal, and if unfolded partway, the animal can be made to stand on the table. (This is fun to do with a school mascot.)
**Lesson Plan: Papier Mâché Snowmen**

1. **Lesson Title:** Geometric Solids: Papier Mâché Snowmen (Kindergarten through 5th grade)
2. **Unit Title:** Geometric Solids
3. **Instructional Objectives:** Students will create a life size papier mâché sculpture of a snowman. (Art Standards: K.1.1, K.2.1, K.5.1, 1.1.1, 1.2.1, 1.5.1, 2.1.1, 2.2.1, 2.5.1, 3.1.1, 3.2.1, 3.5.1, 4.1.1, 4.2.1, 4.5.1, 5.1.1, 5.2.1, 5.5.1; Math Standards: K.3.1.e, 1.3.1.a, 1.3.2.b, 2.3.1.a, 2.3.1.b, 2.3.1.d, 3.3.1.a, 4.3.1.a, 5.3.1.a)
4. **Materials/Media:** Per snowperson: one sturdy wooden support covered in chicken wire; one large spherical base for the snowperson’s head; several newspapers; 4-5 gallons of papier mâché paste; several large flat paintbrushes; 1 gallon white latex paint; small amount of orange acrylic paint; selected garments for the snowman.
   Other Resources: Photographs of snowmen.
5. **Instructional Procedures and Design:**
   A. **Set**
      - Motivation Strategies: Discuss the upcoming season or an upcoming event during which the snowmen will be used or displayed. Talk about the geometric form called a sphere. Describe its characteristics. Describe the papier mâché process. Explain that in the French language papier mâché literally means mashed paper. (Special note: There are many ways to apply papier mâché. The method used here is: tear the newspaper into strips that are about 2” wide and 12” long; liberally paint the paste on an area of the project with a 1½” flat brush; touch a strip of newspaper with the wet brush so it will stick on; lay the newspaper on the wet part of the project; paint paste over the top of the newspaper; repeat. The brush is “magic” because it lets the students pick up the newspaper without even touching it. This will keep the children a bit cleaner.)
      - Vocabulary: sphere, papier mâché.
   B. **Key Questions:** What is a sphere? What does papier mâché mean? From what language does the term papier mâché come? What is the process for doing papier mâché?
   C. **Classroom Strategies**
      - Instructional Preparations: Teacher will build the wooden frames and cover them with chicken wire, shaping the wire to form spheres. Teacher will inflate punching balls to the correct diameter and attach them to a support, such as a large can, so they will not move around while being worked on. Teacher will prepare several gallons of papier mâché paste and gather a stack of used newspaper at least 24” high.
      - Suggestions: Make sure each child gets equal opportunity to work on the papier mâché; if you build more than one snowman, there should be ample room around the projects for all students to participate all the time. As you assign work areas to the students, divide your students into cooperative groups. A good way to store...
and distribute papier mâché paste is to use foam cups used for hot beverage takeout. The lids protect the paste when not in use and the size of the cup is handy for the children.

- **Safety:** Chicken wire can scratch; children should be warned that until the first layer of paper is applied to the wire, there is a danger of getting cut.

D. **Learner Involvement:** 1. Student will work with a group of classmates to cover the snowman with newspaper and paste.

E. **Practice and Review:** Numerous other objects could be made with papier mâché such as masks or figures in motion.

F. **Learning Environment:** There must ample space for the snowmen be placed in the art room. While working on the head and mid-section of the larger snowmen, the snowmen should be placed on the floor. While working on the lower sphere of the snowmen, they should be placed on a table. Students must have adequate room for motion while they are working.

G. **Closure**

- **Clean up:** Nearly everything in the room will have to be wiped down or washed: the children, the tables, the brushes, and quite possibly the floor. Allow enough time to accomplish this.
- **Ending Comment:** Talk about the many purposes of art. Discuss how art is sometimes made to support a performance, such as a play or a concert.

H. **Alternative Activities**

- Special Needs Considerations
- Addressing of Diversity

6. **Evaluation Strategies**

A. **Formal:** Since this is a group project worked on during several days of class, it is impossible to grade an individual child on the outcome of the project. Questions from this lesson that could be included on a subsequent unit test are: What is a sphere? What does *papier mâché* mean? From what language does the term *papier mâché* come? What is the process for doing papier mâché?

B. **Informal:** As you observe students working, look for earnest participation and correct handling of the paste.

7. **Re-teaching:** As the snowmen are being completed over the span of several days, review the definitions and processes associated with the project.
Lesson Plan: Cutting Paper Snowflakes

1. Lesson Title: Cutting Paper Snowflakes
2. Unit Title: Symmetry
3. Instructional Objectives: Student will fold and cut paper to produce a six pointed snowflake that has radial symmetry. (Art Standards: 4.1.1, 4.2.1, 4.5.1; Math Standards: 4.3.1.h, 4.3.4.a)
4. Materials/Media: Per student: 3 pieces of lightweight paper cut into squares (ranging from 6” x 6” to 12” x 12”).
Other Resources: Finished examples and examples of the each step of the folding process.
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Show close-up photos of actual snowflakes. Explain that snowflakes are made of water that is frozen. Point out that each one is different and that each one has six points. Discuss radial symmetry. Demonstrate the folding and cutting. Show examples.
      ● Vocabulary: symmetry, linear symmetry, radial symmetry
   B. Key Questions: What is symmetry? What does linear mean? What is linear symmetry? What does radial mean? What is radial symmetry? How many points does a real snowflake have?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will cut squares of paper. Teacher will prepare examples of the project in progress. Teacher will complete several examples of cut snowflakes.
      ● Suggestion: While folding and cutting the first snowflake, do it with the whole class, demonstrating step by step and quickly doing a visual check of each student’s progress. On the second snowflake, give students the options of working on their own or again doing the folding and cutting with you. By the third snowflake, most students will not need assistance.
      ● Safety: no special concerns
   D. Learner Involvement: 1. Student will fold a square piece of lightweight paper. 2. Student will cut small shapes from the folded paper. 3. Student will carefully unfold the cut paper.
   E. Practice and Review
   F. Learning Environment: Each student need a clean, flat surface to work on.
   G. Closure
      ● Clean up: There will be approximately one million tiny paper scraps to collect for the trash. Most likely, the floor will need to be swept. Scissors should be collected for storage.
      ● Ending Comment: Students could look through kaleidoscopes to see another example of radial symmetry.
   H. Alternative Activities
• Special Needs Considerations: Some students may need help with the folding process; it is prudent to have a supply of pre-folded papers for those who are struggling badly. Sometimes a student will need some help with cutting the shapes; teacher may draw some light sketch lines to indicate where the first few shapes could be cut out of the folded paper.
• Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did student correctly fold the paper? Did student correctly cut the paper? Did student cut enough shapes from the paper to produce a beautiful and intricate design?
      Questions from this lesson that could be included on a subsequent unit test are: What is symmetry? What does linear mean? What is linear symmetry? What does radial mean? What is radial symmetry? How many points does a real snowflake have?
      B. Informal: As you observe students working, look for correct folding and cutting.

7. Re-teaching
Lesson Plan: Color by Choice or Color by Chance?

1. Lesson Title: Color by Choice or Color by Chance?
2. Unit Title: Color
3. Instructional Objectives: Student will create an abstract design of lines and shapes and color it using the colors rolled by a dice. (Art Standards: 3.1.1, 3.1.3, 3.2.1; Math Standards: 3.5.1.b, 3.5.1.c, 3.5.1.d, 3.5.2.b, 3.5.2.c, 3.5.2.d)
4. Materials/Media: Per student: one piece of 12” x 18” white drawing paper; pencil with eraser; coloring tools such as colored pencils, crayons, or markers; a color die.
   Other Resources: A finished example.
5. Instructional Procedures and Design:
   A. Set
   - Motivation Strategies: Select a student at random and ask him which of these colors on the spectrum he likes the best: red, orange, yellow, green, blue, or violet? Show the students a bowl of treats, such as cap erasers, nickels, stickers, sugar free gum, etc. Show them a color die; explain that each of the six faces of the color die have one of the rainbow colors on it. Tell them that they can all have a treat, but only if _______’s favorite color comes up on top when the color die is rolled. Select a second student at random to roll the die. (This will absolve the first student from the responsibility of selecting the “right” color.) Discuss the chances for rolling the favorite color. Explain that since there are six possible outcomes, the chances of rolling one of those colors is 1 in 6. Say things like “Is it possible that we will roll the favorite color?,” “Is it likely?”, and “Is it possible that we will roll the color black?” Roll the die. If the favorite color comes up on top, give everyone their treat. If not, try a second experiment. Say that of the six colors on the die, three are hot colors. Discuss that the chances of rolling red or orange or yellow are three times better than rolling the favorite color. Tell them that this time, when the die is rolled, if a hot color comes up on top, everyone gets a treat. Select a third random student to roll the die. Roll the die. If a hot color is not rolled, do it again until it is. Give everyone a treat. Tell them they are going to use the color die to help them pick the colors for their next project. Stress that no matter if the color rolled is their least favorite color or if they have rolled the same color several times before, they have to use the color on top of the die. Discuss how this is very different from the way artists usually work.
   - Vocabulary: spectrum, choice, chance
   B. Key Questions: What is choice? What is chance? What are the six colors of the spectrum?
   C. Classroom Strategies
   - Instructional Preparations: Teacher will cut the paper. Teacher will gather a bowl of appropriate treats.
   - Suggestion
   - Safety: no special concerns
D. Learner Involvement: 1. Student will draw a design consisting of intersecting lines, making sure that each line extends to the edges of the paper. (This will create at least 20 but no more than 50 shapes.) 2. Student will roll the die. 3. Student will select one shape and color that shape the color that came up on the die. 4. Student will roll the die again. 5. Student will color a second shape the color that came up on the die. 6. Student will repeat this process until all the shapes are colored in.

E. Practice and Review

F. Learning Environment: Each student will need a clean, flat surface to work on.

G. Closure

- Clean up: Collect and count the dice. (They are easily lost.) Collect the pencils and coloring tools. If projects are not complete, or if they will be used in a later lesson, collect and store them.
- Ending Comment: Ask the students: “Which process is the best: choosing your own colors or having your colors chosen for you by chance?” and “Is determining colors by chance a true artistic process?”

H. Alternative Activities

- Special Needs Considerations
- Addressing of Diversity

6. Evaluation Strategies

A. Formal: To grade this project, ask these questions: did the student draw a design consisting of 12 lines? Did the student use the die to indicate the colors used? Did the student completely color in the design?

Questions from this lesson that could be included on a subsequent unit test are:
What is choice? What is chance? What are the six colors of the spectrum?

B. Informal: As you observe students working, look for strict adherence to the colors rolled by the die. Look for careful coloring.

7. Re-teaching: In another lesson, have the students each count the number of red shapes on their paper and record that number on the back of their project. Now have them count and record the orange shapes, the yellow, the green, the blue, and the violet. Place a large tally sheet on the board and designate one student as the recorder. Do a roll call and have the children say aloud their own personal tallies for each color. Ask the recorder to write all the numbers on the tally sheet. Have the children which color was rolled the most times. Discuss the totals for each color should compare to each other. Use a calculator to add all the numbers. Discuss why, or why not, the numbers are close.
Lesson Plan: Cone Hats

1. Lesson Title: Cone Hats
2. Unit Title: Geometric Forms
3. Instructional Objectives: Student will create and decorate a large hat shaped like an obtuse cone. (Art Standards: 3.1.1, 3.1.3, 3.2.4, 3.5.1; Math Standards: 3.3.1.a)
4. Materials/Media: Per student: one large piece of heavyweight paper, about 30” x 30”; scissors; stapler; oil pastels.
   Other Resources: Examples of cones in various sizes, some with acute angles at the point, and others with obtuse angles at the point; an actual Asian hat woven from straw; a finished example of the project.
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Display photos of cones in our everyday world. Include such objects as birthday hats, traffic cones, and ice cream cones. Also include pictures of Asian workers wearing woven hats that are conical in shape. A map of the world will help the children understand that this style of hat is from a place far away. (Teacher should research the history before teaching this lesson. In years past, this style of hat was dubbed by Westerners the “coolie” hat; in more recent years, the term “coolie” has come to be considered a racial slur. Be careful of your language usage during this lesson.) Discuss the angle at the point of the hat. Ask how the obtuse angle makes the hat more functional.
      • Vocabulary: cone, acute, obtuse, function, perimeter, circumference
   B. Key Questions: What is a cone? How can a cone be constructed from a flat piece of paper? What does an acute angle look like? What does an obtuse angle look like? What is the circumference of a circle?
   C. Classroom Strategies
      • Instructional Preparations: Teacher will cut heavyweight paper so that it measures approximately 30” x 30.” Teacher will draw a large circle on the paper; circle should measure about 29” in diameter. Teacher will draw one radius on the circle (a straight that extends from the edge of the circle to the exact center point of the circle.
      • Suggestion: Wear your finished example of the project as you teach this lesson. If there is no ready supply of heavyweight paper that is 30” x 30”, a double thickness of colored butcher paper will work as well; lightly glue it together at a few spots to secure the two pieces together.)
      • Safety: no special concerns
   D. Learner Involvement: 1. Student will cut out the circle and will cut the radius. 2. Student will create a decoration around the perimeter, or circumference, of the circle, using patterns if desired. 3. When drawing is complete, student will ask teacher to slightly overlap the two cut edges of the radius and staple them together.
E. Practice and Review
F. Learning Environment: Each student needs a clean, flat surface to work on, preferably one that is at least 36” x 36”
G. Closure
   • Clean up: Gather paper scraps to put in the trash. Collect scissors and oil pastels for storage.
   • Ending Comment/s
H. Alternative Activities
   • Special Needs Considerations
   • Addressing of Diversity
6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did student carefully cut out the circle? Did student create an attractive design around the edge of the hat? Questions from this lesson that could be included on a subsequent unit test are: What is a cone? How can a cone be constructed from a flat piece of paper? What does an acute angle look like? What does an obtuse angle look like? What is the circumference of a circle?
   B. Informal: As you observe students working, look for careful cutting and thoughtful work on the design.
7. Re-teaching: Make more cones in future projects to create hats, baskets, etc. Combine cones and cylinders to create rockets, towers, or firecrackers. Use constructed cones to make noses on paper masks.
APPENDIX 31

Lesson Plan: Paper Basket Weaving

1. Lesson Title: Paper Basket Weaving
2. Unit Title: Weaving
3. Instructional Objectives: Student will weave strips of colored paper into a colored paper square and then secure the corners of the square to make a square basket. (Art Standards: 3.1.1, 3.1.3, 3.2.4, 3.5.1; Math Standards: 3.3.1.a, 3.2.2.a, 3.1.3.c)
4. Materials/Media: Per student: one large piece of colored construction paper that is 12” x 12” square; approximately 18 colored strips of paper that are ½” wide; clear tape; stapler.
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Show students some baskets woven from straw and some woven from paper. Explain how baskets are often made for a specific purpose; for example, some are woven to hold eggs and others to hold flowers. Point out how the weaving material makes a pattern. Explain how weavers push the material over and under, over and under, many times. Encourage the students to perceive that the pattern of the weaver’s motions creates a pattern with the weaver’s material.
      ● Vocabulary: weaving, pattern, function
   B. Key Questions: What is the main action that a weaver does? What is the most striking visual characteristic of a woven basket?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will cut strips of colored construction paper into pieces that measure 18” by ½”, 12” x ½”, and 6” x ½”. Teacher will also cut several pieces of construction paper into 12” x 12” squares.
      ● Suggestion: Use as many colors of construction as possible; this will vary the look of the final products.
      ● Safety: no special concerns
   D. Learner Involvement: 1. Student will select on large piece of construction paper. 2. Student will fold it in half from corner to corner so a triangle is formed. 3. Student will cut a straight slit that goes from the center of the base of the triangle (the folded edge) toward the top of the triangle Student will stop cutting about 1 ½” away from the top of the triangle. 4. Student will cut a second straight and even slit that is parallel to the first one and is no more than ½” to the right of the first one. Student will stop cutting about 1 ½” away from the edge of the paper. 5. Student will cut a third slit that is parallel to the first two and is no more that ½” to the left of the first slit. 6. Student will continue to cut parallel slits into the folded edge of the paper, spacing the slits about ½” apart and extending to within 1 ½” of the edge of the paper. 7. Student will carefully unfold the large square, lay it on the work surface, and turn it 45° so it looks like a diamond shape. 8. Student will select two colors of construction
paper strips. (They will need a total of about 6 of the shorter strips that are 6” long, 6 of the medium strips that are 12” long, and 6 of the longer strips that are 18” long.) 9. Student will start at the right side of the diamond and weave a short strip of one color into the slits of the diamond. 10. Student will weave another short strip, this time of the contrasting color, into the slits of the diamond. 11. Student will carefully scoot the strips over to the right as far as possible, nudging them in tightly against one another and checking them for a perfectly vertical position. 12. Student will continue to weave the strips of alternating colors into the slits of the diamond, being careful to choose strips of adequate length. 13. When weaving is complete, student will trim the end of the strips and secure them with clear tape. 14. Student will again lay the diamond on the work surface. 15. Student will pick up the corner of the diamond that is at the East or 3:00 position and lay in on the corner that is at the North or 12:00 position. 16. Student will (with teacher’s help) staple the weaving near the fold. 17. Student will pick up the corner that is at the South or 6:00 position and place it against the East corner. 18. Student will (with teacher’s help) staple near the fold. 19. Student will pick up the West or 9:00 corner and place it against the south corner, and staple near the fold. 20. Finally, student will place the North corner against the West corner and staple near the fold.

D. Practice and Review
E. Learning Environment: Each student needs a clean, flat surface to work on.
F. Closure
   • Clean up: Gather extra paper strips for use in other classes. Collect paper scraps for placement in the trash. Collect tape and staplers.
   • Ending Comment: Repeat that baskets are usually functional; ask the students what function their basket might serve.
G. Alternative Activities
   • Special Needs Considerations: Some students might need additional demonstration.
   • Addressing of Diversity

6. Evaluation Strategies
A. Formal: To grade this project, ask these questions: Did student correctly alternate an over-under motion with the weaving strips? Did student weave an adequate number of strips so that the diamond shape was filled to capacity and the final weaving was tightly done? Did the student alternate colors on the weaving strips? Questions from this lesson that could be included on a subsequent unit test are: What is the main action that a weaver does? What is the most striking visual characteristic of a woven basket? Name one possible of a basket.
B. Informal: As you observe students working, look for careful patterning and tight weaving.

7. Re-teaching: Students could make a basket of the same materials that had a different shape.
APPENDIX 32

Lesson Plan: Paper and Tongue Depressor Basket

1. Lesson Title: Paper and Tongue Depressor Basket
2. Unit Title: Patterns
3. Instructional Objectives: Student will weave wooden tongue depressors with cut paper to create a basket. (Art Standards: K.1.1, K.1.2, K.2.2; Math Standards: K.2.2.a, K.2.2.b, K.2.2.c)
4. Materials/Media: Per student: 6 wooden tongue depressors, one 9” x 12” piece of construction paper; stapler; markers.
Other Resources:
5. Instructional Procedures and Design:
   A. Set
      - Motivation Strategies: Show some woven baskets and a completed project to the students. Demonstrate weaving the tongue depressor into the slits of the paper. Demonstrate saying “under” as the tongue depressor goes under the paper, and model saying “over” as the tongue goes over it. Point out that the over and under motion makes a pattern, and that the resulting patterning is wood, paper, wood, paper.
      - Vocabulary: pattern, weave
   B. Key Questions: What is a pattern? How do we weave?
   C. Classroom Strategies
      - Instructional Preparations: Teacher will cut 9” x 12” construction paper in a variety of colors. Teacher will fold each piece vertically, accordion style, into fourths. Teacher will then cut ten, small, equally spaced slits into each peak of the accordion folds. Teacher will unfold and flatten the paper. Teacher will complete at least basket to use as an example.
      - Suggestion: Provide something for the students to put into their basket when they are finished weaving it.
      - Safety: no special concerns
   D. Learner Involvement: 1. Student will choose a piece of prepared paper. 2. Student will weave one tongue depressor in and out of one row of slits. 3. Student will say “over…under…over…under” as he works. 4. Student will weave the second tongue depressor in and out of the second row of slits. 5. Student will continue to weave the tongues in and out of the paper until all six are woven. 6. The student will ask teacher to stabilize the tongue depressors with a strip of masking tape and to fold and staple the basket together. 7. After stapling is complete, the student will use markers to decorate the wood and paper with a pattern.
   E. Practice and Review
   F. Learning Environment: Each child needs a clean, flat surface to work on.
   G. Closure
      - Clean up: Collect markers for storage.
      - Ending Comment. Ask students how they will use their basket when they go home.
H. Alternative Activities
   - Special Needs Considerations: Give extra help to students as needed.
   - Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, use these questions: Did the student weave all six tongue depressors into the cut paper? Did the student make an A-B pattern with the tongue depressor and the paper? Did the student decorate the basket with an A-B pattern?
      Questions from this lesson that could be included on a subsequent unit test are: What is a pattern? How do we weave?
   B. Informal: As you observed students working, look for careful patterning.

7. Re-teaching
Lesson Plan: Seed Mosaic Sketch Book

1. Lesson Title: Seed Mosaic (Grade 2)
2. Unit Title: Seeds
3. Instructional Objectives: 2nd grade students will create a sketch book by gluing various seeds, rice, and pasta to make a cover and by sewing the cover onto several blank pages. (Art Standards: 2.1.1, 2.1.2, 2.1.3, 2.2.1; Math Standards 2.2.2.b, 2.2.2.c, 2.4.1.b)
4. Materials/Media: Per student: two pieces of 4” x 6” rectangle of cardboard or mat board; permanent marker; pencil; glue; a wide variety of beans, seeds, rice, and pasta; several pieces of blank newsprint cut to 4” x 6”; tapestry needle; heavyweight cotton string.

Other Resources:
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Discuss how artists use sketch books to make smaller quick drawings, to explore ideas for larger works, and to make art outside of the studio. Show the students your own sketch book(s). Tell them they are going to make their own sketch book to use at home for art making. Show a finished example. View examples of ancient and contemporary mosaics. Explain how each big picture is made of many, many small pieces. Explain that the word for the small pieces is tessara.
      ● Vocabulary: sketchbook, mosaic, tessara
   B. Key Questions: What is a sketchbook? What is it used for? What is a mosaic? What is tessara? What is the perimeter? What is a pattern?
   C. Classroom Strategies
      a. Instructional Preparations: Teacher will cut the cardboard and paper. Teacher will sandwich several pieces of paper between two pieces of cardboard to create a book. Keeping the sandwiched book intact, teacher will use a drill press to drill small holes along the left hand edge of the book, placing the holes at ½” intervals and positioning them ½” from the edge of the book. Teacher will lightly score the inside of the front cover of the books, placing the scored line 1” from the edge of the front cover. (the score line will allow the book to open freely.) Teacher will gather 2 pounds each of several choices of tessara such as dried red beans, pinto beans, black beans, split green peas, and butter beans; elbow macaroni; rigatoni; ditalini; pasta shells; white rice; and rice that has been dyed with food color. Teacher will complete examples of the project in progress and a finished example.
      b. Suggestion: Display reproductions of mosaics and/or actual examples of mosaic top tables, tiles, or wall art.
      c. Safety: Advise children that even though their tessara is edible, it is uncooked and not clean; it is not to be eaten.
   D. Learner Involvement: 1. Student will write their initial on the front cover of their...
book with a pencil, making it large and simple. 2. Student will write their name on the inside front cover with a permanent marker. 3. Student will glue a pattern of seeds and rice around the perimeter of the front cover, placing it very close to the to, bottom, and right hand edges of the board and putting next to the score line on the left hand side. 4. Student will glue his choice of seeds and rice onto initial, going around the initial two or three times so as to make the letter wider. 5. Student will glue his choice of seeds and rice onto the background areas of the picture until all the cardboard is covered. 6. When all the glue is dry, student will paint a coat of clear acrylic medium over the entire seeded area so as to seal it and secure the small pieces. 7. Student will sew the sketchbook together.

E. Practice and Review: A quick way to review the mosaic process is to do a small torn paper mosaic.

F. Learning Environment: Each student needs a clean, flat surface to work on. The tessara should be distributed by the teacher only and should be done in an orderly manner. Small paper or plastic cups in the 3 oz. size commonly called “bathroom cups” are handy to scoop the tessara as well as distribute it students.

G. Closure
- Clean up: Make sure that all the extra bits of tessara are carefully poured back into the large supply containers. The floor will need to be swept. Table tops will need to be cleared of debris.
- Ending Comment/s

H. Alternative Activities
- Special Needs Considerations: Some children may need help getting started on the drawing their initial. Teacher may draw some light sketch lines to help.
- Addressing of Diversity

6. Evaluation Strategies
A. Formal: To grade this project, ask these questions: Did student draw a large initial on the cardboard? Did student create a pattern around the perimeter of the board? Did student apply tessara to the front cover so as to complete it? Did student completely cover the front cover? Is the cardboard covered adequately with the tessara? Is the finished mosaic sealed and secured with acrylic medium? Is the sketch book sewn together securely?
Questions from this lesson that could be included on a subsequent unit test are: What is a sketch book? What is a mosaic? What is tessara? What is the size of a mosaic in relation to the size of the tessara? What is a perimeter? What is area?

B. Informal: As you observe students working, look for drawings that are large and simple enough to complete with tessara. Look also for patterns on the perimeter and adequate coverage of the board. Watch for sewing that has even secure stitches.

7. Re-teaching: Look at examples of mosaics and the children’s sketch books in subsequent classes.
Lesson Plan: Sailboat Picture

1. Lesson Title: Sailboat Picture
2. Unit Title: Geometry
3. Instructional Objectives: Student will make a picture of a sailboat that a sail that flips, a sun that turns, and a boat that slides.
4. Materials/Media: Per student: one 9” x 12” piece of light blue construction paper; a boat with a mast; a sail; a sun; scissors; crayons.
   Other Resources: Photos of real sailboats with beautiful sails; examples of the project in progress; a finished example.
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Show the students photos of real sailboats. Point out the variety of colors and shapes found on sails. Tell them that they will make their own sailboat and show them an example of the finished project.
      ● Vocabulary: slide, flip, turn, sail, mast
   B. Key Questions: How do we slide a shape? How do we flip a shape? How do we turn a shape? What is a sail? What is a mast?
   C. Classroom Strategies
      Instructional Preparations/Suggestion/Safety
   D. Learner Involvement: 1. Student will cut out the sail for the boat. 2. Student will decorate both sides of the sail and fill it in with shapes and bright colors. 3. Student will color the sun yellow and cut it out. 4. Student will color the boat. 5. Student will insert the sail on the mast. 6. Student will color the water. 7. Student will insert the boat into the cut slit and make it slide through the water. 8. Student will flip the sail as desired. 9. Student will ask teacher to attach the sun to the paper with a brad so he/she can turn the sun.
   E. Practice and Review
   F. Learning Environment: Each student needs a clean, flat surface to work on.
   G. Closure
      ● Clean up: Collect all the paper scraps for the trash. Collect scissors and crayons for storage.
      ● Ending Comment: Ask students where they could go on a trip in their boats, what would their destination be?
   H. Alternative Activities
      ● Special Needs Considerations: Help with cutting as needed. Some students might need help inserting the sail on the mast.
      ● Addressing of Diversity
   6. Evaluation Strategies
      A. Formal: To grade this project, ask these questions? Did student color the sail? Did student color both sides of the sail? Did student color the sun? Did student color the water? Did student insert the sail on the mast?
      Questions from this lesson that could be included on a subsequent unit test are:
How do we slide a shape? How do we flip a shape? How do we turn a shape? What is a sail? What is a mast?

B. Informal: As you observe students working, look for careful cutting and handling of materials.

7. Re-teaching: Do a project in which the students trace a stencil of a boat. Instruct them to slide the boat across the paper to another position. Instruct them to flip it to another position. Ask them what happens if they turn the boat upside down.
Lesson Plan: Stencil Drawings

1. Lesson Title: Stencil Drawings (Grade 2)
2. Unit Title: Color
3. Instructional Objectives: 2nd grade students will create a design by tracing a handmade stencil that has been placed on the drawing paper in various positions and then coloring the drawing. (Art Standards 2.1.1, 2.1.2, 2.2.1, 2.3.1, 2.6.1; Math Standards 2.3.3.a)
4. Materials/Media: Per student: one 9” x 12” piece of white drawing paper; one 4” x 4” piece of card stock; pencil with eraser; scissors; coloring tools such as markers, colored pencils, oil pastels or crayons.
Other Resources: Flash cards that each show one common symbol; a chart of common symbols such as a heart, a cross, a star of David, a five-pointed star, a flower, and some well-known initials such as a power T; a finished example of the project; examples of the project in progress.
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Show a symbol to students and ask them to say what the meaning of the symbol is. Show them some more and let them take turns doing the same thing. Introduce the word “symbol.” Show them the chart of symbols. See if anyone can add a symbol to the samples already shown. Discuss how an object is flipped, slid, or turned. Demonstrate this with large objects that all children can see well. Have four cutouts of a symbol that have been cut out of paper that has a different color on the back side. As you show these, place them on the board. Write on the four different samples the words “symbol,” “flipped symbol,” “turned symbol,” and “slid symbol.”
      • Vocabulary: symbol, stencil, flips, slides, turns
   B. Key Questions: What is a symbol? How do we use symbols? What is a stencil? How do we flip an object? How do we turn an object? How do we slide an object? How can a stencil be useful to an artist?
   C. Classroom Strategies
      Instructional Preparations: Teacher will pre-cut the paper for the drawing the card stock for the stencil. Teacher will prepare or procure the symbol flash cards and chart. Teacher will complete the examples of the project.
      Suggestions: As students start to design their drawing, it may be helpful to liken their paper to the inside of a drawer; tell them to imagine that several of their stencils had been tossed into the drawer, and in the process, some flipped over, others slid around, and a few turned around. Teacher could even use an actual drawer filled with several identical objects or stencils to illustrate this. Teacher should emphasize that a successful project will show all four configurations of the symbol.
      Safety: If a student draws a symbol that requires the interior to be cut out, such as a peace symbol or a capital letter P, the teacher should assist with this.
   D. Learner Involvement: 1. Student will select a symbol to use in the drawing. 2.
Student will carefully draw this symbol with pencil on the card stock, making sure to draw lightly and to draw the symbol so large that it extends to the edge of the card stock. 3. When satisfied with the symbol, student will draw over the light pencil lines with a darker line. 4. Student will cut out the symbol in order to create a paper stencil. 5. Student will place the stencil on the drawing paper in a position of choice, and then trace it carefully. 6. Student will turn, slide, or flip the stencil into another position and trace it. 7. Student will continue the turning, sliding, or flipping of the stencil until the traced drawings have filled the page. 8. Student will select a color scheme. 9. Student will color the drawing.

E. Practice and Review: Fast workers can be given a 6” x 18” piece of drawing paper and can be asked to create an A-B pattern by tracing the symbol and its flipped image over and over again in a straight line.

F. Learning Environment: Each student needs a clean flat surface to work on.

G. Closure
   • Clean up: Scraps of paper should be collected for the trash. If projects are not completed in one class period, the student’s stencil should be carefully paper clipped to the student’s paper for use during the next class.
   • Ending Comment: Teacher could show some photos of more examples of symbols, especially some that are recognized internationally, such as the Red Cross or the white flag of surrender.

H. Alternative Activities
   • Special Needs Considerations: Some students will have trouble drawing the symbol; teacher can guide them by drawing a few light sketch lines for them. If a child is struggling with the scissors, teacher may aid them with the cutting.
   • Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did the student draw a large symbol? Do a good job cutting? Trace the symbols several times so as to fill the paper? Slide the stencil? Flip the stencil? Turn the stencil? Questions from this lesson that could be included on a subsequent unit test are: What is a symbol? What is a stencil? How is an object flipped? How is an object

B. Informal

7. Re-teaching
Lesson Plan: Still Life Drawing

1. Lesson Title: Still Life Drawing
2. Unit Title: “Real” Art
3. Instructional Objectives: Student will look at a still life arrangement and draw it realistically. (Art Standards: 4.1.1, 4.1.3, 4.1.4; Math Standards: 4.3.1.d, 4.4.1.a)
4. Materials/Media: Per student: one 9” x 12” piece of good quality white drawing paper; pencil with eraser; art gum eraser; colored pencils; watercolor paint, cup of water; large and small watercolor brushes
Other Resources: The still life arrangement, a finished example, examples of still life paintings done by famous or professional artists
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Show the examples of finished still life paintings to the students. Explain the term still life means a picture of things that are inanimate, or always still. Point out that objects that are behind another are overlapped by the more forward object. Point out that objects that are farther away are positioned higher on the paper.
      ● Vocabulary: still life, overlap
   B. Key Questions: What types of objects are in a still life picture? What is overlapping?
   C. Classroom Strategies
      ● Instructional Preparations: Teacher will cut paper. Teacher will select and arrange several items for use in drawing.
      ● Suggestion: Select items that the students are familiar with. Make different still life arrangements for each class. (Simplify the drawing of the environment so that the objects in the arrangement can remain the focus of the artwork.)
      ● Safety: no special concerns
   D. Learner Involvement: 1. Student will follow teacher’s guidance and draw the most forward object in the still life arrangement. 2. Student will add details to that object. 3. Student will draw the object that is next closest to her, adding details. 4. Student will continue to draw the objects, until everything in the arrangement is represented on the paper. 5. Student will add details from the environment, such as table edges, walls, and windows. 6. Students will use colored pencils to add color to the drawn objects, using value to create shadows on the objects and cast shadows. 7. Student will use a very light value of watercolor to add color to the environment (the surface the arrangement is setting on and the wall).
   E. Practice and Review
   F. Learning Environment: Each student needs a clean flat surface to work on. Each student needs a clear view of the still life arrangement.
   G. Closure
      ● Clean up: Collect papers, pencils, and erasers for storage. On painting days, discard the used water, wash brushes, and store the watercolor
boxes.

- Ending Comment/s

H. Alternative Activities

- Special Needs Considerations: If a child needs a sketch line, provide it.
- Addressing of Diversity

6. Evaluation Strategies

A. Formal: To grade this project, ask these questions: Did the student draw all the objects in the still life arrangement? Did the student add details to all the drawn objects? Are the objects drawn in correct proportion to one another? Did the student use overlapping and position on the page to indicate which objects were most forward in the still life arrangement? Did student add shadows to the picture? Did the student color the objects so as to enhance their realistic depiction?

Questions from this lesson that could be included on a subsequent unit test are: What types of objects are in a still life picture? What is overlapping?

B. Informal: As you observe students working, look for edges of objects that are truly verticals, horizontals, perpendicular, or parallel. Look for overlapping and correct positioning on the paper.

7. Re-teaching
Lesson Plan: Pasta Spiders

1. Lesson Title: Patternning: Pasta Spiders (Kindergarten)
2. Unit Title: Patternning
3. Instructional Objectives: Kindergarten students will recognize and create an A-A-B-B pattern. (Art Standards K.1.1, K.2.1, K.2.2; Math Standards K.1.1.a (counting to 12 by 1’s), K.2.1.a, K.2.2.b, K.2.2.c)
4. Materials/Media: Per student: one black wooden bead and one black pony bead threaded and attached with 4 black chenille stems and one black chenille stem that has been cut in half; bowls of ditalini that have been dyed purple, orange, and green with food color
   Other Resources: Pictures of a person with 2 legs, a dog with 4 legs, an insect with 6 legs, and spider with 8 legs; a finished example of a Pasta Spider.
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Teacher will discuss legs and instruct students to look at pictures of a person who has 2 legs, a dog who has 4 legs, an insect who has 6 legs, and a spider who has 8 legs. Help students practice counting by 2’s aloud together. Teacher will show the finished spider to the class and ask them to help her count the legs. Demonstrate how to make the spiders’ legs look prettier with patterns of pasta.
      ● Vocabulary: spider, pattern, pasta
   B. Key Questions: How many legs does a spider have? What is a pattern?
   C. Classroom Strategies
      Instructional Preparations: Teacher will dye the ditalini with food color at least 24 hours prior to class. (To dye, place a pound or two of the pasta in a deep mixing bowl. Add 1 teaspoon or so of Wilton gel food color. Add a teaspoon or two of water. Stir well, for several minutes, attempting to evenly distribute all the food color throughout the bowl of pasta. Ideally, all the pasta is dyed to the same color and there is no food coloring not stirred in. It may take an additional spoon of water, but take care not to get the pasta too wet. When the pasta is dyed, spread it evenly, one layer thick, in a large baking sheet. Let dry at least 24 hours before using. Sift through the pasta to check for tiny lumps of food color that did not get stirred in.) Teacher will also prepare the body and legs of the spider. Each spider requires 4 full length black chenille stems and one black chenille stem cut in half. Push all the chenille stems through the hole in a large wooden black bead or piece of black paper. Center all five of the stems. The ends of the half stem are brought together and twisted once. A black pony bead, or another smaller piece of paper, is placed over the short ends, and then the ends are twisted together again. The large bead (or paper) is the spider’s body and the small bead (or paper) is its head.
      Suggestion: To prevent the legs from sliding through the hole in the bead, one of the legs can be twisted once around the other three legs at a point very close to the body of the spider. Do this on both sides of the body. If time allows, a black string
can be looped around the spiders “neck” so the students can pull them on the floor or suspend them in the air.

Safety: Some students may want to eat the pasta; if you see or hear this about to happen, be sure to tell them not to eat it because it is uncooked and not very clean (since it is being used as an art material).

D. Learner Involvement: 1. Student will thread the small pieces of pasta onto the chenille stems, making an A-B pattern. 2. After threading twelve pieces of pasta on to the leg, student will curl the rest of the stem tightly in a spiral to create a foot for the spider and to ensure the pasta pieces do not fall off.

E. Practice and Review

F. Learning Environment Classroom set up: Each student will need a clean flat surface to work on.

G. Closure
   - Clean up: Collect the bowls of unused pasta.
   - Ending Comment/s

H. Alternative Activities
   - Special Needs Considerations: Teacher may layout pieces of ditalini in a line and in a pattern for students who are struggling with pattern making.
   - Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, ask these questions: Did the student make patterns with the ditalini? Did the student put pasta on all eight of the spider legs? Questions from this lesson that could be included on a subsequent unit test are: How many legs does a spider have? What is a pattern?
   B. Informal: As you observe students working, look for patterning, careful handling of the pasta, and spider legs that are completely filled with pieces of ditalini.

7. Re-teaching
Lesson Plan: Source of Color

1. Lesson Title: Color: Introduction to Color theory: Color Sources (Grade 4)
2. Unit Title: Color Theory
3. Instructional Objectives: 4th and 5th grade students will create a spectrum by refracting light through a rectangular prism. They will know that color comes from light, that light must refract to make color visible, and that a rectangular prism can make light refract. (Art Standards 4.2.1; Math Standards 4.3.1.a)
4. Materials/Media: Per student: a rectangular prism, a source of bright light such as an overhead projector, a carousel slide projector, or the sun
   Other Resources: Color wheel, scientific diagrams of light refraction, pictures of rainbows
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Discuss how color is made visible, using pictures, charts, or a PowerPoint to show rainbows in the sky and a scientific photographic of a spectrum.
      • Vocabulary: light, refract, spectrum, rectangular prism
   B. Key Questions: What is the source of color? What does refract mean? What is a rectangular prism?
   C. Classroom Strategies
      Instructional Preparations: Each student (or pair of students) will need a glass rectangular prism. A light source is needed. An overhead projector and a carousel slide projector will both produce an intense light that can be refracted. If the weather and time of day are right, sunlight may be used, either through a window or in the outdoors.
      Suggestions: Practice doing this a few days before the lesson is taught. Find the best surfaces on which to shine the rainbow. Have a Plan B in case the weather is cloudy.
      Safety: Glass prisms will break and shatter if they are dropped. Advise students to handle the prisms carefully.
   D. Learner Involvement: 1. Student will hold the rectangular prism so that the light beam passes through it. 2. Student will turn and manipulate the prism until the light refracts and creates a spectrum.
   E. Practice and Review:
   F. Learning Environment There should be adequate room in which students can move around and experiment with their prisms.
   G. Closure
      Clean up: Collect the prisms.
      Ending Comment
   H. Alternative Activities
      • Special Needs Considerations: Teacher may need to assist a student who is having trouble getting the light to refract.
6. Evaluation Strategies
   A. Formal: Questions from this lesson that could be included on a subsequent unity test are: What is a prism? What does refract mean? What is a spectrum?
   B. Informal: As you observe students working, look for each one to achieve refraction of light.
7. Re-teaching: It can be fun during a later class to set up several prisms in front of the light beam of a carousel slide projector and create several rainbows at once. As you do this, review the vocabulary.
Lesson Plan: Symmetrical Winter Trees and Snowmen

1. Lesson Title: Symmetry: Winter Trees and Snowmen (Kindergarten)
2. Unit Title: Symmetry
3. Instructional Objectives: Kindergarten students will sort white papers from green papers; they will recognize that objects have been folded in half; they will cut symmetrical figures and decorate them with oil pastels. (Art Standards K.1.1, K.1.2, K.2.2; Math Standards K.2.1.a, K.1.1.h)
4. Materials/Media: Per student: one 6” x 12” piece of construction paper (recommended colors are light blue, black, or blue), 2 or 3 pieces of 4” x 3” white construction paper folded in half with the outline of half of a snowman drawn by the fold, 2 or 3 pieces of 4” x 3” green construction paper folded in half with the outline of half of a pine tree drawn by the fold; scissors; glue; white oil pastel; if desired, oil pastels of other colors
Other Resources: Examples of folded paper; symmetrical objects and pictures; example of a finished picture.
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies: Discuss folding in half and dividing in half; introduce the word symmetry; play symmetry charades; demonstrate using oil pastels and show how they will draw bright colors even on top of colored paper
      • Vocabulary: symmetry, winter, oil pastel
   B. Key Questions
   C. Classroom Strategies
      Instructional Preparations/Suggestion/Safety
   D. Learner Involvement: 1. Student will sort the green papers from the white papers. 2. Student will cut the folded pieces of white and green construction paper; they will cut on the pencil lines that were pre-drawn by the teacher. 3. Student will glue the cut figures onto the large piece of construction paper, creating a composition of their choice. 4. Student will use oil pastels to add snow on the ground, snow in the air, and details on the trees and the snowmen.
   E. Practice and Review: If students work quickly, give them another green piece of folded paper that has no lines drawn on it. Let the student practice drawing a line and cutting out a tree shape. Some may be able to accomplish this while others can not. Avoid student frustration.
   F. Learning Environment Classroom set up: Each student needs a clean flat surface to work on.
   G. Closure
      Clean up: There will many paper scraps to clean up and sweep. Make sure the glue bottles have been properly closed before they are stored. Return all oil pastels to the boxes. Students will probably need to clean their hands after using the oil pastels.
      Ending Comments: Teacher could demonstrate cutting a large folded paper that has been prepared before class. Cutting out a complex and large shape, like a
detailed person or a large tree, can be a dramatic end to the project.

H. Alternative Activities

- Special Needs Considerations: Teacher may help students with poor cutting skills. Teacher may draw a few details on one snowman to jump start a student who is having difficulty.
- Addressing of Diversity

6. Evaluation Strategies

A. Formal: To grade this project, ask these questions: Were the figures properly cut out of the folded construction paper? Did the student adequately glue the cut figures to the blue construction paper? Did the student create a pleasing picture with the snowmen and the trees? Did the student add enough details to the picture with the oil pastels?

Questions from this lesson that could be included on a subsequent unit test are:
When paper is cut and folded, what does the resulting look like? How is an oil pastel different from a crayon?

B. Informal: as you observe students working look for careful cutting, creation of a scene as the figures are glued down, and the addition on lots of details with the oil pastels.

7. Re-teaching: Cutting hearts from folded paper around Valentine’s Day is a great way to review this concept. As they continue to do this activity, students will become more comfortable, eventually folding their own paper.
Lesson Plan: Rose Windows

1. Lesson Title: Symmetry: Rose Windows (Grade 4)
2. Unit Title: Symmetry
3. Instructional Objectives: 4th grade students will create a paper design that has radial symmetry and resembles a rose window found in a cathedral. (Art Standards 4.1.1, 4.1.4, 4.4.1, 4.6.2; Math Standards 4.3.1.h)
4. Materials/Media: Per student: one 8” x 8” piece of white drawing paper; one 7” x 7” piece of colored newsprint; one 7” x 7” piece of art tissue paper; one 9” x 9” piece of black construction paper for the frame; media mixer; white glue; scissors; pencil; flat paintbrush
Other Resources: Examples of the project in various stages of completion; a finished example of a rose window project; kaleidoscopes; PowerPoint showing examples of rose windows in cathedrals
5. Instructional Procedures and Design:
   A. Set
      ● Motivation Strategies: Review linear symmetry and then introduce radial symmetry; look at some drawings or have students look through a kaleidoscope to see examples of radial symmetry; look at pictures of rose windows (The Cherbourg Cathedral is one of many good examples; many images are available on the internet and can be shown through a PowerPoint presentation or through printed copies.)
      ● Vocabulary: symmetry, linear symmetry, radial symmetry, kaleidoscope, cathedral, rose window, stained glass
   B. Key Questions: What does linear mean? What does radial mean? Can you name one thing that radiates? What is a kaleidoscope? What is a cathedral? What is a rose window?
   C. Classroom Strategies
      Instructional Preparations: Teachers will precut the papers and prepare examples of the project in various stages of completion. Teachers will gather together scissors, media mixer, glue, and pencils.
      Suggestions: Teacher should provide a wide variety of colors of newsprint and art tissue paper. To help find the exact center of the white drawing paper, fold it in half horizontally and then in half vertically; make a crisp crease and then unfold. Mark the center with a small dot.
      Safety: no special concerns
   D. Learner Involvement: 1. Student will write his/her name on back of the white drawing paper. 2. Student will select a piece of colored newsprint, fold it in half horizontally, and fold it in half again vertically. 3. Student will cut a design in the folded newsprint. 4. Student will cover the front of the white drawing paper with media mixer. 5. Student will carefully unfold the cut newsprint design and lay it in the exact center of the white drawing paper, smoothing it out with media mixer and the flat paintbrush. (Steps 1 – 5 take one class period.) 6. Student will select a
piece of art tissue paper. 7. Student will fold it in half diagonally to create a triangle, and then will fold it in half again to create a smaller triangle. 8. Student will cut designs in the folded art tissue paper. 9. Student will carefully unfold the cut art tissue and lay it in the exact center of the white drawing paper, on top of the cut newsprint that has already been adhered with media mixer. 10. Student will carefully smooth out the art tissue with a flat brush and media mixer. (Steps 6 – 10 take one class period.) 11. Student will fold the black construction paper in half horizontally and then again in half vertically. 12. Student will carefully cut out a “frame,” looking at examples of finished frames. 13. Student will use white glue to adhere the black frame on top of the colored paper design, being careful to place it in the exact center. (Steps 11 – 13 take less than one class period.)

E. Practice and Review: Looking through kaleidoscopes is a good way to reinforce the concept of radial symmetry. When students have completed the project, they may want to color a rose window design that has been copied on white, letter size, 20 lb. paper.

F. Learning Environment Each student needs a clean flat surface to work on. To more easily hand out the newsprint and the art tissue, place the pre-cut squares on a large tray so many of the colors are visible.

G. Closure
Clean up: Brushes must be wiped and then washed with warm soapy water. There will be many small paper scraps to clean from the table tops and to sweep from the floor. The wet pieces must dry flat; make sure the drying rack gives enough support under the paper to prevent sagging of the wet paper. Trays or cookie sheets can be used to hold the wet papers.

Ending Comments: These are slightly translucent and display nicely in a window where they are backlit by strong sunlight.

H. Alternative Activities
- Special Needs Considerations: Guide lines may be drawn on the folded paper to help a struggling student know where to cut. Help can be given with the gluing process; the lightweight paper can be especially difficult to maneuver.
- Addressing of Diversity

6. Evaluation Strategies
A. Formal: To grade this project, ask these questions: Did the student cut all three pieces of paper (newsprint, art tissue, construction paper)? Are all three pieces of paper cut in a design that shows radial symmetry? Are all three pieces of cut paper glued to the exact center of the white paper? Questions from this lesson that could be included on a subsequent unit test are:
- What is the definition of linear? What is the definition of radial? What is linear symmetry? What is the definition of radial symmetry? What is a kaleidoscope? What is a cathedral? What is a rose window?

B. Informal: As you observe students working, looking for correct folding of paper, intricate cutting of the radial designs, proper use of the brush with the media mixer, good craftsmanship, and correct placement of all glued papers.

C. Re-teaching: There are many examples of radial symmetry found in nature images of starfish, flowers, and other items could be viewed.
Lesson Plan: Holiday Necklace

1. Lesson Title: Patterning: Bells and Beads (Kindergarten, Grade 1)
2. Unit Title: Patterning
3. Instructional Objectives: Kindergarten students will create an A-B pattern by threading beads and bells on a necklace. (Art Standards K.1.1, K.2.2, K.5.1; Math Standards K.2.2.b, K.2.2.c, K.4.1.a) Students in Grade 1 will create a pattern of 3 or 4 elements of their own design. (Art standards 1.1.1, 1.1.2, 1.2.2, 1.5.1, 1.6.1; Math Standards 1.2.2.a, 1.2.2.b, 1.2.2.c, 1.2.2.d)
4. Materials/Media: Per student: one 4’ thread that has been inserted into a craft needle, pulled through to a double thickness, and knotted; a bowl of pony beads in holiday colors, and a bowl containing jingle bells
Other Resources: A finished example of a holiday necklace, examples of patterning displayed or drawn on the blackboard.
5. Instructional Procedures and Design:
   A. Set
      • Motivation Strategies Discuss patterning; do some sound patterns with the class such as clap hands - clap lap; demonstrate how to use the tapestry needle
      • Vocabulary: pattern, needle
   B. Key Questions: What is a pattern?
   C. Classroom Strategies
      Instructional Preparations: Teacher will prepare the strings, needles, beads, and bells prior to the start of class. Teacher should make a necklace and be wearing it when students enter class.
      Suggestions: For the younger students, it is good to restrict the number of bells and the colors of beads they receive. Also, when cutting and tying the two ends of the thread together, be sure to make the necklace long enough to comfortably slip over the student’s head.
      Safety: Craft needles are no sharper than a pencil point and do not pose a safety concern unless children poke each other with them. Ask children if it feels good to be poked with a pencil? If not, there should be no poking with the craft needles.
   D. Learner Involvement: 1. Student will thread the beads and bells on the thread in a pattern. 2. When necklace is complete teacher will cut off the needle and knot the two ends of the necklace together.
   E. Practice and Review: The teacher will lead the children in making sound patterns. Selected students will draw patterns on the board.
   F. Learning Environment: Each student needs their own space on an empty, clean table on which to work. An area that is 2’ x 2’ should be sufficient. Bowls of beads and bells should be placed on a flat surface. Work area should be big enough that bowls do not get accidentally knocked over.
   G. Closure
      Clean up: Stack up the bowls to set aside. Retrieve all craft needles in a container.
      Ending Comments: Practice making patterns with sounds or gestures. Sing
“Jingle Bells” using the necklaces as a percussion instrument.

H. Alternative Activities
   - Special Needs Considerations: If a student is struggling with the patterning, teacher may lay that child’s beads and bells on the table in a line, creating a pattern, and instruct the student to pick up the items in order from the line.
   - Addressing of Diversity

6. Evaluation Strategies
   A. Formal: To grade this project, answer these questions: Did the student place an adequate number of beads and bells on the string to create a pretty necklace? In other words, does the necklace appear to be complete? Were the beads and bells placed in a correct pattern?
   B. Informal: As you observe students working, look for focused work and correct patterning.

7. Re-teaching It is always fun to create patterns. Play the pattern game found on page 30. Start a class by having one student come forward and draw a pattern on the board or create a pattern using provided objects. Have the children line up in a pattern such as boy – girl – boy – girl, or blue clothes – not blue clothes – blue clothes – not blue clothes.
Lesson Plan: Rainbow Spinner Game, a Race to the Rainbow

1. Lesson Title: Color: Rainbow Spinner Game, a Race to the Rainbow (3rd grade)
2. Unit Title: Color
3. Instructional Objectives: Art: 3rd grade students will know the sequence of colors in the spectrum, the sequence of colors on a color wheel, and understand the connection between the spectrum and the color wheel. (Art 3.1.1, 3.2.1, 3.6.2) Math: Student will create a repeating pattern made of 6 elements (the six colors); student will skip count by 6’s to determine how many steps there are on the path to the rainbow; student will multiply the number of violet squares by 6 to determine how many steps there are on the path to the rainbow; student will understand probability by using the spinner during the game. (Math 3.1.2.a, 3.2.2.a, 3.5.2.a, 3.5.2.b, 3.5.2.c)
4. Materials/Media: Per student: one copy of the game board copied on white, legal sized, 20 lb. paper, already fitted with a spinner made of a paper clip, brad, and masking tape; coloring tools; two game pieces
   Other Resources: A finished example of a Rainbow Spinner Game.
5. Instructional Procedures and Design:
   A. Set
      - Motivation Strategies: Review information about the rainbow including: the scientific word for rainbow is spectrum; the source of color is light; the sequence of colors on the rainbow is red, orange, yellow, green, blue, violet. Explain to the students that they will be making a board game called “Race to the Rainbow.” Tell them that the game board has been drawn for them and they must add the color. Instruct them to color in the path on the board with colors that are “rainbow order”, starting with the color red.
      - Art Vocabulary: rainbow, spectrum, color wheel, pattern
      - Math Vocabulary: pattern, skip counting, multiply, probability
   B. Key Questions: What is the source of color? What is a spectrum? What is the sequence of the colors on the rainbow? How is the color wheel related to the rainbow? How likely is it that your spinner will land on red during any given turn? Is it possible that your spinner will land on red during every turn?
   C. Classroom Strategies
      Instructional Preparations: Teacher will copy the game board and attach a spinner to each one prior to class. Teacher will procure some small objects to use as game pieces. (I used the plastic “jewels” that are used to glue on to craft projects, and the students loved them.)
      Suggestion: As you prepare each spinner, you may want to stabilize the brad on the back of the paper with a short piece of masking tape. Also, do not fasten the brad too tightly or the paper clip will not spin well.
      Safety: no special issues
   D. Learner Involvement: 1. Student will select the coloring tool they wish to use from a choice of markers, crayons, and colored pencils. 2. Student will color the steps of the path with the colors in “rainbow order.” As they work, they may want
to say aloud the pattern they are repeating: “Red, orange, yellow, green, blue, violet.” It is this repetition that is key to learning and remembering the sequence.

3. Student will color the color wheel that is used for the game spinner. 4. Student will color the rest of the game board in a decorative way. 5. Upon completion of the coloring, student will skip count by 6’s, counting every violet square on the path and will determine how many steps there are to the rainbow. 6. Student will count every violet square and multiply that number by 6 and will determine how many steps to the rainbow. 7. Student will whisper to the teacher how many steps are on the path to the rainbow, and then s/he will receive two game pieces from the teacher and will play the game with another student.

E. Practice and Review: Student will select a set of colored objects and arrange them in rainbow order. Some colored objects include colored cards made from construction paper, colored wooden blocks, colored plastic tiles used in math activities, and colored buttons.

F. Learning Environment It will be beneficial to have on display several color wheels, both artist made and commercially printed. Also, a finished game board is a critical visual aid for this lesson.

G. Closure
Clean up: Store the coloring tools.
Ending Comments: Have the class chant aloud in unison the sequence of colors in the rainbow. Have the class count aloud by 6’s to 90. Ask review questions and reward correct answers with a treat.

H. Alternative Activities
- Special Needs Considerations: Place a small colored dot on each square of the path to indicate the color that the square should be colored in. Count by 6’s with the student. Do multiplication with the student. Allow student to simply count every square by 1’s.
- Addressing of Diversity

6. Evaluation Strategies
A. Formal: To grade this project, answer these questions: Was the coloring complete? How much of the coloring was done in the correct sequence? Is the coloring done well with bright, dark colors that are in the proper place? Did the child correctly count by 6’s? Did the child correctly multiply by 6?
Questions from this lesson that could be included on a subsequent unit test are: What is a spectrum? Where does color come from? Can you name the colors in rainbow order? Can you color a color wheel correctly placing the colors in rainbow order?

B. Informal: As you observe students working, look for focused work, careful work, and correct sequencing.

7. Re-teaching: In later classes, colored objects could be placed in rainbow order as a class wide, starter activity. It might be fun to create a spinner with all the student’s names on it. Use it one day to select helpers. Ask the students, Is this a fair way to pick helpers? Will everyone eventually be selected? Why or why not? What are your chances of being picked?
APPENDIX 43

Journal

Following is a journal of what occurred in the art classroom between July 2006 and January 2008. The actual teaching of the curriculum is a very important part of any education research. Planning prior to the classroom experience and assessment of the classes are critical bookends that support the work that is done when a teacher teaches and a child learns. The journal includes the researchers’ personal notes and observations as well as lesson descriptions and photographs. Complete lesson plans can be found in the Appendices 14 through 42.

July 2006

Planning has started for the research study. I am finding much material that affirms the value of integrating art and other content areas. Elliott Eisner is especially strong in his conviction of its value. I have acquired the 3rd, 4th, and 5th grade math SPI’s from the Curriculum Instruction Facilitator at Martin. She has marked on the charts the areas she feels are most critical. These areas include Data and Probability, and she marked the use of a spinner as a good area for me to explore. Also, she believes it would be helpful to look at Measurement which includes measuring to the nearest inch and finding the perimeter of a rectangle, and Real World Problem Solving.

August 2006

I have talked to the Math specialist for Project Grad. She has made available to me several resource materials including a book used by the classroom teachers entitled Math on the Menu. She says it would be helpful for me to reinforce the concept of large number estimation. Also, she gave me copies of the Project Grad Move it Math
Curriculum Map for each grade level. I can use this to see which concepts are being taught during each week of the school year.

I obtained the Tennessee Math Content Standards and Student Accomplishments for grades K-5. I wrote a memo to one teacher from each grade level asking for her input on what math concepts would be best to integrate in art class. I selected a teacher from each grade level based on years of teaching experience at that school and interest in my project. Also, I selected three from Lawnville and three from Martin. Part of the memo stated, “As you know, Art instruction is limited to 40 minutes, every four days, comprising only 2.4% of the school week. There simply is not enough time to teach all of these concepts, and I will need to select some of the standards to integrate into the art curriculum. Please help me make choices.” Each teacher reviewed and marked the standards and then returned the memo to me. I am ready to review all the material, choose the standards to integrate into art, and begin planning lessons.

August 2006

Even though the planning is still in its early stages, it has become evident to me that math concepts involving geometry will easily pair with art lessons, so I am going to begin the year with some geometry related projects.

Grades 3, 4, and 5: Pyramids (geometry). One teaching and management strategy used by Project GRAD is called Cooperative Learning. It is a way to group students in 3 or 4 member teams which consist of a very strong student, two average students, and one less strong student. Theoretically, all team members benefit by working together on certain activities in class. The teams name themselves, and create a sense of identity within the
context of the larger classroom. The teams were asked to create a team pyramid that would serve as a marker or a flag that displayed their team name and symbolic colors and images (Figure 39). Some choices for team names included wild animals and mascots for local high schools. We also looked at photographs of pyramids such as those in Egypt, at the Louvre, in Memphis, and in Las Vegas.

*Grade 5: Pyramids (geometry).* After completing their team pyramid, the fifth graders constructed a small “personal pyramid” (Figure 40). This was a quick way to repeat and therefore reinforce the previous lesson. It also gave the students a pyramid to take home with them. I find that in almost every assignment, some students will finish their work much sooner than average. Providing those students with a smaller version of the original project is a way to effectively review and repeat what they just learned.
Figure 40. Example of personal pyramid.

*Grade K: Mr. Square (shape recognition and construction):* This lesson is about the recognition of a square shape, the drawing of a square, and the student’s recognition of their own name. To prepare for class, the teacher first wrote with a marker the student’s name on a 6” x 24” piece of white drawing paper, being careful to space the letters at 2” intervals. Then the teacher wrote each letter of the student’s name on a 2” square of light colored construction paper. Finally, the teacher drew a cartoon of Mr. Square in the upper right hand portion of the paper. During class, the child matched the letters on the 2” squares with the letters on the large white paper and glues them on top of the matching letter. This is a great opportunity for the students to practice using the glue bottle and learning that “a dot of glue is a lot of glue.” After the child glued the letters in the correct sequence, he then drew friends and family for Mr. Square. Fast workers also drew concentric squares on another piece of paper and counted how many they drew (Figure 41).
Grade K: Square Monster (shape recognition, patterning). This project promotes recognition of the square and patterning. Students were given several 1” segments of plastic drinking straws and an equal number of 1½” construction paper squares with one hole punched in the exact center of each one. Students threaded the squares and straws onto a large chenille stem in an A-B pattern. A monster face was added to the first square and a curly tail was created at the end. The Square Monster “crawled” on the table when the student held the tail and pushed it in a zigzag motion. Students liked to guess why Mr. Square turned into a Square Monster; common theories were that he was sick, he was hungry, someone took his toys, and he was sleepy.
Grade K: House picture collage (recognition of shapes). The purpose of this project (Figure 42) is to have kindergarteners recognize the shapes of rectangle, square, triangle, and circle. They were given a piece of 9” x 12” white drawing paper, a 12” x 3” green construction paper rectangle, a 4” x 4” square and a paper triangle with a 6” base. There was a class discussion about the names of the shapes, and the teacher talked about how two shapes positioned together can look like an object. Examples included making a snowman from three circles. Students were asked to cut fringe on the green construction paper to create “grass.” (This is a good way to get a preliminary gauge of a kindergartener’s cutting ability; this was a project where accurate cutting was not critical to the artist’s success.) Children were asked to draw a circle to create a sun. Once they built their house, they were asked to draw the people who lived there. They loved to tell
about their house and the people. This helped the teacher get to know the students and encouraged verbal communication.

*September 2006*

I have selected the main math concepts I will try to integrate into some art lessons this year, and I have started a list of classroom practices I can use to emphasize math concepts. It is time to find and/or develop lesson plans. At the same time, I am also very busy developing lesson plans to help celebrate Hispanic Heritage Month at Lawnville. These will be taught during the last half of September and the first half of October.

*October 2006*

*Grade 3: Glyph self portrait (use of symbol).* This project began with students drawing a self-portrait. Instructions for the drawing included the usual artistic concerns such as the shape of the face, the placement of the features, and the actual shape of the student’s eyes and lips. Individual mirrors were provided for each student to use. After the self-portrait was complete, each student made a frame for their picture. The frame was to include clues about the person who is pictured, such as their gender, age, favorite food, favorite color, and years in attendance at that particular school. Specific symbols were used to indicate these different characteristics. When the frame was complete, the self-portrait was glued onto the center of it. Finally, the student constructed and attached a set of “doors” that when closed, covered the self-portrait. When the finished pictures were displayed, other students and teachers tried to guess, based on the hieroglyphic clues, whose self-portrait was behind the doors. After guessing, they opened the doors to see if they were correct.
Hispanic Heritage Month. The Hispanic lessons have been a lot of fun for the students. The different lessons included making Peruvian clay pottery, maracas, rain sticks, self-portrait puppets and a puppet stage, and learning a Spanish song “Donde estas?” It has been difficult to incorporate a lot of math into a lesson that is already combining art and social studies concepts. I have, however, been able to use some geometric terms such as sphere and cylinder. This has been extremely time consuming and has undoubtedly taken the focus away from integrating math into art. However, choosing not to participate in the Hispanic activities was not an option.

Classroom Survey. I have been calling the roll using a survey method I heard about in a graduate level education class. The basic operation of the survey involved the teacher asking an opinion question prior to calling each child’s name during roll call. Some of the opinion questions used were “What is best, chocolate or vanilla?”, “Which color do you like best, red, blue, or orange?”, and “What tastes better, a cheese burger or a cheese pizza?” After hearing about this in a university class discussion, I located a math lesson paralleling the idea (“I Love That Teaching Idea!,” 2001). I also found a list of possible questions (Lesson Exchange: Daily Graphing Activities). As the students answered the roll, they stated their answer instead of saying “here.” One student was “hired” to be the Survey Manager (Figure 43), and he/she marked the answers on a large graph (Figure 44). The whole school used the same graph, and when the students returned to class the next time, the graph was displayed. They read on the bar graph what the entire school’s opinions were. I found this to be an excellent way to not only teach graphing but to also get to know the students, get the student’s attention as soon as class
Figure 43. Classroom manager chart showing the job of survey manager

Figure 44. Example of a classroom survey.
started, and to start some interesting discussions. On the first day of art class, I asked the question, “Are you wearing new shoes?” As seen in Figure 10, 76% of the children answered that they were indeed wearing new shoes. The graphs were displayed in the room and hallway for several weeks. I intend to 5th graders to calculate the percentages.

I am attempting to familiarize students with ordinal numbers by using them in written and oral instructions (Figure 45). It is more effective to practice using these instead of just memorizing them.

I adapted the geometry game for lessons on symmetry, calling it the “Symmetry Game,” letting children take turns being the leader. For the symmetry game, the leader struck a pose, the others identified the pose as being symmetrical or not, and then the

Figure 45. Instructions written on marker board using ordinal numbers.
leader (and teacher) would affirm or disavow their identification. The younger children especially loved playing the symmetry game.

Another lining up game that teaches math skills involves making patterns of sounds and motions. As children waited in line, a leader creates a three or four element pattern, such as clap hands – clap hands – snap fingers – wave hello. The leader repeated the pattern several times, and as the other students caught on, they joined in. We usually continued the pattern three or four times after the last child had joined the game.

Another small way to reinforce mathematical expression is to show the recipes for color mixing in an equation form. Varying the sizes of the circles indicates the quantities of paint that are used in the color mixing recipes, and the children are very aware of that (Figure 46).

There are some other practices I can employ on a continuing basis. For example, I found a “Simon Says! with Geometry Terms.” The game began with the teacher saying a geometry term, such as “line.” The teacher and the children attempted to make a visual representation of the term with their body. For example, for a line, we extended both arms straight out to our side with our palms flat. For the term “parallel,” we extended both arms straight above our head. This was a fun game to play when the students were lined up and waiting for their teacher to pick them up.

November 2006

Grades 4-5: Starburst drawing (measurement, geometry). This lesson plan was found on a website, and it is a great one (Figure 47). My elementary students loved this,
Figure 46. Recipes for mixing secondary colors expressed as math equations

Figure 47. Example of starburst drawing.
and one of my interns successfully taught it later in a middle school art class. The 
purpose of the lesson is to teach students how to properly use a ruler to draw a straight 
line. Some tips that were discussed were holding the ruler with the non-writing hand, 
using the thumb to hold the bottom of the ruler and the index finger to hold the top, and 
placing the cork down on the paper. During the course of completing the project, students 
drew at least 61 lines, so it’s an excellent way to practice with a ruler. The students also 
used the ruler to measure one line. They first drew a horizontal 10” line in the center of 
their paper. Then they drew 15 points above the line and 15 points below the line, 
scattering the points all over the paper. Next, each of the 30 points was connected to the 
original 10” horizontal line; the first connection was a line that intersected with both the 
point and the left end of the 10” horizontal line. The second connection was a line that 
intersected with both the point and the right end of the horizontal line.

As the students drew these lines, it was easy for the teacher to walk around, 
observe their ruler technique, and make corrections if needed. There was some 
grumbling, but the usual comments of “no pain, no gain” and “artists must be strong” 
were enough to push the projects to completion. When the drawing was complete, the 
students focused on purely artistic concerns by selecting a palette which was limited to no 
more than four colors. The students were encouraged to select a color scheme such as hot 
colors, cold colors, or complementary colors. They finally added color to all the tiny 
shapes that resulted from the crossing lines, striving to achieve at least two values of each 
color. There is so much practice with the ruler involved with this project; it prepared the 
students for further use of the ruler in art (and math).
Grade 3: Seed Mosaic (perimeter, area, pattern). This project used common household materials to create art in the classroom; this can liberate the students to be creative with whatever they can find around them (Figure 48). (We art teachers must recognize and remember that some children might never have a quality sketch pad, fine brushes, a pencil set, or anything more than common household materials to work with.)

At the beginning of the lesson, essential vocabulary was introduced; this included perimeter, area, and pattern. The available materials were shown to students, along with examples of patterns made with the beans and pasta. First, the students create a patterned perimeter on the cardboard rectangle, and they were encouraged to make that a 3 element pattern. The early finishers measured the perimeter of the chalkboard. Students were given the choice of selecting their measuring tool, a ruler or a yardstick. They all agreed that a perimeter is usually a “pretty big” number. In subsequent lessons, a simple shape

Figure 48. Teacher’s examples of patterns made with beans and pasta, used during instruction of seed mosaic project.
was drawn and then filled in with tessara which included white rice, colored rice, pinto beans, black beans, black-eyed peas, split green peas, sunflower seeds, and several types of pasta. As often as possible, the term “area” was used during art class in sentences such as “Your grass area is rather small, so you will need only a few split green peas” or “the sky area in your picture is very large; you’ll need a whole cup of blue rice” (Figure 49).

*Grade 1: Native American headbands (patterning).* This is a classic project; it was easy to execute, and the children loved wearing their headband (Figure 50). There is nothing quite as exciting to a child as a feather! To start, each student needed a long, narrow piece of paper, at least 24” long. White drawing paper and butcher paper will work, as will various other papers. For this particular occasion, a brown butcher paper was used. It was folded twice and then taped closed; this gave the headband more weight and strength. The children were given several stamping objects, such as square art gum erasers, new pencils with round erasers on top and triangular stamps. They were also given a disposable foam plate, covered with several layers of damp paper towels, and loaded with red, green, and black tempera paint. The class talked about patterning, and types of patterns, such as A-B-C-A, A-A-B-B, and A-B-C-C. Students were encouraged to create a pattern that was more complex than the standard A-B-C. They were also challenged to create a D or E element to the pattern by stamping a small shape over a large shape. They stamp printed the headbands and left them in the art room to dry. During their next class, they selected a feather to insert in some pre-cut slots on the headband. Their heads were measured and the headbands were stapled together. The headband lesson went well with the construction of the tipi.
Figure 49. Example of seed mosaic.
Grade 1: Tipi (geometry): To begin a discussion about the three dimensional cone, the class was shown several examples of cones including an ice cream cone, a bright orange traffic cone, a birthday hat, and a pencil point. The children then looked at a very large cone, the Native American tipi. They looked at the frame of their tipi that had already been constructed from medium sized branches of a tulip poplar tree. (The tulip poplar branches are very straight and even in size, so they make an excellent building material for a tipi. If no tulip poplar is available, broom handles or wooden dowels will work as well.) The Native American’s use of animal hides for clothing and tipi coverings was discussed. Each child was given a large irregular torn piece of brown butcher paper.
and was told it was their animal hide. Referring to a large display of Native American symbols, the children each decorated their animal hide with oil pastels, signing their work with their handprint. Before the students returned for their next class, the tipi frame was covered with the animal hides, each one being hot glued to a paper base. In subsequent classes, pairs of children took turns going into the tipi with a flashlight and books about Native Americans. It was an exciting experience! Months later, a child was heard to say that Indians lived in cones.

December 2006

Kindergarten - Grade 1: Paper dolls (symmetry). Prior to class, a paper was prepared for each student; a piece of white butcher, about 24” long, was folded in half. The outline of half of a girl (or a boy) was drawn on the paper, next to the fold. A very simple profile of a person was used for this project so the cutting would not be too difficult. When the lesson began, the class discussed the symmetry of the human body, with an arm on the left and an arm on the right, an eye on one side and an eye on the other side. Many symmetrical features were pointed out. Then the students cut out their paper dolls. It was a magic moment when they unfolded the paper doll and saw the symmetry. Silly questions were asked, such as, “Does your little girl have one leg? Two legs? Three legs?” They colored the dolls to match their own features. Sometimes they wanted to color in imaginary clothing, or a sports uniform, or at other times, students wanted to color in an exact replica of what they were wearing that day. They love their “mini me” paper dolls, and usually talked to them, played with them, or rocked them. It is also a good idea to end with the Symmetry Game mentioned in October 2006.
Grades 1 – 5: Papier mâché snowmen (geometry). The children learned about spheres by creating three life sized snowmen, ranging from 3’ to 5’ tall. The base of each snowman’s body was built from 2’ x 4’ pieces of wood, cut to the appropriate lengths and nailed together to form a support. Chicken wire was then attached to the wooden tree using a heavy duty stapler. The heads of the snowmen were created by applying the papier mâché on top of a large punch ball (Figure 51). To hold the punch ball in place as the children worked on it with wet glue, the punch ball was first taped to a large, empty, and clean aluminum can. The students covered the chicken wire and the punch balls with many layers of newspaper and papier mâché paste. After the heads of the snowmen were thick with many layers of newspapers and completely dry, the punch balls were deflated and pulled out of the papier mâché sphere. The heads were placed over the top of the wooden tree and attached to the top with the stapler. Paper cones were created by twisting together several newspaper semicircles. The cones were hot glued on by the teacher, and

Figure 51. The head of a snowman, in progress.
then the students reinforced that with several layers of papier mache. When all the paste was dry, the students painted the snowmen with white latex paint. Some of the better painters were selected to paint the orange carrot noses and the black facial features. Various hats, scarves and gloves were used to dress the snowmen. The snowmen were used as part of the set for the Christmas concert and later to decorate the foyer (Figure 52).

*Grades 4 and 5: Paper Snowflakes (radial symmetry).* Cutting snowflakes from paper is something that almost all adults have done at some point in their lives, and all school children should learn how to do this. While going through the folding process, there are good opportunities to talk about halves and thirds. Also, discussion of real snowflakes introduces some science concepts. It is absolutely necessary to fold and cut
the paper so the resulting snowflake has six points, just like a real snowflake. Once the students learned how to fold the paper, they usually worked quickly and independently, producing several snowflakes in one class period. This is a good way to reinforce the concept of radial symmetry as seen in rose windows and kaleidoscopes.

*January 2007*

*Grades 4-5: Colors by chance or choice? (probability).* This project made it interesting to talk with students about the artistic process and how design decisions are individual and intrinsic to art making. The students first drew a design using rulers, or curvy lines. A minimum number of lines to be drawn was set based on the size of the paper. Then each student was given a die which has a different color on each of its six faces. The students were instructed to roll the die, and color a shape with the color that landed on top. They continued this process until their paper was full of color. At first, the students complied with the roll of the die. However, as the process continues, there was some resistance from the artists to their artistic choices being taken away, and students started to “cheat.” They were reminded that the “cheating” would skew the results. At the end of the project the students counted and recorded the number of red, orange, yellow, green, blue, and violet shapes on their paper. A roll call of the class was taken, and each student orally shared their totals for each color. The numbers were added together to obtain a class total. The students discussed probability and agreed that the count for each color should be almost equal. When there were large disparities between the totals for some colors, the students discussed the reasons why this might have occurred. The class totals for several classes were added together, and this evened out most of the large disparities. The classes then discussed how larger samples of data
produced more predictable results.

Another way to discuss probability is to play a game that uses instruction cards (Figures 53 and 54). The cards were placed face down on a table and drawn at random. Cards directed students to draw a shape or to use a certain color. Selected cards were taped onto a large instruction sheet. After the drawing was complete, the children followed the instructions to create a design. Probability was discussed. The students discussed how likely it was that one of four shape cards would be drawn; they agreed that half of the shape cards will be drawn so the probability of selecting one is 1 in 2, or 50%.

*Grade 2: Cone hats (geometry).* An actual Asian work hat was made available to the class, and with some paper that was large and heavyweight, the students were able to

Figure 53. The instruction board used in “Colors by Chance or Choice?”
Figure 54. The cards that are chosen at random in “Colors by Chance or Choice?”

construct their own cone hats (Figure 55). Prior to class, large circles were drawn on the paper, and a wedge of that circle resembling a piece of a pie was drawn. The wedge represented about 45 degrees of the 360 degree circle. Students used oil pastels to create a pattern around the perimeter of the circle. When complete, the hats were glued together and worn when leaving class.

February 2007

I am teaching a broad unit about the culture of the Zulu people from South Africa. This is to be done in celebration of Black History Month. The main purposes of the projects is to teach different facets of the Zulu culture, but some math concepts were brought into the classes as well. The fifth graders are constructing a bead necklace that is symmetrical in form. The fourth grades are making pottery which has a hemispherical base. The third graders are making ceramic and bead necklaces which are symmetrical. I am finding that the focus on Black History is working to the same end as the concentration on Hispanic heritage did in the fall: it is
taking our focus away from math integration. However, the distraction is unavoidable.

Grades Kindergarten – Grade 2: Butterfly (symmetry). The students were asked to select a piece of pre-folded paper. The outline of a butterfly half was drawn on the papers. The students cut the paper on the line, and when unfolded, the resulting shape was that of a butterfly. The students were given small shapes, decorative stickers, oil pastels, markers, and glue. They decorated the butterfly’s wings in a symmetrical fashion: each time they applied decoration to the left wing, they also applied the same decoration in the same place to the right wing. At the end of class, a tongue depressor was glued to the fold of the paper making the center of the butterfly rigid and allowing its wings to float up and down in a flying motion (Figure 56).
March 2007

Grades Kindergarten – Grade 1: Paper basket weaving (patterning). This project is about the pattern of motions and the resulting pattern of art materials. Before class, preparations were made with 9” x 12” construction paper by folding it vertically, accordion style, into fourths. Then ten small slits were cut into each peak of the accordion folds. The paper was unfolded and flattened before the students began to weave. The students chose from a variety of colors of paper. They wove six tongue depressors in and out of the slits. The children were encouraged to say “up and down, up and down” or “over, under, over, under” as they worked. After the weaving was complete, the students used markers to decorate the wood and paper with a pattern. The tongue depressors were then stabilized with a strip of masking tape, and the woven paper was folded in half so as
to hide the tape. The baskets were stapled along the sides. The child then inserted some purchased “grass” and a purchased plastic egg. Some of the female students attached a string handle to convert their basket into a purse (Figure 57).

**Grade 3: Paper basket weaving (patterning).** This weaving project is also about the patterning of motions and the resulting pattern of art materials. Before class, many strips of construction paper were cut in the following dimensions: 18” by ½”, 12” x ½”, and 6” x ½”. Several pieces of construction paper were also cut into 12” x 12” squares. The student selected a piece of the large colored construction paper and folded it in half from corner to corner. Then straight and even slits were cut into the fold; the slits were

Figure 57. Examples of paper woven baskets, kindergarten work on the right, third grade work on the left.
about ½” apart and extended to within 1 ½” of the edge of the paper. The paper was then unfolded. Colored strips of paper were selected and woven into the slits. When the weaving was done, the corners of the baskets were pulled together and stapled. Purchased “grass” and a plastic egg were placed in the basket. This same project was executed by a small group of selected students during an after school session. They used sheets of scrap booking paper and sewn the corners together (Figure 58).

*Grade 3: Color Spinner Game (probability).* This project reinforced the rainbow order of colors, the connection between the rainbow and the color wheel, probability, and the use of a spinner. The students began with a legal sized reproduction of the game board. They added the color by repeating the colors of the rainbow (red, orange, yellow,
green, blue, violet) over and over again on the path to the color wheel (Figures 59 and 60). The repetition of the colors reinforced the learning of the rainbow order of colors. Upon completion of the art work, students were given two game pieces and played the game with another friend.

This project was very popular, and when the students were in 4th grade the following year, they begged to make another game just like it. A similar game could be made using a color die instead of the spinner. The game could be made more complex by adding another spinner which could indicate which player gets to have the next turn.

April 2007

*Grades 2 – 3: Seed Mosaic Sketch Book (perimeter, area, patterning).* As the end of school was getting close, I felt that the students might benefit from being given some art materials to use at home during the summer. I showed them some of my own sketch books that had been filled up during the years. They made the cover for their book in much the same way as the seed mosaic project previously discussed. After the cover was finished, it was sandwiched with another piece of board and several sheets of newsprint. A drill press was used to make small holes in the paper and board at \( \frac{1}{2} \)" intervals. The students completed the sketch book by sewing it together with heavy black thread and a tapestry needle (Figure 61). Several students brought their sketch books to school in the fall to show me what they had drawn during the summer.
Figure 59. Example of the “Race to the Rainbow” spinner game.

Figure 60. Close up view of the spinner for the “Race to the Rainbow” game.
August 2007

*Grade 5: Pyramids, Cubes, and Rectangular Prisms (geometry)*. We began the school year by creating geometric and organic designs (Figure 62). The organic designs were made on white coated paper. The students placed a fat drop of pigment on the paper using the stopper from an ink bottle or a round paintbrush. They used a drinking straw to blow air onto the drop of pigment, using their breath to direct it around the paper to create a design. They selected a pattern for a pyramid, a rectangular prism, or a cube, and when the pigment was dry, they glued the pattern onto the back of the decorated paper. They cut and glued together the solid geometric form. The contrast between the organic shapes and lines and the geometric forms was discussed. This project made a natural progression from last year’s pyramid project. Many students asked for additional patterns to take home.

*Kindergarten: Mr. Square (shape recognition)*. It appears that Mr. Square’s popularity is solid, and in kindergarten art, we once again allowed him to help us to spell our names.

September 2007

*Grades 4-5: Still life picture (directional words)*. This is a classic art project that defines a still life, explores the genre, and executes a drawing (Figure 63). While drawing these terms were used: over, under, forward, backward, between, left, and right. We used expressions such as, “The bowl is forward on the table, so it is lower on the page” and “The cylinder is behind the bowl so it is drawn so some of it disappears under the bowl.”
Figure 61. Example of sketch book with seed mosaic cover.
Figure 62. Examples of solid geometric forms constructed from paper that has been painted with organic lines and shapes
Figure 63. Example of student drawn still life.

Kindergarten – Grade 5: Still life (geometry): While looking at the refraction of light through glass prisms, the term “triangular prism” was reinforced. The students seem to be very comfortable with this term.

October 2007

Kindergarten – Grade 2: Spiders (patterning). This project taught counting by twos, making a pattern, translating a repeating pattern, symmetry, and counting to 8. The students threaded colored ditalini pasta onto chenille stems to make colorful spider legs (Figure 64).
November 2007

Kindergarten - Grade 1: Snowman pictures (Symmetry). The students cut trees and snowmen from folded paper. Unfolding the paper created symmetrical shapes. The students glued the cut shapes onto a large piece of paper and finished the picture by coloring with oil pastels (Figure 65).

December 2007

Kindergarten – Grade1: Holiday necklace (patterning). The students made a holiday necklace by stringing beads and bells onto a string. The younger students were asked to make an A-B pattern. The older students created patterns of their design using four different elements. Even though the jingle bells were exciting to the point of distraction, most children were able to make a pattern (Figure 66).
Figure 65. Example of picture with symmetrical snowmen and trees.

Figure 66. Example of holiday necklace.
Grades 4-5: Paper Snowflakes (radial symmetry). A portion of one class was used to cut snowflakes from folded paper. Sparkly wrapping tissue paper in green, red, and white was used. Since the children had thoroughly learned how to do this last year, it took only a quick review and demonstration to get the students started.

Grades 4-5: Rose Window (radial symmetry). This lesson taught some architecture and art history concepts while also teaching radial symmetry. The students cut paper snowflakes and looked at kaleidoscopes to see examples of radial symmetry (Figure 67). The mechanism of the kaleidoscope was explained; the students recognized that the placement of the three mirrors inside the kaleidoscope created a triangular prism. Students looked at several pictures of rose windows and especially focused on the Cherbourg Cathedral. To make the rose windows, the students cut three different designs that were radially symmetrical. The first was from colored newsprint. The second was from colored art tissue paper. The third was from black construction paper and served as a frame. All three designs were centered and glued one top of the other onto a piece of 8” x 8” white drawing paper. The final results were beautifully translucent, and we displayed them in a window.

Grade 4: Jingle Bell Ornament (radial symmetry). A final project on radial symmetry was done when we made snowflake ornaments from jingle bells, beads, and chenille stems. Using an example for reference, the students attached beads and bells to chenille stems to create the ornaments.
Figure 67. Four examples of rose windows.
VITA

I love art, and I will talk about it to anyone who will listen. I am currently in my tenth year of teaching art in public schools. Over the past twenty-eight years I have taught in pre-schools, public elementary, middle, and high schools, museum classes, and private lessons. In addition to teaching art, I have worked as a muralist and graphic designer. I hold a Bachelor of Science in Art Education and a Bachelor of Arts in Sociology, both from the University of Tennessee, Knoxville. This thesis will conclude my work on my Master of Science degree (Track I) in Teacher Education with a major in Art Education, also at the University of Tennessee, Knoxville. I have shown my own art work in many local and regional shows. I have received awards at the Knox County Art Teachers Art Show and in an art show presented by graduate students in art education at UT. In 2007, I co-presented a study of collaborative mentor-intern art shows at the National Art Education Association. I believe that as schools strive to best serve their students in a fast changing society, we as educators must reflect, assess our own performance, and accordingly modify our current practices. This can help us and our learners reach higher standards. A main interest outside of art education is my family which includes my husband of twenty-five years, Tim; my two sons, Andy and Perry, who are my favorite learners; my mother; and my extended family. I enjoy any activity that allows me to think and create such as drawing, painting, stained glass construction, collage, and ceramics, as well as writing, gardening, cooking, and reading.