Weaving My Math to Make Art

Curriculum

This curriculum was developed for the Boulder Valley School District by art teacher Virginia Schick and math teacher Kelly Armitage. The integrated curriculum interlocks math concepts and visual art concepts to create a hands-on art/math curriculum. Integral to the success of this program is teacher training. The curriculum is offered as a one-day continuing education workshop which includes instruction in inkle weaving and teaching the math concepts. In addition, to make the curriculum available throughout the school district, the materials have been assembled into a kit that is checked out by classroom teachers for a specified period of time from the district resource center, making the materials available district wide.

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Resources for finding out more:

F&W Media/Interweave Press

Publishers of books and magazines about weaving and spinning, and the textile arts. Their web site lists numerous resources that could be helpful to teachers establishing weaving programs in their schools, as well as basic information about weaving and spinning.

Handweavers Guild of America

This national organization has affiliate guilds across the country. Their web site is a good resource for information about local guilds, schools, and resources.

Schacht Spindle Company Inc
6101 Ben Place
Boulder, CO 80301
www.schachtspindle.com

Schacht Spindle Company is a manufacturer of hand weaving looms, spinning wheels, and the accompanying accessories. Their web site provides product information and a dealer list. They also publish a monthly newsletter, and a blog with project instructions and ideas.

Weaving Math To Make Art
Art lesson #1
Introduction to textiles and weaving
One 50-minute period

Students will read *The Goat in the Rug* by Geraldine, a story of the steps of shearing, washing, combing, dyeing, spinning, warping, and weaving a Navajo rug. Students begin to explore weavings by looking at textile art from people and places from the Inca, colorful belts from Guatemala, tapestries from Europe, Kente cloth from Africa, and Kimonos from Japan. They will discuss what they see. Students will learn the vocabulary words, warp, weft, heddle, inkle loom, shed, beating, and shuttle by identifying them with an inkle loom. Finally, students will play "the snowball game" to assess whetherh they know the vocabulary words.

Objectives:

1. Students will begin exploring weaving in literature.
2. Students will see many textile art forms from many time periods and cultures.
3. Students will begin learning weaving vocabulary
4. Students will participate in assessment of vocabulary acquisition.

Materials:

Teacher

Textile books
The Goat in the Rug or *Charlie Needs a Cloak*
CD with textiles, such as *With Open Eyes*
Visuals
Weaving books
Two or more warped inkle looms and shuttles
CD player
Spin the Weaver's Song CD

Students

8" x 5" paper
Pen or pencil

Sequence:

10 minutes. Motivator. Play "Song of the Sky Loom", a Native American prayer by the Tewa people. Read *The Goat in the Rug* or *Charlie Needs a Cloak.*
20 minutes. Introduce. Introduce the unit by showing as many different kinds of textile art forms from many different places and times. Use many different resources. Concentrate on the qualities of color, function, beauty, and how the textiles are made. Briefly discuss art.
If students become "bored on the floor", ask small groups to each take a book or CD rom, or set of visuals and discuss in small groups. Ask them to find their favorite, least favorite, most colorful, strangest, something they never knew existed, etc. Have groups report back to the entire group.
10 minutes. Show students a warped inkle loom. If possible, pass several warped inkle looms with some weaving on them around for the students to examine. Identify words listed above. Review several times with the students asking them to come up and identify the parts and learn the weaving vocabulary.

10 minutes. Play “the snowball game”. Split the class into two or three groups.
Ask each student to write one of the vocabulary words on their paper. Put pens away and crumple up papers like snowballs. Play “The Weaver” song. Students can throw “snowballs” during the verses of the song. During the chorus they must stop throwing snow and sing along At the end of the along, each student must find a snowball. After the song is over, they must open the snowball and identify the vocabulary word either by pointing it out on the loom or verbally explaining the word.

Assessment: Record how well students did with the vocabulary.

Weaving Math to Make Art
Lesson #2 Introduction to Inkle Loom Weaving
One 50-minute class

Students will be introduced to inkle weaving. They will watch how to warp a loom and practice warping a loom. They will watch how to make a pattern and practice making up a pattern of their own.

Objectives:

1. Students will see and discuss inkle weavings.
2. Students will see and practice how to warp an inkle loom.
3. Students will see and practice how to design a pattern for inkle loom weaving.
4. Students will review vocabulary words.
5. Students will use color theory to design patterns.

Materials:

Teacher

CD player and "Songs From the Loom" CD
1 inkle loom and 1 belt shuttle per student
5 string heddles for each loom
10 yards of cotton carpet warp or smooth yarn per student
The Weaver's Inkle Pattern Directory (Anne Dixson), book
Inkle Weaving A-Z (Jane Patrick), DVD
Dia's Story Cloth, book
Woven inkle samples
Design pattern worksheet

Students

Graph paper
Colored pencils

Sequence:

10 minutes. Motivator. Play the song, "Sweet Becky at the Loom". Read Dia's Story Cloth.
5 minutes. Introduce. Introduce inkle weaving. Show inkle weaving samples. Show visuals from inkle weaving book as well. Briefly discuss the history of inkle weaving.
15 minutes. Demonstrate how to warp the inkle loom with a short warp. Emphasize the heddle use. Pass out looms with heddles on them and yarn balls. Ask students to practice warping their looms.
20 minutes. Demonstrate how to design a pattern and draft it on graph paper. Discuss color choice and theme for their art. Show examples of patterns and how to graph them. Pass out colored pencils. Students complete design pattern worksheet. Pass out graph paper. Have students design and graph two patterns.

Assessment: Have them hand in both assignments to check for understanding.

Weaving Math to Make Art
Lesson #3 Warping the Inkle Loom
2.5 hours, extra-long art period

Students will warp their looms with patterns and colors. Weavers from the community and parent volunteers will assist students.

Objectives:

1. Students will use pattern letter sequence to warp their looms.
2. Students will warp looms using good technique.

Materials:

Teacher

Same materials as used for students
Loom set up ready to weave

Students

Heddles (will depend on pattern)
Inkle loom
Belt shuttle
Scissors
Tape
Yarn
Schacht weaving booklet, pages 3-4 (download from website at: http://schachtspindle.com/pdfs/inkle-manual.pdf)

Sequence:

Have students come prepared with their written pattern, measured yarn, loom and shuttle. Before beginning to warp, be sure that the tension pegs are secured in the middle of the slit opening.
15 minutes. Teacher demonstrates how to warp looms using a pattern. Teacher demonstrates how to change colors in the patter and install the heddles. Teacher demonstrates how to mark off pattern as student warps.
STRESS THAT CARE AND PATIENCE AND TECHNIQUE TO WARP PERFECTLY WILL PAY OFF IN A BEAUTIFUL WOVEN BAND.
90-120 minutes. Students warp looms. (Our patterns were under 60 ends and it took most students a little over an hour to warp. The allotted time will increase or decrease depending on the number of ends.) One adult for every 5-7 students is optimal. Adults do not have to be weavers but must see the demonstration and understand the process.

Troubleshooting Tips:

- Double check that the tension peg is set in the center of the slot.
- Watch to make sure students cross off pattern as they warp.
- Watch that students install heddles correctly.
- Watch that students alternate heddled and unheddled threads.
- Check to see that student's knots are tight.

Weaving Math to Make Art
Lesson #4 Weaving
2.5 hours, can be split up

Students will weave inkle loom belts using good weaving technique.

Objectives:

1. Students will weave on inkle looms.
2. Students will have good technique, such as even selvedges, straight wefts, etc.

Materials:

Teacher

Same as for students
Weaving music

Students

Warped inkle looms
Belt shuttles
Weft yarn

Sequence:

Make sure tension pegs are tight. Be sure that students begin weaving 6”-8” past tied knots. Advance warp as needed.
10 minutes. Teacher demonstrates how to begin weaving, including how to get the up shed and the down shed. Show students how to secure the weft at the beginning of the weaving, and then how to open the shed, weave across, change sheds and pull the weft snug against the selvedge. Demonstrate how to wind the weft yarn onto the shuttle, how to use the shuttle correctly, and how to beat the weft with the shuttle.
140 minutes. Students weave. After 10-15 minutes, gather students together and demonstrate good weaving technique. Demonstrate how to advance the warp as the weaving progresses.

Weaving Math to Make Art
Lesson #5 Finishing Weavings
50 minutes

Students will finish weavings using one or several techniques for finishing.

Objectives:

1. Students will use one or more finishing techniques as shown in teacher samples.
2. Students will use good techniques and craftsmanship when finishing.

Materials

Teacher

Same as students for demonstration
Woven samples with different finishing techniques.
Students
Woven belt
Blunt needle (tapestry needle)
Scissors
Tape
Accessories, as desired

Sequence:

15 minutes. Teacher demonstrates several finishing techniques.

1. Blunt needle finishing of loose weft end.
2. Making a plain fringe.
3. Twisted end finish.
4. Sewn finish
5. Wrapped finish
6. Other textile techniques for a finish: macramé, beads, tassels, buckles.

35 minutes. Students finish ends of weaving.

Weaving Math to Make Art
Additional activities and ideas

1. Critique with students as a group.
2. Students write comments to each other about weavings.
3. Students self-critique.
4. Make shoe laces, bookmarks, dog leashes, lanyards, bracelets, etc.
5. Read poetry on weaving as motivators.
6. As a local weaver to give a weaving demonstration.
7. Ask the weaving community to borrow a floor loom and let students take turns weaving.
8. Find out if your local art museum or natural history museum has textiles in their collections and either ask for a curator to visit your classroom or take a field trip to the museum to meet with the curator.

Weaving Math to Make Art
Lesson # 6 Symmetry
One xx minute class

Students will explore symmetry in nature, around the classroom, and in planning their weaving designs.

Objectives:

1. Students will become familiar with geometry and how it applies to symmetry
2. Students will learn the meaning to symmetry and how it relates to design.
3. Students will explore pattern creation using math/science skills.
4. Students will explore the relationships between objects.
5. Students will use calculations and scientific methods (observing, classifying, analyzing, generalizing)

Background:
Symmetry is all around us. We see it in nature and in the human-made objects around us. We can find balanced proportions in leaves, animals, flowers, trees, grass, buildings, designs, posters, and so on. We can find bilateral symmetry when one side of an object matches the other side (like the shape of a butterfly). We can find translational symmetry when patterns are repeated side to side or up and down (as in Escher). We can find rotational symmetry when shapes are repeated and turned around a central point (like a flower with petals).

Sequence:
Xx minutes. Explore bilateral symmetry. Have students fold a piece of paper and write a word along the fold. Cut around the word, leaving the folded side attached. Open and observe bilateral symmetry. Alternately, you could also have students use a mirror and place next to their word or picture or drawing.
Xx minutes. Explore translational symmetry. Fold a strip of paper in half lengthwise, then in half lengthwise again, and then repeat a third time. Cut out a design in the center fold. When it is opened, four designs should be attached to each other, showing translational symmetry. Show examples from Escher.
Xx minutes. Explore rotational symmetry. Have students cut out a shape on an index card. Trace around the shape on construction paper. Then rotate it and trace it again. Repeat this several times, until the shape returns to the original position. This is rotational symmetry.
Xx minutes. Explore symmetry using inkle band examples. Show students weaving bands the illustrate bilateral symmetry. Then have students graph their own design using bilateral symmetry.
Xx minutes (OR HOME WORK?) Have students go outside and find examples of the three types of symmetry in nature and human-made examples. Have them classify these examples into the three different types of symmetry.
Xx minutes. Discussion. Look at a multiplication or addition table. Whey is there a bilateral symmetrical line that goes diagonally? (Inverse equations equal the same number 4 x 6 = 6 x 4)