Art and Culture Center of Hollywood
Distance Learning Program

Integrated Art Lesson Title: An Experiment in Cooperation

**Description and Overall Focus**
This lesson will focus on M.C. Escher and how he used mathematical shapes to create "tessellations."

**Length of Lesson**
45 minutes - 1 hour

**Grade Range**
Upper Elementary

**Sunshine State Standards**
(see attached)

**Objective(s)**
Students will work in groups to create geometric squares from various tangram pieces. They will use pantomiming (a non-verbal drama tool) to communicate what pieces are needed to successfully complete the task.

**Materials: PLEASE NOTE:**
Several pieces of large poster board

Some materials must be acquired prior to this lesson
5 small manila envelopes for each table group and 1 large manila envelope
Tangram pieces cut and placed in the envelopes as described in the Lesson Plan

**Introductory activity**
Students will be introduced to the art of M.C. Escher and the way he used puzzle pieces and mathematics to make wonderful "tessellations."
Students will also be shown a picture of Chinese tangrams made from ivory and given a short history into when they were originally created.
Students will also be given an introduction to what pantomime is and how it will be used in this exercise to communicate as a group and solve the task.

**Core activity**
Students will be placed in groups at tables (preferably 5 students per group) and told to listen to the instructions as they are read to them.
Students will open the large envelope found on their table and, upon direction, open the envelope and begin to non-verbally create the 5 squares of the task.
**Closure activity**

Students when finished will sit quietly and wait for the other groups to complete the assignment. The teacher will check their work to make sure the squares are equal and correct. Students will share how they felt while doing this task and how difficult or easy it was to complete the assignment without using words.

**Assessment**

Students will learn how to create squares by visually and physically combining unusual shapes in various combinations. This will help with their knowledge of positive/negative spaces, form, mathematical computations and will assist in creating a more cohesive learning environment between students in the classroom.

**Teacher follow-up idea**

Additional lesson plans are attached so that the original Tangram pieces can be used to try to create a person, candle and a man. The solutions are provide in the instructions for the teacher. There is also a page of the black shapes the students need to try to create using all 7 pieces given to them.

**Student follow-up activity**

Students will continue to learn about tangrams and shape and form by creating other objects with the 7 Tangram pieces.

**Book /email references**

http://mathform.org
http://tangrams.ca/inner/makeset.htm
M.C. Escher Life and Work by J.L. Locher
M.C. Escher Coloring Book by Harry N.

www.artandculturecenter.org

Lesson plan prepared by Sherie Tengbergen, artist and educator.
Metamorphosis 2  1940

M.C. Escher
1898-1972

Sky and Water
Woodcut
An Experiment in Cooperation

Before class, prepare a set of 5 squares and an instruction sheet for each group of 5 students. The squares should be precut as indicated below and lightly labeled A, B, C, D, or E as shown. Once this is done, mark corresponding envelopes A - E and place the appropriately labeled pieces inside.

- Envelope A = 3 pieces
- Envelope B = 4 pieces
- Envelope C = 2 pieces
- Envelope D = 2 pieces
- Envelope E = 4 pieces

Divide the class into groups of five and seat each group at a table that contains 5 envelopes A-E containing the proper number of pieces and an instruction sheet. Ask that the envelopes be opened only on signal.

Describe the experiment as a puzzle that requires cooperation. Read the instructions aloud as the students follow along, then give the signal to open the envelopes.
Chinese Tangrams

The invention of the tangram puzzle is unrecorded in history. The earliest known Chinese book is dated 1813 but the puzzle was very old by then. One reason for this could be that in China, its country of origin, at the time it was considered a game for women and children. This would have made it unworthy of serious study and unlikely to be written about.

The most popular belief is that the word “tangram” comes from the obsolete word “trangram” meaning puzzle or trinket. You can learn more about this in the ONLINE ETYMOLOGY DICTIONARY which is a fun lace, by the way, if you like words.

Tangrams interest the math inclined with the geometry and ratios of the pieces. You find them used in classrooms around the world to teach basic math ideas in an interesting way.
Puzzling Art - "Cooperation Squares"

Tangram Pieces

Before class, prepare several sets of squares that are made up of the seven pieces described below. (I make each 7 pieced square a different color of illustration board so that I can keep the squares separate).

Once you have the squares cut, you will divide the students into groups and hand out the puzzle diagrams that they are to create. The man, candle and chinese figure all are made using the seven puzzle pieces you created from the square. The three puzzles are included in your lesson packages to be copied onto a sheet that can be passed out to the class. *The puzzles and their solutions are located below for your benefit.
Puzzling Art - "Tangram Puzzles"

Instructions: After the classroom has been divided into several small groups give each group an envelope containing the 7 tangram pieces and a copy of these characters.

The students are to work together to create the following objects. Each object will need to use ALL seven tangram pieces. Remember, none of the shapes can be overlapped!

*a perfect square

*a Chinese character

*a candle

*a man's head

*Note: The teacher will have the solutions to these puzzles!