Shapely Skylines

Skyline (n.) -- the outline of objects seen against the sky; specifically the buildings of a city

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Topic/Theme: Geometry/Measurement

Prerequisite Skills: Knowledge of geometric shapes and their attributes, prior knowledge on meeting criteria in a problem solving activity.

Level: Grade 5

Time Element: 2 – 3 days

NCTM Standards Addressed:

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- Understand measurable attributes of objects and the units, systems, and processes of measurement (to address enrichment activities)
- Apply appropriate techniques, tools, and formulas to determine measurements (to address enrichment activities)

PA Math Standards Addressed:

2.3.5 Measurement and Estimation
A. Select and use appropriate instruments and units for measuring quantities (e.g., perimeter, volume, area, weight, time, temperature). (to address enrichment activities)

B. Select and use standard tools to measure the size of figures with specified accuracy, including length, width, perimeter and area. (to address enrichment activities)

2.9.5 Geometry

A. Give formal definitions of geometric figures.

B. Classify and compare triangles and quadrilaterals according to sides or angles.

E. Construct two and three dimensional shapes and figures using manipulatives, geoboards and computer software.

J. Define the basic properties of squares, pyramids, parallelograms, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, triangles, cubes, prisms, spheres and cylinders.

L. Identify properties of geometric figures (e.g., parallel, perpendicular, similar, congruent, symmetrical).

Math Assessment Anchors Addressed:

M5.B.1 Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.

M5.B.1.1 Select appropriate units (customary or metric) to measure specific attributes of objects.
Reference: 2.3.5.A

M5.B.2 Apply appropriate techniques, tools and formulas to determine measurements

M5.B.2.1 Use appropriate tools to determine measurements.
Reference: 2.3.5.B

Reading Standards Addressed:

1.4.5 Types of Writing

B. Write multi-paragraph informational pieces (e.g., essays, descriptions, letters, reports, instructions).

- Include cause and effect.
- Develop a problem and solution when appropriate to the topic.
  Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs
  (to address enrichment activities)

1.1.5 Learning to read independently

F. Identify, understand the meaning of and use correctly key vocabulary from various subject areas.

1.6.5 Speaking and Listening

D. Contribute to discussions.

- Ask relevant questions.
- Respond with relevant information or opinions to questions asked.
- Listen to and acknowledge the contributions of others.
- Adjust involvement to encourage equitable participation.
- Give reasons for opinions.
- Summarize, when prompted.

Objectives:

- The students will create a skyline using a variety of geometric shapes which meet established criteria.
- The students will identify, compare, and analyze attributes of two- dimensional shapes and develop vocabulary to describe the attributes.
- The students will recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life.
- The students will understand the relationship between geometry and city planning.
- The students will understand such attributes as length, area, and size of angle and select the appropriate type of unit for measuring each attribute (to address enrichment activities).
- The students will select and apply appropriate standard units and tools to measure length, area, size of angles (to address enrichment activities).

Instructional Strategies and Plan (include strategies used to help different types of learners, i.e. auditory, visual, etc.):

- Use of manipulatives
- Graphic Organizers / pictures of skylines
- Cooperative learning
- Scaffolding
- Use of criteria sheet

Procedures:

1. Direct students to use the following website to practice manipulating shapes. (It is an Internet game where students play with tangrams.)

http://matti.usu.edu/nlvm/nav/frames_asid_289_g_2_t_3.html?open=activities

2. Discuss what students discovered as they manipulated the shapes (Smaller shapes can be used to make up larger ones.)
3. Discuss attributes of various geometric shapes that were used and complete a Frayer Model graphic organizer on the board for students to refer to during the lesson. See link if you are unfamiliar with a Frayer model. http://its.guilford.k12.nc.us/act/strategies/Frayer.htm
4. Read Night City by Monica Wellington to introduce the concept of skylines.
5. Discuss skylines that the students may be familiar with. (Teacher may use a chart or word web on the board to facilitate this.)
6. Instruct students that they will be creating a skyline by combining the pattern blocks to meet specified criteria. (See info sheet as well as building code worksheet.) Students may also add buildings of their own design.
7. Pass out Shapely Skylines information sheet and Building Code worksheet and explain.
8. Pass out 11 x 17 white drawing paper, pattern blocks, sticky tack, crayons and/or colored pencils, pencils.
9. Allow students sufficient time to complete their skylines. (While they are working, the teacher should monitor their progress.)
10. After the outline of the skyline has been traced, instruct students to add detail with their colored pencils/crayons to make it look realistic.
11. Pair students and have them trade pictures and lay the pattern blocks over the buildings to replicate the skyline. Encourage dialogue within the pairs pertaining to similarities and differences of the shapes used to create each building.
12. Wrap up discussion comparing/contrasting student skylines with pictures of skylines from selected trade books.
13. Collect project and use rubric to grade each project.
14. Display each project as well as a description of the project and examples of actual city skylines.

Materials/Resources: 2 dimensional shape sets for each pair of students, 11x17 white drawing paper, crayons, colored pencils, sticky tack, pencil, worksheets, tradebook

Interdisciplinary Connections:

- Reading:
  The following trade books will be used introduce and to compare / contrast different skylines:
  Night City by Monica Wellington
  Sky Scrape, City Scape: Poems of City Life by Jane Yolen
  Above London, Above Washington, Above Paris, Above Chicago, Above New York by Robert Cameron

- Technology:
  http://matti.usu.edu/nlvm/nav/frames_asid_289_g_2_t_3.html?open=activities
  (For use in tangram game)

www.library.tudelft.nl/~egram/skylines.html (For background info)

www.pbs.org/flw (For enrichment activities related to the skyscrapers of Frank Lloyd Wright)

www.architecture.org/schoolyards.html (Background knowledge for teachers)

http://its.guilford.k12.nc.us/act/strategies/Frayer.htm (Example of a Frayer model word organizer)

- Other:
  This lesson also includes components that address art and history standards.

Assessment Strategies:

- Formative Evaluation (checking student understanding during the lesson):
  - Graphic organizers
  - Informal observations

- Summative Evaluation (how will it be determined that the objectives were achieved?):
  - Discussion of quantity and type of shapes used
  - Informal peer evaluation of skyline product for satisfaction of criteria
  - Use of rubric to score end product

Correctives/Remediation:

- Students having trouble with shape identification should refer to the shape key.
- Students having difficulty tracing the shapes may work with a partner for assistance with holding the shapes while they trace.
- Monitor students' skylines to make sure criteria are being met.
- Students having difficulty reconstructing peer's skyline could be given *one* shape's placement.
- If problems persist, give *all* the exact shapes that were used in the original building and allow student to place them.

Extensions/Enrichment:

- The students will determine perimeter and area of specific buildings.
- The students will compare / contrast their own skyline with skylines from selected trade books or a peer's skyline.
- The students will create an advertisement to rent one of the buildings.

Special Accommodations: (special needs students)

- Description of the Special Needs Student Selected:

Jimmy is a student diagnosed with Asperger's syndrome. He is above grade level in decoding and fluency in reading. Jimmy loves to read anything that is fact based and quickly memorizes and recites the facts. He has great difficulty with problem solving and inferential thinking. Jimmy has poor fine motor skills and has trouble writing within boundaries and organization of his written work. He has strong rote math facts but has severe difficulty with the organization of multi-step sequences and problem solving. When he is presented with these types of math problems, he crawls under the desk and refuses to come out.

- Accommodations to Use with this Student:

  - Place student with a peer or aide to assist him with this activity.
  - Record all steps on note cards and disseminate as each step is completed.
  - Allow Jimmy to use Manipulites (foam pattern blocks) to help him with his dexterity.
  - Refer to previously mentioned remediation / correctives.