Lesson Title	Topographic Profiles
Length of Lesson	50 minutes
Created By	Corey Ladner
Subject	Geometry
Grade Level	10^{th} – 12^{th}
State Standards	2.a, 3.g,
DOK Level	DOK 2
DOK Application	Cause/Effect, Infer, Interpret, Distinguish, Make Observations, Relate, and Compare.
National Standards	Geometry Specify Locations and describe spatial relationships using coordinate geometry and other representational systems. Use visualization, spatial reasoning, and geometric modeling to solve problems.
Graduate Research Element	In my research, elevation contours on topographic and Digital Elevation Maps are used to determine the boundaries and estimated volume of a proposed reservoir.

Student Learning Goal:
Students will represent and describe data from real-world contexts with graphs, relations, and cross-sectional drawings of prisms, cylinders, pyramids, and cones. This lesson will focus on the use of topographic maps to develop the students' skills of plotting points on a coordinate plane, forming line segments with points, constructing orthographic drawings and 3D models.

National Standards:
Geometry:

- Specify Locations and describe spatial relationships using coordinate geometry and other representational systems.

- Use visualization, spatial reasoning, and geometric modeling to solve problems.

Materials Needed (supplies, hand-outs, resources):
11"x17" graph paper, 12" rulers, pencils, toy cube blocks, topographic map of Starkville, Mississippi Quadrangle, topographic map of Crater Lake, Oregon.

Lesson Performance Task/Assessment:
The students will be assessed on their understanding of the coordinate plane system, orthographic drawings, and 3D models of 2D illustrations. As the assessment, Students will be presented with the task of properly graphing elevation points on a coordinate plane, forming an orthographic drawing with the plotted points, then converting the orthographic drawing into a 3D model. Refer to independent practice for details.

Lesson Relevance to Performance Task and Students:
The lesson provides the students with real world problems involving the practice of measurements and data collection that allows them to infer relations, functions, and patterns of the data.

Anticipatory Set/Capture Interest:
The teacher will capture the students' interest by asking the students:

- Who can tell me how far above sea level you are sitting right now? Columbus, MS: 217ft
- Who can tell me the location of the highest geographical point in Mississippi? Woodall Mountain: 807 feet

Guided Practice:
Students will be introduced to topographic maps, in which the teacher will teach show the students how to read and measure elevation contour lines (e.g. contour interval, major contours, intermediate contours). Using a Starkville, MS Quadrangle topographic map, the teacher will then give a visual demonstration of the steps for constructing a topographic profile (i.e. cross-sectional view of topography).

Independent Practice:
Students will receive a hands-on project that allows them to practice the geometry skills of graphing points on a coordinate plane, drawing an orthographic illustration of an object, and building a 3D model of the object. Students will be given a topographic map of Crater Lake, Oregon, of which they will construct topographic profiles on graph paper to represent a defined cross-section of the map's terrain. Once the students have graphed a representative topographic profile, students will visualize their profiles as an orthographic drawing in order to build a model of the topographic profile using toy cubic blocks.

Remediation and/or Enrichment:
Remediation:
In the case that remediation is needed the student can meet with the instructor for individual tutoring. The student can also be grouped with a higher performing student that understands the lesson.

Enrichment:
In situations where there is complete understanding and performance, the lesson can be extended by having the students use graphical points defined in the topographic profile to locate and calculate the most gentle and steepest slope segments of the represented topography

Check(s) for Understanding:
The teacher will check for understanding by asking the students the following questions:

- How can orthographic drawings and 3D models be applied to real-world situations?
- In comparison to the topographic map, how does the orthographic drawing of the topography influence your visual perspective?
- What are some ways can topographic profiles be useful to people?

Closure:
The teacher will close the lesson by showing students the reality of their independent practice with a powerpoint presentation of Crater Lake (INSPIRE_LP_Ladner_9.4.12_Crater Lake.doc), containing photographs of Crater Lake and information on how the lake was formed. Then, the teacher will explain to the students specifically how graphical drawings and 3-D models can be applied to the field of Environmental Geology when characterizing topography, natural geographic boundaries, and reservoir perimeters.

Possible Alternate Subject Integrations:
This lesson can be easily incorporated into high school algebra and physical science courses.

Teacher Notes:

It is recommended that the teacher use a camera and projector system to show the guided practice demonstration on a projector screen.

Attachments:

INSPIRE_LP_Ladner_9.4.12_Crater Lake.doc