What's Your Perspective on This?

Purpose.
Participants will analyze the relationship between a 3-dimensional model of a " city plot" made up of 3x3, 4x4, or 5x5 squares with buildings of varying heights and the 2-dimensional representations of the different views (front, back, right, left, and top).

Overview.
Participants will use Cuisenaire Rods to build a "city plot "that is on a square grid with dimensions 3 cm x3 cm, 4 cm x 4 cm, or 5 cm x 5 cm. They will work with a partner starting with a 3 cm x 3 cm plot and design a "city plot" filling each square on the grid with a Cuisenaire Rod. Then they will each make a sketch of the front, back, right, left, and top views of the buildings on their plot of property. Next, they will use another group's sketches to build their "city plot" before working on a computer with the *Building Perspective* software by Sunburst Communications.

TExES Mathematics 4-8 Competencies. The beginning teacher:
III.010.C Uses a variety of representations (e.g., numeric, verbal, graphic, symbolic) to analyze and solve problems involving two-and three-dimensional figures such as circles, triangles, polygons, cylinders, prisms, and spheres.
III.010.D Analyzes the relationship among three-dimensional figures and related two-dimensional representations (e.g., projections, cross-sections, nets) and uses these representations to solve problems.
V.016.D Communicates mathematical ideas using a variety of representations (e.g., numeric, verbal, graphic, pictorial, symbolic, concrete).
V.016.E Demonstrates an understanding of the use of visual media such as graphs, tables, diagrams, and animations to communicate mathematics information.

TEKS Mathematics Objectives. The student is expected to:
4.14.D Use tools such as real objects, manipulatives, and technology to solve problems.
5.14.D Use tools such as real objects, manipulatives, and technology to solve problems.
6.11.D Select tools such as real objects, manipulatives, paper/pencil, and technology or techniques such as mental math, estimation, and number sense to solve problems.
7.8.A Sketch a solid when given the top, side, and front views.
7.13.D Select tools such as real objects, manipulatives, paper/pencil, and technology or techniques such as mental math, estimation, and number sense to solve problems. Sketch a solid when given the top, side, and front views.
8.7.A Draw solids from different perspectives.
8.14.D Select tools such as real objects, manipulatives, paper/pencil, and technology or techniques such as mental math, estimation, and number sense to solve problems. Sketch a solid when given the top, side, and front views.

Terms.
Perspective, views, two-dimensional, three-dimensional, square prism, Cuisenaire Rods

Materials.
- Computer projection device
- Computer lab or lap top computers
- Lab Packs (10 per pack) of Sunburst Communications *"Building Perspective"* software
- Cuisenaire Rods
- Centimeter grid paper

Transparencies.
- *What's Your Perspective on This?*

Activity Sheet(s).

- *What's Your Perspective on This?*

Reference.

Vislocky, Elaine S. and Waldman, M.(1994). *Building Perspective: Teacher's Guide*. Sunburst Communications, Inc. Pleasantville, NY.

Procedure.

Steps	Questions/Math Notes
1. Distribute one set of Cuisenaire Rods per group of three to four. Have participants study the relationships among the rods and arrange them from 1 cm in length to 10 cm in length. Explain that they will be using these rods to place buildings of different heights on a 3 cm by 3 cm square grid and looking at the buildings from different views or perspectives. They will make a sketch of the different views of their buildings on this 3 cm x 3 cm "city plot". Then they will exchange their sketches of the front, back , left, right, and top views with another group and construct their "city plot" from these sketches. Their partner group will do the same. Each group will check the building site of their partner group for correctness in arranging the buildings according to the sketches provided. If a group does not place the correct buildings on the site, they can ask their partner group to remove one of the buildings in error. Then the group will try again to get the correct arrangement. After each group has successfully built a "city plot" on a 3 cm x 3 cm grid plots, have them work with a 4 cm x 4 cm grid plot and build a "city plot" . Have them draw the front, right, back, left , and top (on separate sheet of paper) views of their plot. They are to exchange all views except the top view with a partner group. Then each group will use their partner group's four views to build a "city plot". This will be more challenging than the 3 cm x 3 cm "city plot" . After checking the top view with their partner group, a group may ask to have an incorrect building removed. Then it is back to the "planning board" for a new building assignment for a specific square on the "city plot". This process of "guess and check" can be used until the correct "city plot" has been determined.	Ask questions to stimulate participants' thinking about viewing three-dimensional objects and representing them in two-dimensions. *What does an elevation of a home or building represent?* *What will your sketches of the different views of your "city plot" represent?* *How can someone use these sketches to help him/her determine which buildings are on specific squares of the "city plot"?* *Do you think that the front, right, back, and left views of a building will be all you need to determine where to place the Cuisenaire Rods for a specific "city plot"? Why or why not?* *How can you determine which building (Cuisenaire Rod) belongs to which square on your centimeter grid?* *What is the relationship between a three-dimensional "city plot" and its two-dimensional views or perspectives?* *How could you change your 3x3 or 4x4 "city plot" to make it more challenging?* *How could students benefit from this type of hands-on experience in the classroom?*

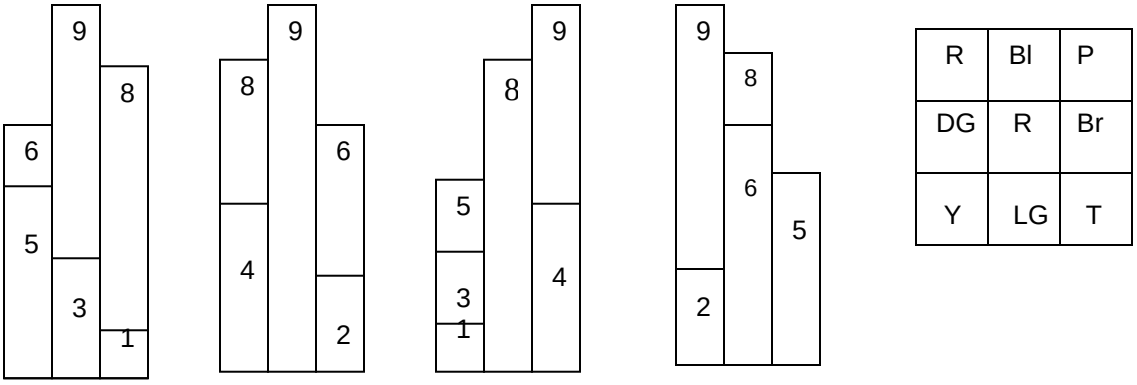
2. Have participants go to a computer lab with *Building Perspective* software by Sunburst Communications, Inc. loaded on the computers or provide them with a *Building Perspectives* CD to load on a laptop computer in the classroom. For more information on this software, go online at www.sunburst.com. A teacher's guide is included with each lab pack or site license. Use this guide book to demonstrate how to use the software on a computer projection device in the lab or classroom. Inform participants that their previous experiences with the Cuisenaire Rods parallels what they will be doing on the computer. They may want to use the Cuisenaire Rods at the computer work station to help them visualize the two-dimensional pictures on their computer screens. Recommend that all start with a 3x3 city grid to become familiar with the software and then progress to the next level(s). Their objective is to complete a correct "top view" of different colored buildings on the city planning grid (right side of the screen). On the left side of the planning grid is a view of the city (front, right, back, or left) accessed by the menu at the bottom of this screen. The buildings range in height from one to nine stories in the same manner as the Cuisenaire Rods used in the modeling. These buildings are color coded by height and do not correspond to the colors of the Cuisenaire Rods used previously. Every square on the city planning grid is occupied by a building. A *"hide building"* option is available on the bottom of the city planning grid to enable one to get a better view of what lies behind a taller building. When one has completed his/her planning grid for a specific "target city", he/she can click on the "compare" option to get feedback on the correctness of the solution. If the top view of the "target city" matches one's solution, the screen lights up with "Congratulations!". If the solution is not correct, the participant can compare each of his/her views with the correct views of the "target city" .	Monitor the participants' work at the computer work stations and ask them questions regarding their predictions about the buildings for the various squares on the "target city" selected. *What made you decide to place that building in that particular square on the planning grid?* *Are there other options for the placement of that building? How do you know?* *When did you decide to use the "hide building" option? How did this help?* *How did you use the Cuisenaire Rods in building the "target city"?* *How did you use the option "Compare Sides" to help you plan your "target city"? "Compare All"?* *How has the option "Demolish Incorrect Buildings" helped in the solution?* *Have you selected a "free building" ? If so, how did this help?* *What are some other strategies that you could use to help you complete your "target city" correctly?* Ask questions to debrief the laboratory investigation. *How did your experience with the computer software "Building Perspective" compare with your initial experience with the Cuisenaire Rods?* *How did your strategies change from a 3x3 level to a 4x4 or 5x5 level? What strategies stayed the same? What strategies changed?* *"Building Perspective" software is designed for grades 4 to adult. How would you use "Building Perspective" software in your mathematics classroom?* *What is the value in using the Cuisenaire Rods and this software in the classroom?* *How would you adapt the activities for your grade level?*

Sample Solution for Modeling with Cuisenaire Rods:

Cuisenaire Rod representations are arranged in order by size and color and are not drawn to scale.

Example of sketches of the front, right, back, left , and top views of a building using Cuisenaire Rods. The numbers on the faces of the rods represent their length.

Front View **Back View** **Right View** **Left View** **Top View**



These views/perspectives are similar to those presented in the "*Building Perspective"* software.

Extension.
Have participants work at a 5x5 level on their own and discuss the strategies that were most helpful in finding a correct solution to the problems presented.