**Science**

**Modeling and Visualization**

**Fourth – Fifth Grade Levels**

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| **Introduction:** | This lesson introduces using the computer to visualize the apparent clockwise rotation of the Earth by modeling the motion of two familiar asterisms: the Big Dipper and the Little Dipper. These asterisms can be found the constellations Ursa Major and Ursa Minor. Polaris, the North Star is in the Little Dipper. The example is a project of the two asterisms that were drawn as part of the K-1 Technology Passport. Students may redraw their examples or use the ones they did when they were younger. The technology makes it easy to try many ideas. |
| **Topic:** | Students write a script to make their drawing turn on the computer screen, change the center of rotation and leave a trail that will look very similar to time lapse photographs of the night sky. |
| **Subject:**  | **Science** |
| **Time:**  | Lesson 1 Two labs  |
| **Description:** | Students will use Etoys scripts to experiment with virtual representations of objects they are studying in science. Modeling allows us to experiment with things too large, too small, too expensive or too alive. The lesson introduces a vocabulary of words common in science, mathematics, and everyday experience. |
| **Vocabulary:** | asterism, Little Dipper, Big Dipper, constellation, Ursa Major, Ursa Minor, Polaris, center of rotation, x- y, axis, y-axis, clockwise, counter clockwise, apparent, actual |
| **Evaluation Criteria:** | Draws the two asterisms: Big Dipper and Little Dipper in proportional relationship to each other on the screenKnows the difference between an asterism and a constellationKnows Ursa Major and Ursa Minor are constellationsMarks the location of Polaris in the Little Dipper Writes a script that turns the asterisms on the screenCan find the center of rotation of the two asterisms Can move the center of rotation to PolarisCan compare the result of adding a ‘stamp’ tile to the turn script and time lapse photography of the night skyExperiments independently and applies basic knowledge and common senseRecords results and states conclusions |
| **Teacher Information:****Etoys Quick Guides:** Click the question mark in Etoys to open the set of tutorials about basic tools and techniques.  | Use Etoys Quick Guides if the lesson mentions unfamiliar tools or techniques. Give students time to read them too.**Etoys Quick Guides:** Click the question mark in Etoys to open the set of tutorials about basic tools and techniques.   |
| **Goals:** | Students use Etoys scripts to make an object move on the screen and explore modeling the apparent motion of the night sky.Students explore applications of positive and negative numbers. |
| **Lesson 1:**Two labsSupplies: Paint ToolsHalo Handles: ViewerSupplies: TextScript Tiles: Turn byScript Tiles: StampScript Tile: Pen UseNavigator Bar: Keep Find Projects | Students and use a sky map to identify the Little Dipper and the Big Dipper. They can find and label Polaris, the North Star. Students draw these two asterisms with one paint tool.Move the center of rotation of the drawing so that it is exactly on Polaris.Type the name Polaris the North Star and put it near the correct star.Open a Viewer for the drawing and make a script with a turn by tile.Add a stamp tile to the script.Make another script with clear all pen trails. Click on the exclamation mark to run a script once.Use the world’s Viewer to change the background color; choose fill and border. Experiment with all four tiles in this category.Discuss whether the turn by value should be a positive or negative number. Students can think about how the Earth rotates, where the sun rises and sets and apply their knowledge. Have students choose positive or negative as they have conjectured/know. Start and stop the scripts. Look at their neighbor’s screen and see if all of the stamped images are moving in the same direction.More discussion may be needed. Research for facts.  Give students time to experiment a variety of values. Keep the project: namePolaris E.G. katePolaris  |
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| **Student Information:** |  |
| **Standards:** | ScienceIllinois State Standards: Late Elementary Science12F. Know and apply concepts that explain the composition and structure of the universe and Earth’s place in it.Explain the apparent motion of the sun and stars. Identify easily recognizable star patterns. 11A. Know and apply the concepts, principles, and processes of scientific inquiry. Formulate questions on a specific science topic and choose the steps needed to answer the question. Collect data for investigations using scientific process skills including observing, estimating, and measuring. Construct charts and visualizations to display data. Use data to produce reasonable explanations. 12.4.47 Define a constellation as a group of stars that form a pattern in the sky. Understand that constellations are useful in the study of space because they help create a map of the sky.Know that locations in the sky are often described using the names of constellations.MathematicsIllinois Performance Standards: Fourth Grade9A, 9B, 7A 3-D and 2-D shapesFind common attributes of shapes by exploring rules and directions.9A Reflection and SymmetryFifth Grade Exponents and Negative Numbers6A, 6B, 6C Order and compare positive and negative numbersAddition of positive and negative numbers Subtraction of positive and negative numbersArt National Standards for Art Education Kindergarten-Fourth Grade Content Standard 6 Making connections between visual arts and other disciplines National Educational Technology Standards (NETS)1. Basic operations and concepts Students are proficient in the use of technology. 2. Social, ethical, and human issuesStudents develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity. 3. Technology productivity toolsStudents use technology tools to enhance learning, increaseproductivity, and promote creativity.Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works |
| **Resources:** | Etoys Help Quick Guides: Open Etoys and click the question mark in the Navigator Bar to open a set of interactive tutorials that introduce basic tools and techniques.[**EtoysIllinois.org**](http://www.EtoysIllinois.org) for projects, tutorials, and lesson plans[**Squeakland.org**](http://www.Squeakland.org)for Etoys software |
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