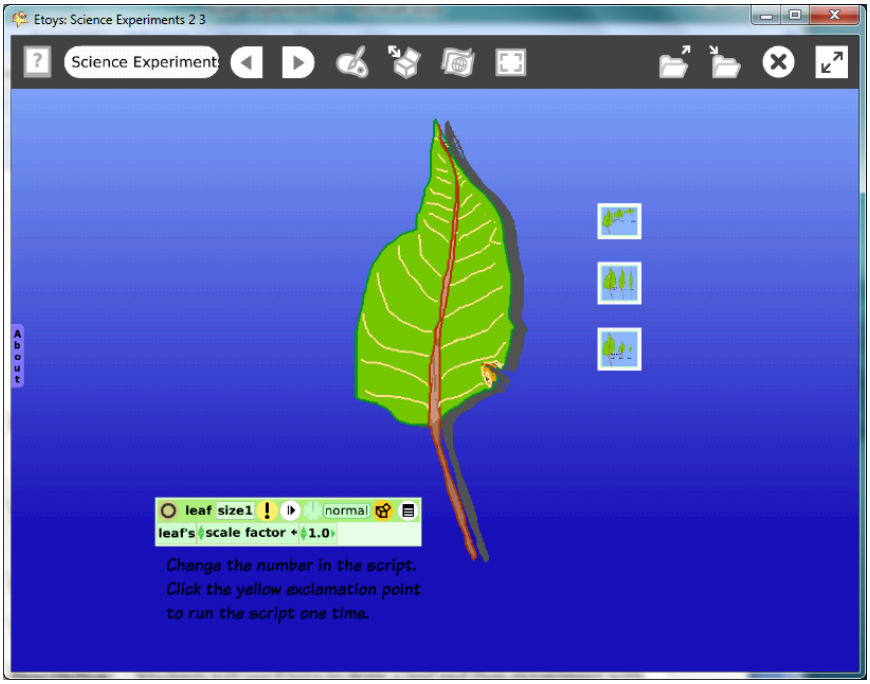
Science
Experimentation Using Etoys
Second - Third Grade Levels



Introduction:	This lesson introduces using Etoys to experiment with properties of a drawing of a leaf. Technology makes it easy to try many ideas, experiment with changes, and make a digital portfolio.
Topic:	Students use Etoys to change the width, length, and scale factor of a leaf drawing. The changes will be labeled and can be compared.
Subject:	Science
Time:	Two labs
Description:	Students will use Etoys to draw a leaf and then experiment with its size and proportions. The project can include drawing a leaf or it can use one done previously in an earlier Technology Passport lesson or by turning over a new leaf. Students experiment with variables of location, size and proportion. These tile based variables can be combined and recombined to demonstrate how combining even a few variables

	will dramatically increase the number of possible results. The lesson introduces a vocabulary of words common in science, mathematics, and everyday experience.
Vocabulary:	leaf, blade, veins, margin, edge, petiole, texture, line, shape, size, width, length, position, x-axis, y-axis, heading, scale factor, increase, decrease, proportion, design, pattern, duplicate, copy, above, below, beside, before, left, right, upper, lower, edge, near, up, down, between, almost, exactly
Evaluation Criteria:	Draws a leaf from two viewpoints: face and side view. Labels leaf parts: blade, veins, margin and petiole. Labels leaf parts in distorted views. Uses tiles from Etoys Geometry category: length, width, and scale factor. Experiments with leaf proportions using the yellow halo handle. Experiments independently and records results.
Teacher Information: **Etoys Quick Guides:** Click the question mark in Etoys to open the set of tutorials about basic tools and techniques.	**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.
Goals:	Students experiment with tiles in the Geometry category and observe the effects of changing the width, length and/or scale factor of a leaf drawing. They will record changes and label them. Students compare the effects of changes in their project and by other students nearby.
Lesson 1: Two labs	Students work independently after the tools have been introduced. Show one example; give students time to experiment and document their results. Students should include information about what they changed and by how much. Another person following their experimental trail

	should be able to reproduce their results.
Navigator Bar: Keep Find Projects	Open the leaf project from the K-1 Technology Passport or draw a new one to experiment with in this lesson.
Halo Handles: Viewer	Open a Viewer for the leaf drawing, click on basic to open a menu of categories and choose geometry.
Script Tiles: Width Length	Make a script with the tile for leaf's width. Use the arrows by width to change from the arrow ← to increase or decrease. Type in a new number that is half the value showing. Use other decimal values too. Click the exclamation point to run the script.
Supplies: Text	Label the results of each change and keep examples of experiments.
Supplies: Grab Patch Tool	Get a Grab Patch tool make a copy of experiment results. Include text before using the Grab Patch tool. It makes an exact copy but allows the original to be recovered and used for another experiment.
Halo Handles: Collapse	Collapse the new copy and move it to begin a gallery of examples. Click inside the small version to expand it again. The example project shows three changes but there are many more possible changes. Give students time to experiment and document their results. Publish the project. Use Publish As, rename it: NameLeafExpDate
Extend Lesson 1	Ask students to use their leaf and make combinations of changes to the leaf and leave it on their screen for others to see. They should notate the exact changes and hide them under the leaf. Ask students to look at projects done by other students in the class and to analyze what effects have been applied and estimate the amounts of change.

	Discuss: Is it possible to change a real leaf's dimensions. How can we experiment with very large and very small things and very alive things? What are the advantages and disadvantages of experimenting with the computer?
Student Information:	Show students example projects if an LCP projector is available or use a computer and show examples to small groups.
Standards:	Science Illinois State Standards: Early Elementary Science 11A.Know and apply the concepts, principles, and processes of scientific inquiry Describe an observed event Develop questions on scientific topics Collect and record data for investigations Arrange data into logical patterns and describe the patterns Compare observations of individual and group results 12A.Know and apply concepts that explain how living things function, adapt, and change Categorize living organisms using a variety of observable features Mathematics Illinois Performance Standards: Second Grade 9A, 9B, 7A 3-D and 2-D shapes Find common attributes of shapes by exploring rules and directions. Third Grade 7A, 7B Use appropriate units for measurement and recognize sensible measurements Art 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 issues Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity. 3. Technology productivity tools Students use technology tools to enhance learning, increase productivity, 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** for projects, tutorials, and lesson plans **Squeakland.org** Etoys software
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