

Flying Toys

Among Davinci's many concerted observations of nature, he gave particular attention to the flight of birds. Isaacson mentions that DaVinci produced more than five hundred drawings and thirty-five thousand words scattered over a dozen notebooks on this topic (Isaacson, p 181.) Eventually, he did make some drawings for various kinds of flying machines. Following DaVinci's example, students can carry out a design engineering project by observing the flight of birds and then use their observations as data for crafting a flying toy.

Modern aircraft are sleek in form and could be thought of as sculptures: from a spy plane's clean, triangular design, to various fighter jets with their swept back wings-- each are striking visual images. Making models of airplanes could be in some ways be a way of making sculptures.

Common design engineering projects include designing paper airplanes or similar kinds of flying toys. There are various commercial toys which are propeller driven, and there are some that are gliders launched by hand. In the outline below, I will mention activities that are part of a curriculum project sponsored by the Society of Automotive Engineers. I was involved in testing the activities with a team from the Educational Development Center. The overall goal was to have middle school students develop an understanding of the design process by going through the process themselves. Students were introduced to the project via a letter from a fictional publishing firm, requesting a proposal for a book of designs of flying toys. After testing and experimenting with a preselected set of materials, the students put together drawings of their designs and crafted a formal presentation to deliver to the school about their findings. For a detailed description of the activities, a curriculum guide can be ordered from the Society of Automotive Engineers.

Art activities associated with this project could involve the students observing birds in flight, making drawings of flying birds, playing around with different designs of airplanes, making a hanging sculpture that incorporates shapes of birds or planes. The art teacher can also help the students in their final drawings for the presentation.

ART

Observing the flight of birds

Students observe flying birds either on the school grounds or as a homework assignment.

The drawings can focus on the flight paths of birds and observations on how the birds use their wings.

Abstract drawings of flight path of birds.

Imaginary flying things

Students can draw and draft pictures of imaginary animals and machines.

The art teacher can help students paint and add decorative features to their final prototype.

The art teacher can help students in their preparation of their final report in the drawing of their final prototype.

ENGINEERING DESIGN

Review the design challenge

Students review the letter from the fictional publisher and develop a plan.

Design and test a preliminary model

Students play around with a set of materials-Styrofoam sheets, modeling clay, balsa wood sticks, tape. In this stage there is an open exploration as they try a variety of designs and methods of launching. These efforts are discussed and the findings are consolidated into a common design which will be systematically tested.

Experimenting with a standard model

Students work with the standard model, launching it with a rubber band attached to a meter stick, measuring the distance traveled. They test different variables:

- Placement of the wing on the body of the glider.
- Vary the weight of clay on the nose of the plane.
- Test different arrangements of the tail.
- Test different types of main wings.

Final Model

Students return to their original designs and modify it based on their findings from the experiments to arrive at a final prototype.

They prepare a final report which includes scale drawings of their model.

They do a formal presentation of their findings showing the drawings and the report.