A Design Engineering Project

Windmills and Wind sculpture

Contemporary wind mills have a scale and shape that has an aesthetic appeal. Their large size and slow movement can mesmerize people of all ages. Even older wind mills, such as the ones in heavily populated places like Holland, have a special attraction. A design engineering project can be carried out with students in both science and art classes, drawing on the intrinsic appeal of windmills: using simple materials, students can make a model windmill of their own. Students are challenged to work with a limited set of materials to meet a specific goal. In the project outline below, I suggest simple materials such as index cards, dowels, plastic cups, string, and some other simple tools. A fan is the wind source.

After their initial experiments and model-building, students will have gained some understanding of how moving air acts on different kinds of windmill arrangements. They can then apply their understandings to the construction of different kinds of wind sculptures. These would be indoor pieces activated by a fan. Different materials other than those used in the engineering project can be added. This project can be a model for an outdoor sculpture, or a small sculpture that hangs from the ceiling, or one that stands on the table activated by the moving air from a fan.

Materials: Index cards, Dowels or skewers, plastic cups, a metal or plastic tube, tape, fan, nails as weights, string.

ART	ENGINEERING DESIGN
Wind sculptures Given their findings and experience constructing models in the science class, students can try their hand at making wind sculptures. They can check the internet to see different examples and what might be possible. The set of materials can be different from the one in the science class, but should be limited in order to challenge and spur their creative thinking. Some simple wind sculptures could be made for the outdoors.	**Making a model windmill** Students are shown the materials and challenged to construct a model windmill that turns easily in a fan's current. **Refining the preliminary model** Students are then challenged to add a cup on a string and connect this to their model. What is the best arrangement of the arms on their model that will lift a cup of nails from the floor to the model? What is the maximum number of nails that can be lifted? **Experimenting with variables** Students test different arrangements to see what is the maximum number of nails that can be lifted with each arrangement. They can test: Number of arms Size of the arms Orientation of the arms. Drawing on all the previous experiences, students make a final prototype.