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Wind-Energy Education: Making Paper Windmills

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Wind is a limitless source of energy. Large wind turbines such as the familiar 100 meter propeller-type generators are the symbols of environmental consciousness. The
wind turbine (i.e., the 'windmill') is a key element in wind energy use. Students use paper models to learn about the types of windmills.

The oldest known windmill is a Persian windmill of Panemone design that has a vertical axle containing four to eight fabric sails. Holland is famous for using windmills to harnessing wind energy for milling grain into flour; hence the term 'mill' in 'windmill'. Each type of windmill is designed and used for different purposes. Multi-braded windmills are used to pump aquifers in western America; whereas the sail-wing type windmills are popular throughout the Mediterranean. We teach the benefits of specific windmill designs using paper models.

We have developed more than ten different types of paper windmills. First, they are classified into horizontal- versus vertical-axis windmills. Second, they may be classified into lift- versus drag-force type. Third, we may classify windmills by their objectives; such as to generate electric power, to pump aquifers, to milling grain or to cut timber. Students learn the characteristics of each windmill type by making and rotating paper models. Students will find that the 'ease of rotation' depends on the type of windmill; and why a windmill does rotate and how we harness the wind.

There are several hidden curriculums for students. First, they will develop their basic modeling skills such as cutting and gluing; Second, they will use their artistic sense to color the windmill; and third, they will learn about windmills' history and their impact on society. Spinning windmills are also entertaining to students. In our workshop, participants will make several kinds of windmill models and experience our proposed wind-energy lessons.