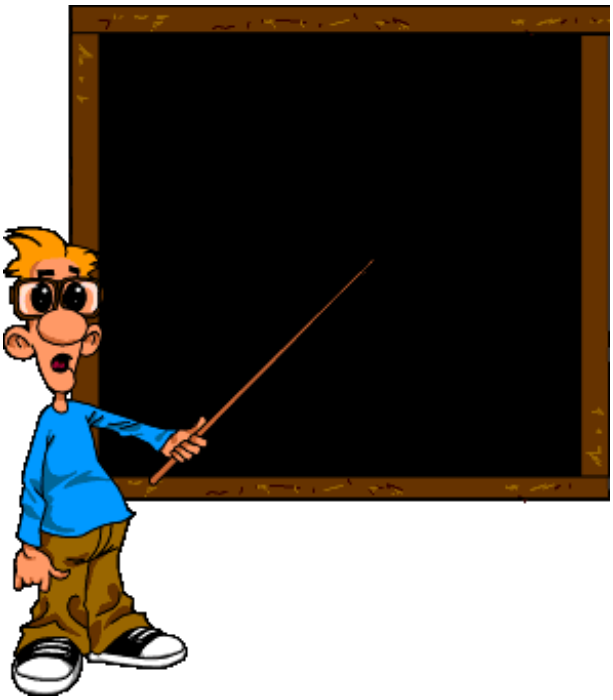
Teacher's Guide for WIND WITH MILLER



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Download the teacher's guide as a pdf document

1.WIND WITH MILLER

Target Group

"Wind with Miller" was developed for students at the age of 12-14 years and up as the primary target group. However, use is not restricted to schools. The web site is an easy-to-read introduction to wind power. There are many possibilities to plumb the depths with activities as well as a supplementary 'grown-up' web site consisting of about 200 pages dealing with wind power at an upper secondary school level (US: high school).

How Does It Work?

The starting point of the web site is the question "How does it work?" The curiosity about how things and processes in everyday life - in this case wind turbines - actually work, can be a very useful driving force to learn more about technology and natural science. Not necessarily because the students are

interested in the subjects, but if you focus on satisfying their curiosity to understand and explain their surroundings, it is hard to avoid learning some physics and mathematics in the process.

The web site provides the opportunity to begin answering some of these questions, however, it is not the intention that the web site should stand alone. The web site provides the material for the students to learn for themselves - using experiments, studies and measurements on small, self-built wind turbines and through the use of extensive simulation tools for large wind turbines.

The purpose of the web site is not to educate junior engineers but to provide an insight into how the machines and different gadgets of everyday life work and how they are made. Most of the activities concerning aerodynamics are just as relevant for aeroplanes, helicopters, sailboats, wind turbines, and even ship propellers and water turbines.

Focus on Physics and Technology

"Wind with Miller" focuses on the physics and technology of wind power. In an introductory "Crash Course" we go through the different components of a wind turbine, their functions and elements of basic meteorology as well as the necessary terminology.

After this you can choose freely from a series of modules treating the function of the components of the wind turbine as well as chapters on the installation of wind turbines, how wind is created and how to find the best site for the wind turbine (avoiding obstacles etc.).

Several Ways to Approach the Subject

The web pages of "Wind with Miller" abstain from dealing with such issues as environment, pollution and other social aspects. Instead we refer you to the web and other literature on the subject mentioned in the teacher's guide. The primary reason not to include these topics in the web site is that they are more suitable for joint discussion in class. The web is not capable of everything - when it comes down to it, a debate on social values should be a dialogue between people, not with a machine.

Assignments and activities in the teacher's guide encourage interdisciplinary use of the web site - for instance in subjects such as math, woodwork, English and history, but also subjects not included on the timetable like media and technology. The teacher's guide also encourages the students' own research on the Internet through links in the teacher's guide.

Multilingual

The web site "Wind with Miller" is part of the large www.windpower.org web site, which exists in five languages. This provides the possibility to perhaps include the web site in language teaching.

Visual Approach

The web site is not a text accompanied by illustrations, as it is still the standard of most educational material on the web. On the contrary, drawings and animations form the framework of a series of short texts. Furthermore, because we value the possibility to see the things in real life, we have included several commented photo galleries in the web site.

Interactivity

The web site requires that the user her/himself is active in the many short sequences. The text is presented in short paragraphs

so they remain synchronised with the drawings and animations that appear on the screen. Therefore the content is more extensive than the impression you get by counting the pages, as a single page often consists of three to four steps.

Activities

The web site contains ideas for practical activities as well as a virtual model of a wind turbine, which is built up gradually in a process where the reader is given the opportunity to experiment with the model. The model makes it possible to calculate the production of a real, large wind turbine at different wind speeds, the variation of the wind speed depending on the height of the tower, and the roughness of the landscape. (The model can also be used by upper secondary students).

The activity suggestions and the virtual wind turbine model on the web site can be good starting points for using the web site as a dictionary where one topic is dealt with at a time instead of letting the students have long reading sessions.

Teacher's guide

The teacher's guide and the activities kit are available both on the web and as an Adobe Acrobat (pdf) document, i.e. a printed full-size book with the right typography, which can be downloaded from the web site. We recommend that you download this publication, although the web edition has the irrefutable advantage that it makes it easy to follow links to relevant sites on the Internet. Therefore you will probably end up using both editions in actual practice.

At the moment, the teacher's guide is not fully developed, but it will be regularly supplemented, especially with background information for the activities on the web site.

E-mail and telephone support

The Danish Wind Industry Association will answer technical questions via e-mail and provide assistance on the use of the web site over the phone.

Financing

The Danish Ministry of Education and the Danish Energy Agency has financed the development of Wind with Miller together with The Danish Wind Industry Association. The DWIA handles the running and further development of the web site. The web site is non-commercial and contains no advertising.

2.Technical checklist - before you start

Video and 3D panoramas

In order to see video (from the wind farm at Middelgrunden) or 3D panoramas (from a wind turbine factory), you will need to install a so-called QuickTime 'plug-in' (a little helper programme) for each computer. To check if this plug-in has already been installed, look at the page http://www.windpower.org/en/test/rosesk.htm. The necessary QuickTime plug-in can be downloaded for free from Apples web site.

Try it yourself

The teacher should go though the web site on his/her own hand before the students start using it. It will frustrate the students if the technicalities do not work - or if the teacher is unable to help

with the orientation on the web site.

Check that the site runs on all computers

Check that all the computers which will be used by the students actually can run the web site. This is done by opening the first page of Wind with Miller in a browser. If the browser is too old or the monitor configuration is not right, the page will notify you of this by itself.

As a minimum a version 4 of the browsers Netscape Navigator or Microsoft InternetExplorer is required. If some of the computers' browsers are too old (from 1997-1998) it is necessary to install new ones. They can be downloaded for free from the two companies Netscape and Microsoft. The screen resolution has to be 800 pixels across (or more). Otherwise the pages cannot be viewed properly.

Please notice that the new version of Netscape (Netscape 6) is defective, so practically all new web sites are displayed incorrectly. Do not download this browser until you are notified by e-mail (from the download service of the site) that it can be used.

Help!

Should all fail, call the Danish Wind Industry Association on +45 3373 0330. It is always easier to explain the problem and receive advice when you are sitting right by the computer using the web site. If you wish to contact us by e-mail instead, please put down your telephone number (and at what times we can reach you) as it can be difficult and very time-consuming to assess the problem without direct communication.

3.Professional Hints

Use More...

The "More"-button is the best tool for increasing the professional background for "Wind with Miller", but there is also a table of contents for the Guided Tour of the grown-up web site as well as a search engine. It can also be a good idea reading the FAQs (Frequently Asked Questions) about wind power.

Help via e-mail

The DWIA answers more than a thousand questions on wind power a year - usually the same day as the question is received. Everyone is welcome to send us questions via e-mail.

4.Ideas for Improvement

Write to the editors

All good web sites are regularly updated. So is this one. Send an e-mail with ideas for improvement, suggestions for working sessions, experiments, supplementary materials etc.

The editors are particularly interested in the questions asked by the students. They are often a source of inspiration for further development of the material.

5.Copyright

Copyright

Copyright is not just for books, films, and music, it also applies to web sites on the Internet. The copyright applies no matter whether the material is used for commercial or non-commercial purposes, including educational purposes.

Reproduction and publication of the material on this web site - in its entirety or in part, on the Internet, in print, or any other media - is prohibited. It is a good idea also to teach the children to respect copyright.

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6.Useful links and literature

Background material on and activities related to aeroplanes, aerodynamics etc.

The NASA Education Program has a large collection of educational material on aeroplanes etc. including web sites, activities, teacher's guides etc. at a high pedagogical and professional level for all age groups. In particular we recommend Aeronautics, a 130-page teacher's guide (in pdf format) aimed at a slightly younger audience than our target group.

The Wind: Our Fierce Friend from the Franklin Institute Online is an award winning web site on wind energy, again addressing a younger audience. It contains a couple of activities and the fundamental pedagogics are in order. The website is mainly a teacher's guide, but sadly it is somewhat outdated web technically speaking (has not been updated since 1996).

How does it work?

Learning with everyday life as a starting point

HowStuffWorks.com is a very extensive website with explanations for virtually everything, including how for instance a boomerang or an aircraft works. The website is generally of a very high professional quality, it is well illustrated and has many links to in-depth articles other places on the web. The articles are at an upper secondary school level.

How Things Work is a smaller, yet also very thorough web site of a high quality intended for teaching physics at a university level.

Mad Scientist Network answers questions on natural science and has a large archive of responses at an upper secondary school level.

Construction drawings for wind turbines

Picoturbine.com has drawings and building instructions (in pdf format) for a small Savonius wind turbine including generator. It only takes about an hour and a half to build it. The building instructions come with a small teacher's guide.

Do you want to go somewhere else?

Search

The search engine requires an Internet connection to work