E-LEARNING TUTORIALS USING REMOTE SENSING IMAGERY FOR HIGH SCHOOLS AND UNIVERSITIES

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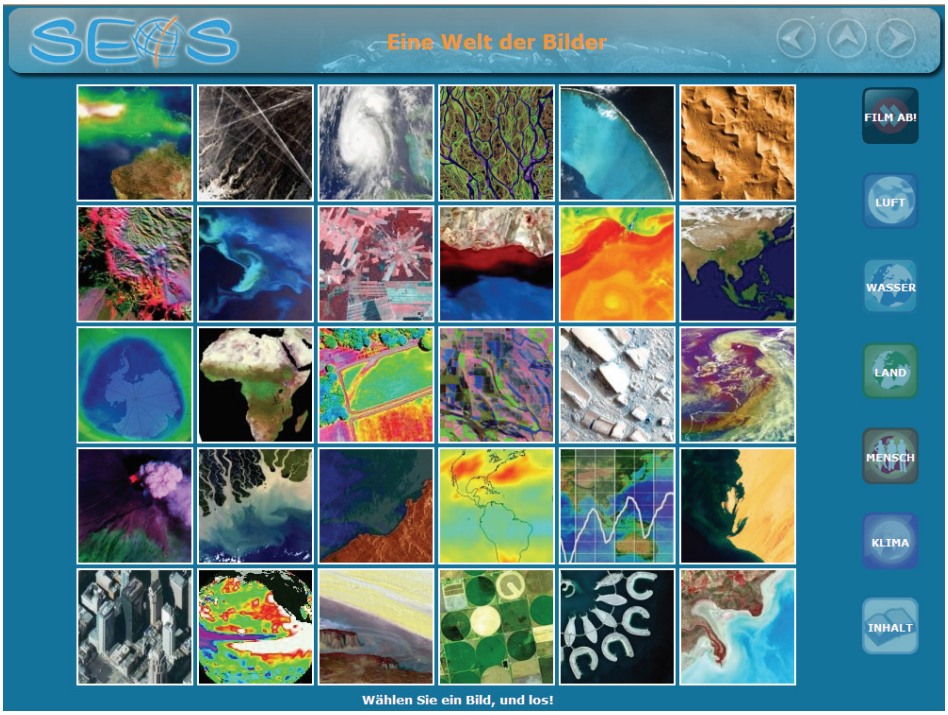
The EU-Project SEOS (Science Education through Earth Observation for High Schools) is an effort to enhance the sensibility of high school students towards their environment and encourage interest towards natural sciences with the help of remote sensing images of the Earth.

Astronaut Karen Nyberg looking at the blue planet while on board the International Space Station. Courtesy: NASA/Johnson Space Center.

A consortium of European project partners worked together to realise sixteen learning tutorials which were tested in different partner high schools in Europe. Together with the partner high schools, a strong emphasis has been placed on proper didactical methods for conveying the contents of the tutorials. The learning material is applicable for different teaching methods and group work/ projects. Worksheets containing questions about the topics encourage students to learn and explore independently.

The tutorials cover a wide array of topics ranging from remote sensing of the atmosphere, ocean and land surface to current environmental issues such as pollution, natural disasters, land use change and climate change (global warming). They can be used in the subjects Physics, Biology, Geography, Mathematics and Technique, focusing mainly on the inter-disciplinary nature of the theme or topic being addressed. The tutorials are available in English and German, and some of them also in French, Dutch, Greek, Portuguese and Arabic versions, so they can also be used in language subjects.

The tutorial „A World of Images“ features selected satellite images showing different facets of the Earth which enable young students to appreciate the beauty of our home planet as seen from space. A virtual spaceship takes the user to a flight through the Milky Way galaxy, passes by the planets of our solar system and finally reaches the planet Earth which opens up into a mosaic of colourful images. A click on an image opens up explanatory texts with links to related tutorial pages. Intriguing questions at the end of the text can be dealt with during lessons or given as homework.



A mosaic of satellite images in the tutorial A World of Images, showing an overview of all themes.

For Geography and Biology subjects, there are tutorials dealing with the topics *Conservation and Protection of World Heritage, Coral Reefs, Land Use Change, Agriculture and Natural Resources Management*, the *Global Positioning System GPS*, and *Ocean Colour in the Coastal Zone*.

The latter contains cross references to Physics for which there are tutorials dealing with *Earth Spectra, Ocean Currents,* and *Laser Remote Sensing*. For Mathematics subject, we have the tutorials *3-D Models, Time Series Analysis,* and *Classification* and *Modelling.* These tutorials include also pages for advanced readers and can thus be used in university.

Nutrients for algae growth are abundant in the deep oceans where daylight is scarce. In the near-surface layers, this is the other way around. The role of wind and ocean currents is explained, and Physics as a driving factor of biological processes.
Courtesy: National Oceanographic Laboratory, Southampton, UK

Aside from being used in schools and universities, several tutorials such as *Agriculture, Ocean Currents* and *Marine Pollution*, are also applicable for use by the government and industrial sectors within the framework of the Copernicus-Programme (Global Monitoring for Environment and Security“ (http://www.copernicus.eu/main/overview/) of the EU/ESA.

Project website: http://www.seos-project.eu.