Sentinels' Eyes Enhance STEM Education

Digital and Interactive Applications of Remote Sensing in School Lessons

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1. Introduction: Earth Observation in School Lessons
2. Implementation: Satellite- and ISS-borne EO
3. Update: Sentinel 1-2 data
4. Outlook
Introduction:
Earth Observation in School Lessons
Introduction
Integration of Earth Observation in Schools – State of the Art

Teachers are interested and motivated
Focus on Geography, not on STEM

No mathematical or physical analysis
Visual image interpretation

Too complex, too much time, no software
Easy and comprehensive access is needed

Working with embedded EO imagery
Learning portal containing interactive teaching materials
Introduction
Comprehensive Approach of EO Integration

Real-World Problem

Interdisciplinary

Background Information & Tasks

Interactivity

Interactive Tool

Solution

Intermediacy

Maths

Physics

Biology

Geography
Implementation:
Satellite- and ISS-borne EO in Schools
Interactive teaching materials for 5 STEM subjects (Flash-based)

Introductory units dealing with earth observation in general

Specialised research tools on remote sensing and image processing

Analysis tools for weather monitoring, classification, and change detection
Implementation

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- Mathematics
Implementation

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- Informatics / Computer Science
Implementation
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- Physics
- Classification
Implementation
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- Biology
- NDVI tool
- Swipe tool
Implementation
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- Geography
- Classification
Implementation

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- Augmented Reality Apps
### Implementation

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<table>
<thead>
<tr>
<th>FIS modules by subject</th>
<th>German (English)</th>
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<tr>
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Implementation
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Our Info Box on Remote Sensing

Satellite images are not all the same. In our Info Box on remote sensing you can find out about the differences and you can also discover how to predict the weather and what is meant by a "bit".

Animations and illustrations help you understand the physical background of remote sensing. What is more, they also provide an easily accessible introduction to sensors such as radars, to the manifold methods of analysing digital images and to the fields of application of remote sensing.

You can choose between a beginner's and a more advanced version of the Info Box:

Info Box for Beginners

The beginner's version of the Info Box is primarily addressed to younger users. Here, you can find out more about the physical basics and the fascinating characteristics of remote sensing and satellite images.

Info Box for Professionals

The advanced version of the Info Box is addressed to users looking for more than just an overview. Here, you can find detailed information on electromagnetic processes, on sensors and methods of analysing digital images, as well as on the manifold fields of application of remote sensing.

EO Open Science
September 29th
Frascati, Italy
Implementation

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- **NDVI Calculator**
  - The NDVI is an index indicating the vitality of vegetation on the surface of the earth by means of red and infrared wavelengths. In this example, the NDVI can be calculated from satellite images acquired before, during and after the 2007 Greek forest fires. For further information on the function of the NDVI in remote sensing of vegetation click [here](#) or check out the teaching unit "Traces of Fire".
  - [starten](#)

- **Image Difference Calculator**
  - This tool serves to calculate the modification of two images of the same extract. In the emerging image, the modification is displayed in white. This example shows images of Las Vegas between 1975 and 2005. Aside from calculating them, you can also put the images on top of each other and you can compare them visually.
  - Find out more about the calculation of difference images in the teaching unit "Traces of Fire".
  - [starten](#)

- **Image Classification: Creating Thematic Maps Online**
  - This tool makes it really easy to transform a satellite image into a thematic map. For this purpose, all sections of the satellite image similar in colour are marked with the help of three colour controllers (red, green and blue) and a tolerance controller. These sections can be coloured and linked to thematic information (e.g. water, forest or settlement) in order to create a map that features land-cover classes.
  - The unit "From Satellite Images to Maps" picks up on the RGB classification. If you want to find out more about colours and classification, we would like to encourage you to take a look at the info box.
  - [starten](#)

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**Teaching Materials**

- curricular topics & RS techniques
- saving progress
- class management
Update: Sentinel 1-2 data
Types of RS data to be replaced:
- Worse spatial resolution than Sentinel
- Outdated data
- SRTM
- Mostly Landsat

Types of RS data without need to replace:
- Better spatial resolution (e.g. RapidEye, Aerial data)
- Large composites (e.g. all of Germany)
- Specific event data before Sentinel launch
- HD thermal data
Update

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- Data with higher spatial resolution
Update
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- Updated time series
Update

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- More current data
Update
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- Easier classification based on new data
Outlook
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- Flash based learning units to be transferred in HTML5/JavaScript
- Sentinel-1 data to replace SRTM data
- Sentinel-1-based unit on Interferometry
- Sentinel-3 thermal data for physics topics
- Virtual and Augmented Reality
- Mini-MOOCs
Thank you!

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