Understanding EO – MOOC by MOOC

New Approaches to Introducing Remote Sensing and European Earth Observation in Schools

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Outline

1. Activities in teaching basic EO-knowledge
2. eLearning Approaches and Material
3. Learning Videos for Schools and MiniMOOCs
4. Producing Content for MiniMOOCs
5. Conclusion and Outlook
Activities in teaching basic EO-knowledge

e-Learning material and online portals

- Interactive Lessons for Physics, Math, Geography, Biology, Computer sciences
- Information on RS basics compiled with pupils in mind
- Live and archived EO videos from the ISS
- Lessons on EO and Space using classic material as well as AR and interactivity
eLearning Approaches and Material
Interactive Lessons and their “evolution”

Interactive Lessons
Curriculum based material for direct use in STEM

RS-functionalities in interactive lessons

Apps / Augmented Reality

Virtual Reality
eLearning Approaches and Material
Open learning resource on RS their “evolution”

Open learning resources
Information on RS basics compiled with pupils in mind

Info Box
Infos on RS with Interactions and illustrations

Remote Sensing Systems

Learning Videos / MiniMOOCS
Short clips on RS Basics and applications that can be combined into short courses
What is a MiniMOC / MOOC?

**Challenges**
- Need of staff for support
- Hard to fit into schedule of school curricula
- No digital material for secondary school level education
- FIS LMS not capable of fully hosting MiniMOOCs

**Three main prerequisites**
- **Course Characteristics:**
  - Learner is guided by a tutor
  - Sequencing (Chapter 1, 2, 3...)
  - Outcome evaluated
- **Digital Learning Content:**
  - Course makes use of mainly videos
  - Also quizzes, interactions etc.
- **Learning Environment:**
  - Courses are hosted online on a LMS (Learning Management System)

**Solutions**
- As open as possible (no fixed dates)
- Bridging gap between OER and MOOC
- Not restricting the use to schools only
- Creating it
- Other Hosts (EO-College)
- Concentrating on Material that can be compiled to a MOOC on any LMS

EO Open Science and Future
EO 2018
ESRIN - Frascati
Producing Content for MiniMOOCs
Producing content for multiple purposes

Introduction to the Electromagnetic Spectrum

Mini-MOOC Introduction to RS
1. 
2. 

Mini-MOOC Hyperspectral Imaging
1. 
2. 

Single resource for physics lessons with RS as a hook or example
Producing Content for MiniMOOCs
Production Process

Finding the topic

School curricula
3.1 Prozessebezogene Kompetenzen im Fach Physik
Die prozessebezogenen Kompetenzen beschreiben die Handlungskompetenzen von Schülerinnen und
schülerinnen im Fachbereich. Sie werden auf der Grundlage der Curricula und Leitbildern entwickelt.

RS Topics
EM spectrum
infrared
indices
Radar RS
resolutions
desertification
Food Security
Climate Change

Texting and Storyboarding

Production

Audio
Video
Producing Content for MiniMOOCs Visual Examples
## Production Process

Production Plan and MiniMOOCs

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<thead>
<tr>
<th>Introduction to EO</th>
<th>Advanced EO</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Images from Space</td>
<td>Radar Remote Sensing</td>
<td>Remote Sensing in Land Use Land Cover Changes</td>
</tr>
<tr>
<td>The Electromagnetic Spectrum 1</td>
<td>Images From Microwaves</td>
<td>Remote Sensing in Climate Change</td>
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<tr>
<td>The Electromagnetic Spectrum 2</td>
<td>Hyperspectral Remotes Sensing</td>
<td>Detecting Mass Movements (Interferometry)</td>
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<tr>
<td>Infrared</td>
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<td>Remote Sensing of Vegetation</td>
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<td>Spectral Resolution</td>
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<tr>
<td>Radiometric Resolution</td>
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<tr>
<td>Spatial and Temporal Resolution</td>
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</tbody>
</table>

**MiniMooc on:**

**Details of remote sensing:**
- **RS:** Remote Sensing
- **Space:** Satellite
- **vegetation:** Plant growth

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Conclusion and Outlook

• Interactive learning materials as well as the open learning resources (InfoBox) are going to be updated and extended by Learning Videos and MiniMOOCs

• Most Important production paradigms are reusability and modularity

• Learning Videos can be used as a single learning resource or combined to MiniMOOCs.

• In the long run, videos along with additional interactive material should define a pool of learning resources which can be used in MOOCs as well as other learning arrangements.
Thank you!

www.fis.uni-bonn.de
www.columbuseye.uni-bonn.de
e-Learning Approaches and Material

two major types of materials:

<table>
<thead>
<tr>
<th>Material Type</th>
<th>What does it do?</th>
<th>How does it do it?</th>
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</thead>
<tbody>
<tr>
<td>Interactive Lessons</td>
<td>Problem solving lessons with RS</td>
<td>Framework for RS functionalities embedded in a e-Learning environment. Programmed</td>
</tr>
<tr>
<td></td>
<td>methods</td>
<td>in Flash / Actionscript.</td>
</tr>
<tr>
<td>Open Learning Resources on Remote</td>
<td>Information on RS basics compiled</td>
<td>The “Info Box“ Text accompanied by illustrations and interactions. (again</td>
</tr>
<tr>
<td>Sensing</td>
<td>with pupils in mind.</td>
<td>programmed in Flash / Actionscript)</td>
</tr>
</tbody>
</table>
Updating the Material / Learning resources
Producing content for multiple purposes
Producing Content for MiniMOOCs
Producing content for Mini-MOOCs
Updating the Material / Interactive materials
Updating with Sentinel Data - The “easy” part
Updating the Material / Interactive materials
Updating with Sentinel Data - The “easy” part
Updating the Material / Interactive materials
Changing from Flash to HTML5 / JavaScript – “The hard part”

Using backend services for RS

Frontend

RS Browser Application

request

display

Backend

image request

send

process

image data

Server with RS Data and processing service

image data

Upsides:
• No need for a RS library as they already exist
• Working with original data
• Prooven concept
• Fast processing

Downsides:
• Not as versatile
• Restricted to online use and fast Internet
• Maintenance of server
• Severe impact if service fails
Updating the Material / Learning resources
Learning Videos for Schools and MiniMOOCs
MOOCS in school lessons

What is a MiniMOC / MOOC?

Massive Open Online Course

What is a lesson in school?

Massive Open Online Course
Updating the Material / Learning resources
Producing content for Mini-MOOCs