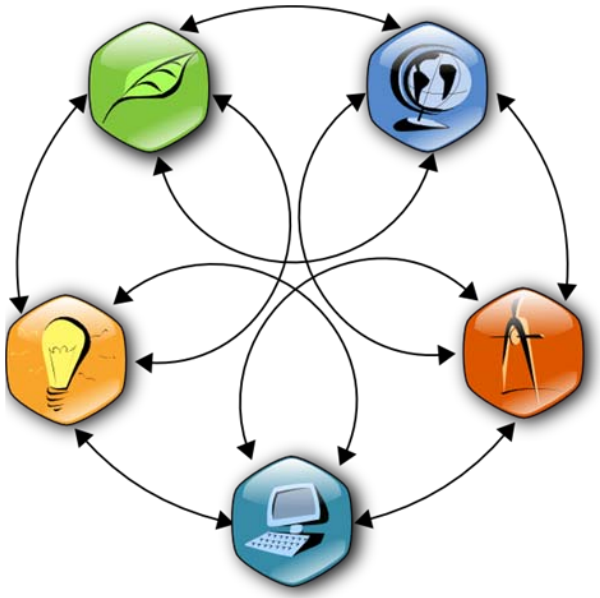
Implementing Remote Sensing Software Functionalities in Interactive Learning Applications



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Outline

1. Background & Motivation
2. Going Digital
3. Interactive Applications
4. Examples

Why remote sensing in school education?

Remote Sensing has a high potential for young students from secondary schools / high schools, because :

•Remote sensing data offers the possibility of handling a range of curriculum-specific topics in the school subjects of geography, biology, maths, physics and computer science .

•The high degree of topicality and multitude of spatial, temporal and spectral resolutions of remote sensing data make it possible to work on **up-to-date** and **dynamic problems**.

•The graphic quality of the data allows a **new view** of certain problems and offers a **high degree of vividness**.

•Through the combination of images and technology, remote sensing data has a **motivating and fascinating effect** on pupils.

May 14, 2006

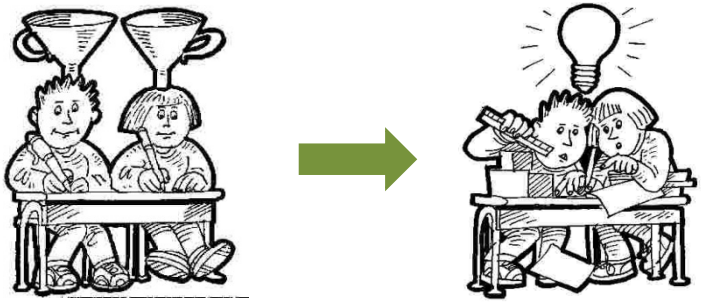
May 14, 2008

Why remote sensing in school education?

- By working independently with remote sensing data, students' **methodological skills** can be facilitated in the area of data processing, general computer work and digital image processing.

- Literacy
  - Methods literacy
  - Multimedia literacy
  - Computer literacy

- The use of remote sensing in school lessons allows new forms of teaching, learning and instruction methods to be put into effect.



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Remote Sensing in Schools – State of the art

Integration of remote sensing primarily in geography lessons

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Satellite Images to demonstrate geographic phenomena

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Remote Sensing in School = Visual Image interpretation

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Limited Range of possebilities for the use of RS in schools.

Remote Sensing in Schools – new concept

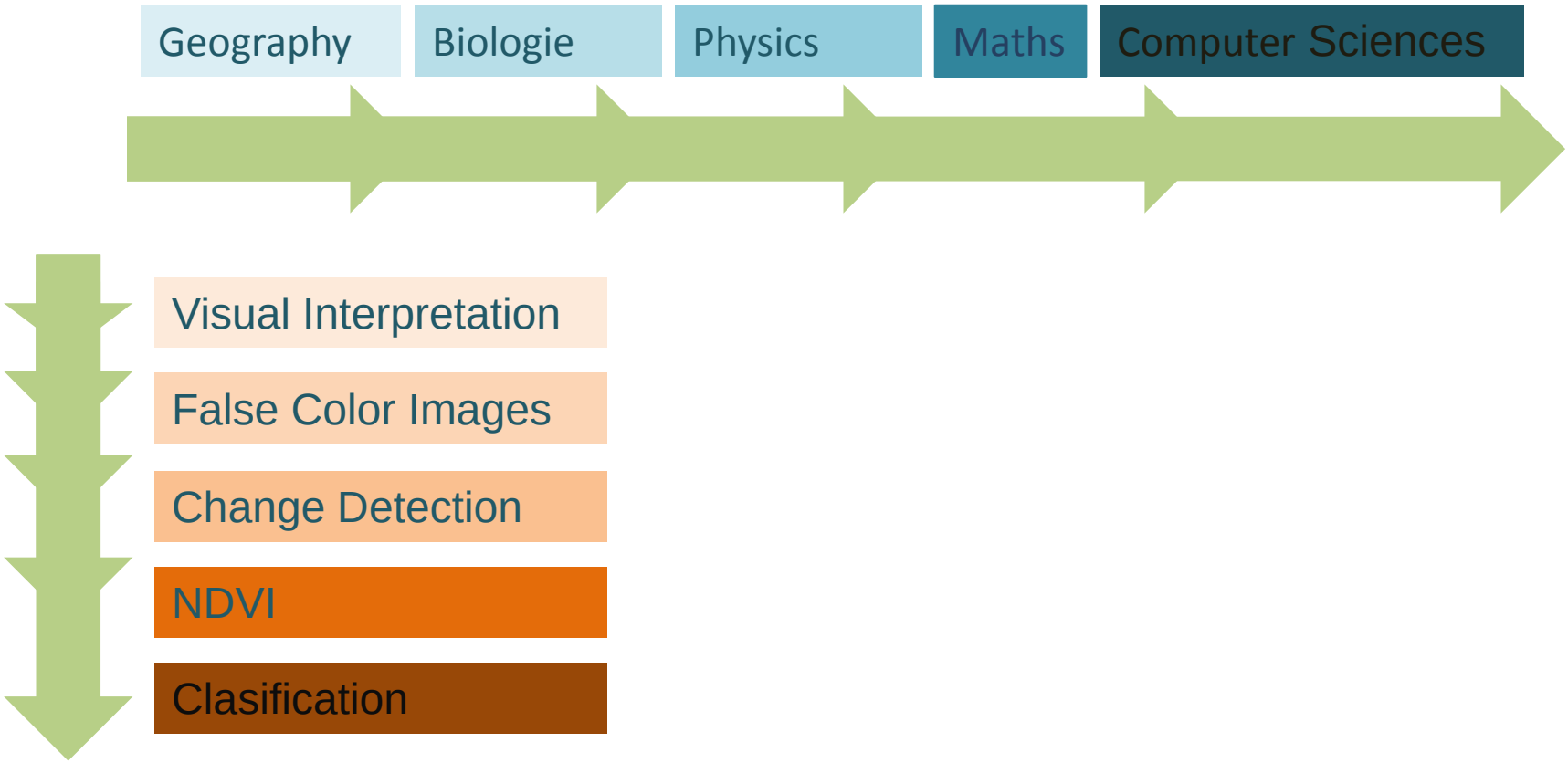
"Satellite images clarify, highlight issues and attract attention. Mostly, however, they allow students (…) to recognise correlations themselves." (Alean & Biber 2005)

However, remote sensing encompasses more than just the purely visual interpretation of aerial and satellite images, meaning that this method only covers one area of remote sensing's topic spectrum.

Essentially, the approach neglects the physical and mathematical fundaments of remote sensing, as well as more advanced methods of analysing satellite or aerial images.

Conclusion: To fully benefit from the range of possibilities the images should also be threatened as what they really are: digital data!

Going Digital! : Expanding the Range and Depth of RS Topics in Schools



Going Digital ! : Requirements and Obstacles

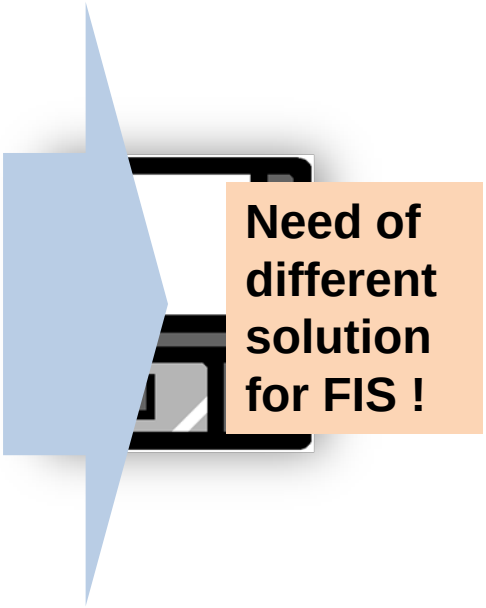
RS Software today:

-RS Software in general is complex due to its vast range of functionalyties. No present solution offers a scalable approach.

-Professional Software is expensive

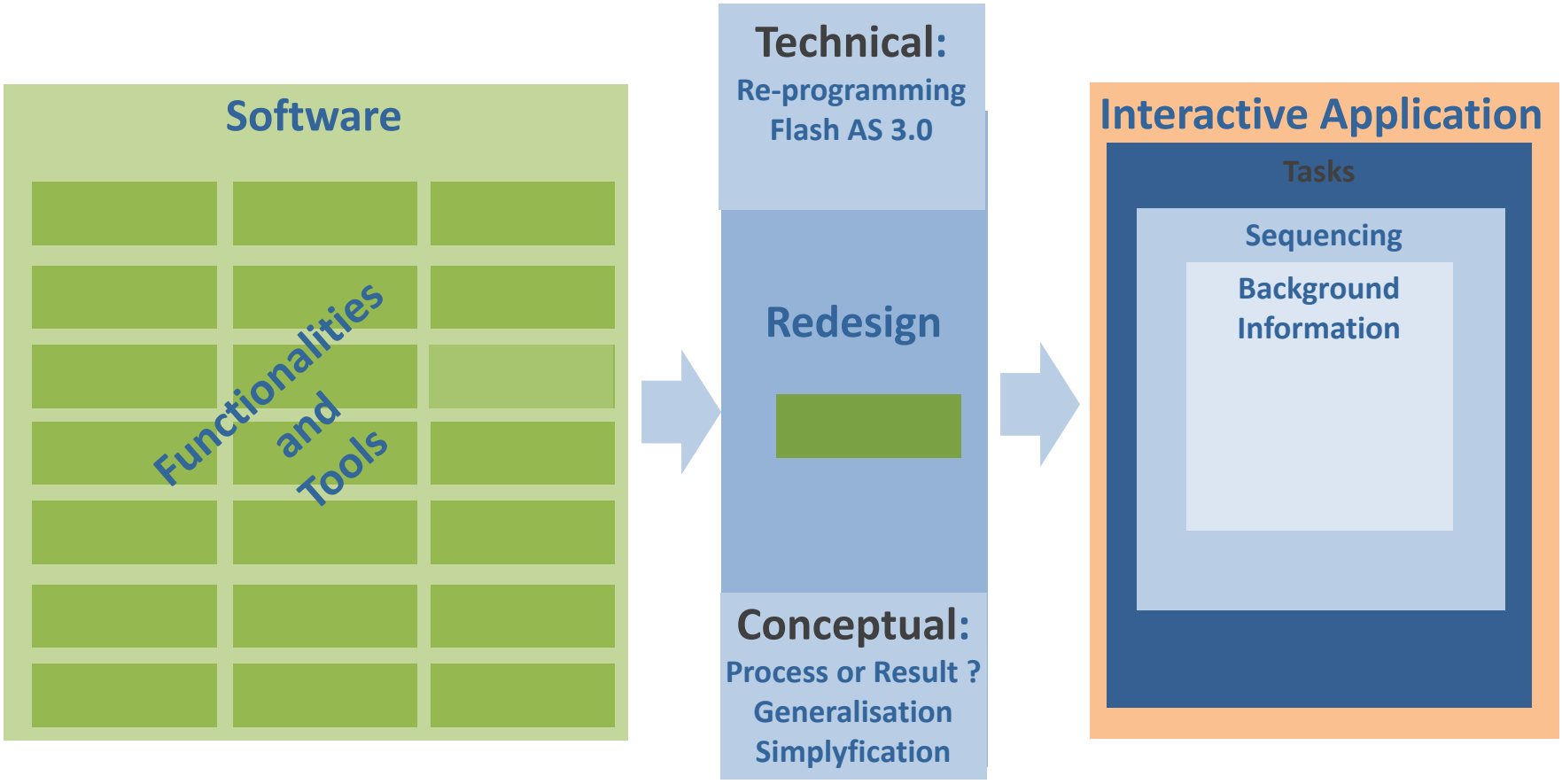
- Tools in Sofware are “black boxes“.

-At present there is no software solution suitable for every day use .



Need of different solution for FIS !

Interactive Applications: Extraction and Implementation of RS Software functionalities



Interactive Applications: Essential Features

Only needed functionalities are implemented

The tools are always used in the context of a simulated microworld where they can produce the result asked for in the lesson but also any other possible result.

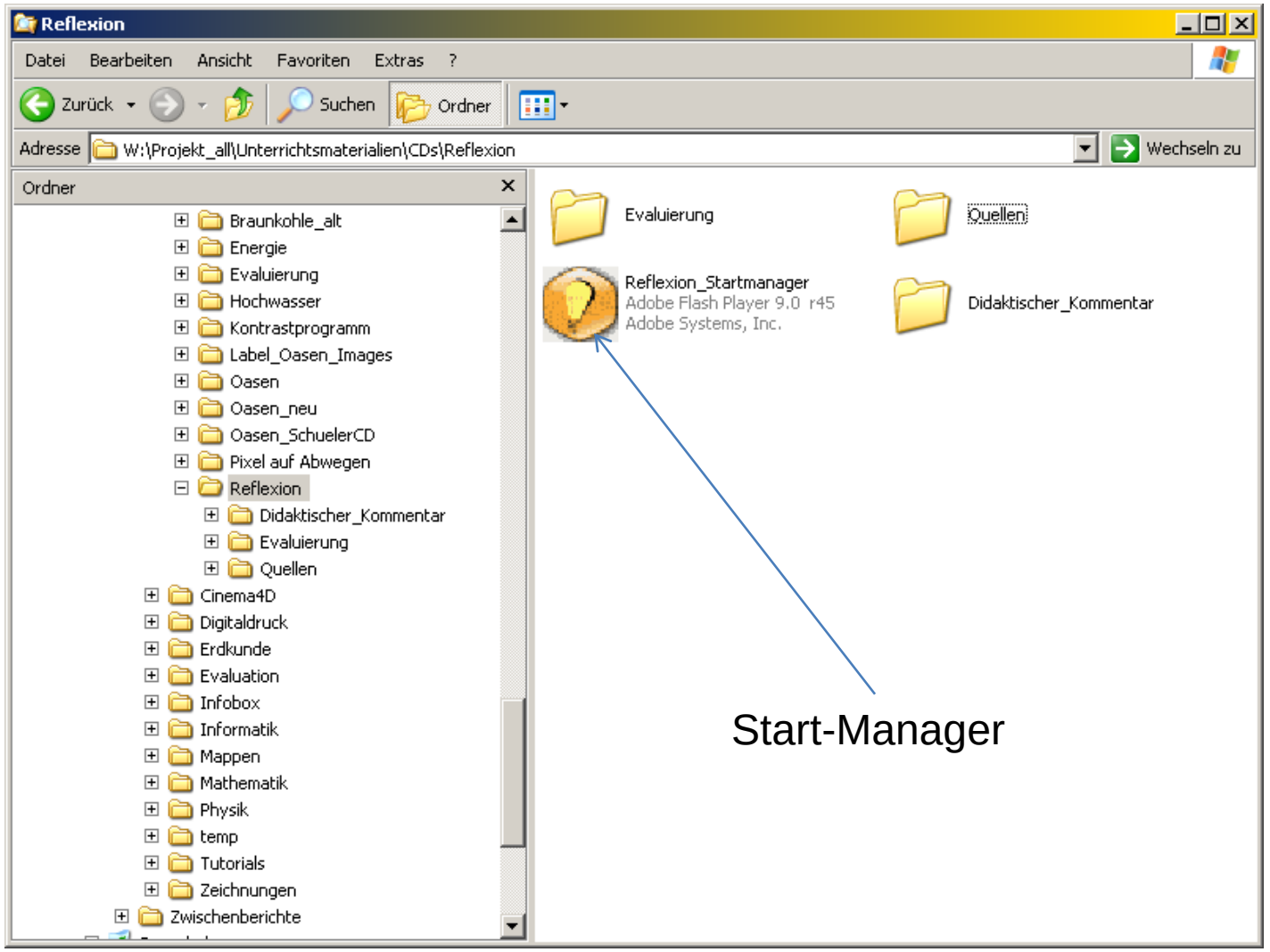
The tools are embedded in the interactive learning applications and therefore not designed for multi purpose use. They are intrinsically tied to the lesson itself and the images used.

While the implemented tools themselves are not meant for multi purpose use, the methods used to create them can of course be employed to create new lessons with different images.

They are meant as an addtion or alternative to the use of RS Software.

Aim: facilitate the day to day use of RS in schools

Computer-aided learning without complex software solutions

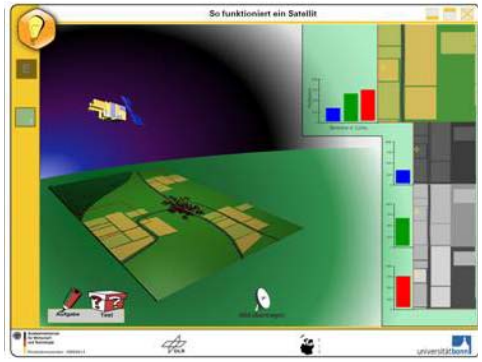


Examples of Instruction - Physics "To hit upon the unseen"

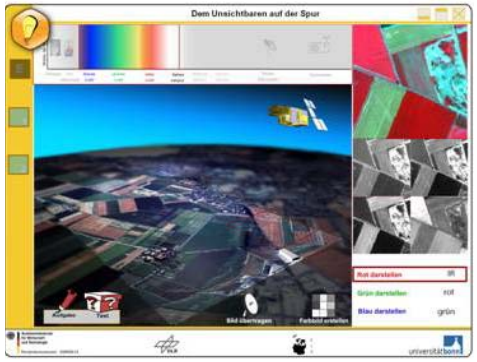
The goal of the teaching unit is to understand connections between the electromagnetic spectrum, reflectance, absorption, exposure and development of satellite images.

- The first part of the learning module introduces pupils to the subject of reflectance.
- Together with a virtual professor, the goal of which is to determine the characteristics of the objects in terms of their reflectance attributes.
- The first modular unit concentrates on the area of visible light in the electromagnetic spectrum.

Examples of Instruction - Physics "To hit upon the unseen"



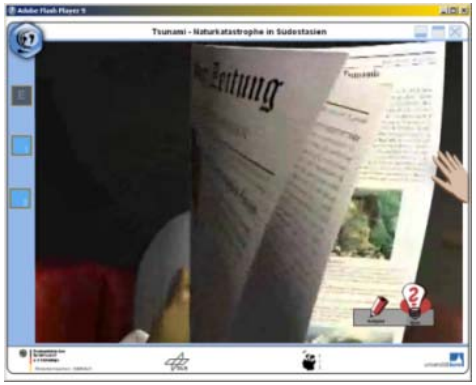
- The goal of the second part of the learning module is to understand how a satellite actually works.
- The focus of attention is thus on the following question: how does a satellite convert the reflectance signals it receives into colour image information?



- In the last modular unit, an overall look at the electromagnetic spectrum is given, followed by a corresponding examination of whether a satellite can also use other wavelengths apart from the area of visible light.

Examples of Instruction - Geography "Tsunami - when waves change everything"

The goal of this teaching unit is to familiarise students with the meaning of natural disasters, to gain spatial cognition and do a spatial assessment, grasp the possible formations and causes of tsunamis, and get to know the possibilities remote sensing can offer for damage ascertainment.

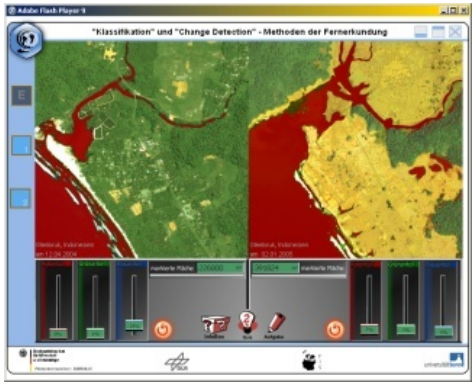


- To begin with, in the first part of the learning module pupils are introduced to the subject of natural disasters in general and tsunamis in particular by the professor they have already become familiar with in the physics module.
- Here students can gain background information on the tsunami that raged over Southeast Asia in 2004 through a newspaper the professor is reading.

Examples of Instruction - Geography "Tsunami - when waves change everything"

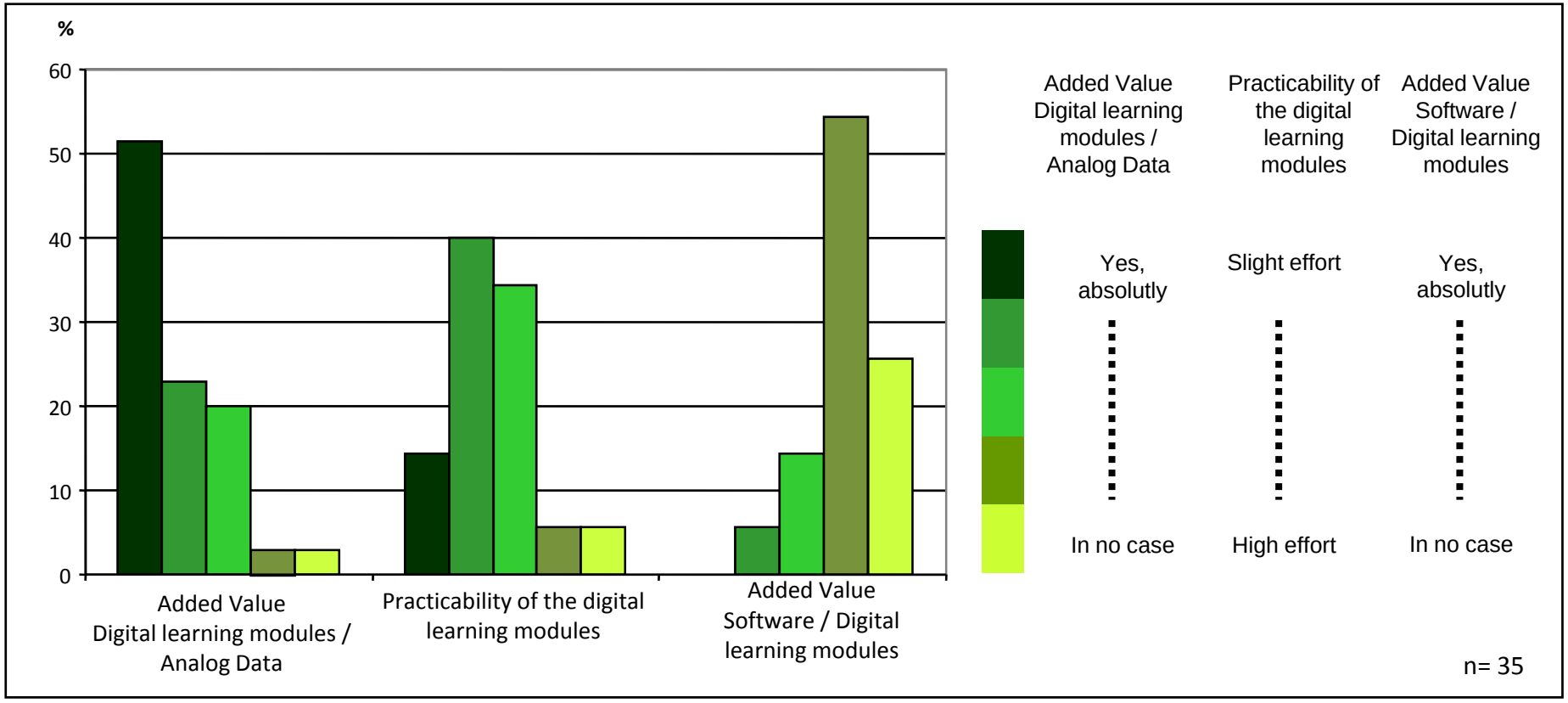
- In the second modular unit, the knowledge gained through the professor's virtual newspaper should be linked with two satellite images.
- Students are first asked to compare both satellite images by using an interactive controller, and to familiarise themselves with both images.
- Then they have to name the structures that were destroyed by the tsunami.
- They should also put themselves in the position of the residents who lived in the disaster area, and reflect on the effects the damage had on them.

Examples of Instruction - Geography "Tsunami - when waves change everything"



- In addition, pupils are asked to consider the value of satellite images in such cases of natural catastrophes, and how these images can be used during these disasters.
- For this purpose, they can refer to the information box for more details where the procedure of change detection is also vividly explained in a short film.
- Once the pupils have grasped the concept of change detection, they can classify specific land surfaces in the last modular unit and, for example, ascertain how much of the land surface shown in the picture was flooded, or how much of the agricultural area was destroyed by the tsunami.

Results of the evaluation



Thank you for your attention!

The learning modules were and will be made available in the form of e-learning modules on the project's homepage
English translation is underway.

www.giub.uni-bonn.de/fis