

**“Training Camp Nature and Technology”  
in Bavarian Forest National Park  
for GIS at schools**

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## **Abstract**

Over the years, at the Technische Universität München extensive forestal, climatological and touristical data concerning the “Bavarian Forest National Park” have been gathered to set up an interdisciplinary research platform based on a web-capable central GeoDBMS. Now the focus is on a sustainable use of this research project, including a “GIS Training Camp” for pupils, teachers, students and GIS users, which will make studies more vivid and more problem oriented. In this "GIS Training Camp" located in the Bavarian Forest National Park at the border triangle of Germany, Czech Republic and Austria, one can analyze, process and visualize a spatial problem with the appendant reality within the range of vision. In didactically prepared courses lasting three to six days, the "GIS Training Camp" offers workshops developed especially for the target groups. During these workshops the participants are introduced to GIS technology and gradually learn to plan and carry out projects of their own. The exercises are prepared according to carefully selected instruction principles and methods (problem oriented working). Relocating the "classroom" into nature (Bavarian Forest National Park) opens a wide range of possibilities for the schools.

Besides, there is also the option to organize field trips into the national park. Thus, students and pupils are able to understand the relationships between the real world and their model of it in GIS. Students and pupils learn how information is gathered, processed and communicated with state-of-the-art technical equipment, which meets the requirements of basic IT education.

## **Introduction / Motivation**

So far, the rapid development of the World Wide Web has resulted in an implicitness in the daily handling with computers and the “online world” both on the job and in spare time; thus, with the beginning of the new millennium the jump into information society was completed. GIS is a substantial key technology, which is required for international labour and research markets. Therefore, GIS also has become a part of school curricula. In nearly all German states initiatives have been started to familiarize pupils and teachers with GIS.

For instance, every year a GIS-Day is staged throughout Germany and numerous advanced educational institutions offer GIS courses for teachers. At some schools GIS projects are already conducted as it is already common in the USA. In October 2003, the First European ESRI Education User Conference (EurEdUC) took place in Innsbruck, where international experts discussed chances and initiatives. In particular the developed synergies resulting from the cooperation of the Ministry of Education and the Arts, universities, schools and Land Surveying Offices (e.g. in Baden-Württemberg and Rheinland-Pfalz) guarantee GIS success at schools.

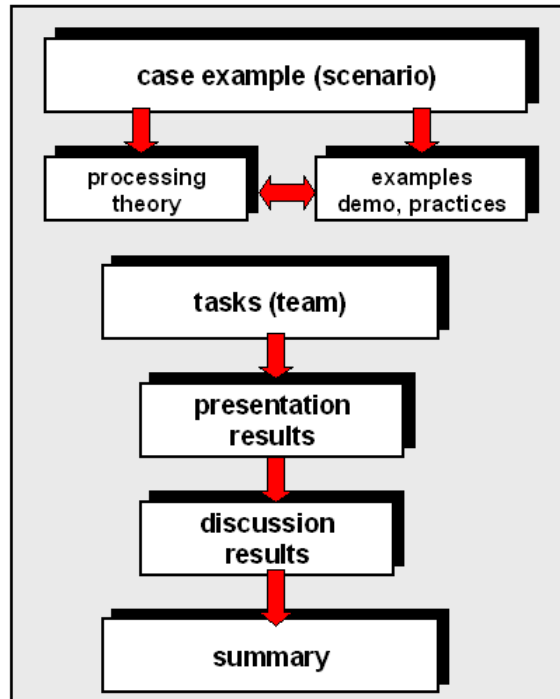
Many highly motivated teachers have to be given credit, who are committed to integrate the new topic in their lessons in a didactical manner.

## **Targets**

### ***Didactical concept***

The project “Training Camp for Nature and Technology” not only wants to mediate specialist knowledge, but also intends to contribute to the didactical manner.

There is a cooperation with the chair of empiric and pedagogical psychology (Prof. Mandl) of the Ludwig-Maximilians-Universität München to synchronize the didactical components. The practices are worked up to carefully selected school principles and methods (problem-oriented working).



**Figure 1: problem-oriented working**

With the relocation of the learning spot to an extracurricular area (Bavarian Forest National Park) the idea of “opening of the school” is followed. The change of the working environment positively affects the motivation of the participants. Thereby, the independent learning of the students plays an important role in an innovative and cooperate environment.

The computer-aided learning (E-Learning) supports the activity of the pupils in a particular manner. Based on a certain scenario, the participants can create their own analyses and subsequently present their results in front of the group. This concept is supported by exercises and examples.



**Figure 2: pupils working with GIS**

In addition, there is also the option to organize field trips into the national park. Thus, students and pupils have the possibility to understand the relationship between the real world and their model-like illustration in GIS. Thereby the ways of data acquisition, information processing and the communication by means of modern technical equipment are demonstrated in terms of a basic training of information technology.

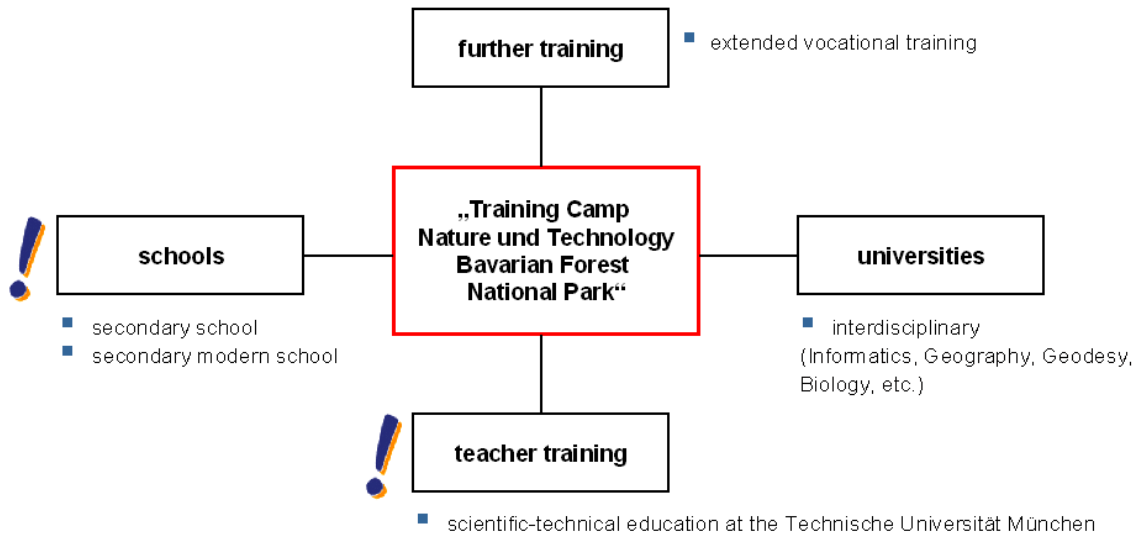
Interdisciplinary education is supported by the combination of the subjects Chemistry, Geography, Physics, Computer Sciences and Biology.

The pupils have to - after finishing their projects - present their results in front of the class, so that the pupils' self-confidence is trained at the same time.

**Target groups**

The GIS Training Camp is adjusted to pupils and teachers at secondary school in Bavaria and in addition it is also designed for students. Thereby on the one hand students of lecturership are qualified whose education is added with GIS. On the other hand, the Training Camp is offered to students who want to achieve their diploma. Likewise, the students of Master courses can be integrated without any problems.

Another target group are the participants of extended vocational trainings. Thus, they have the possibility to improve their knowledge and to specialize.

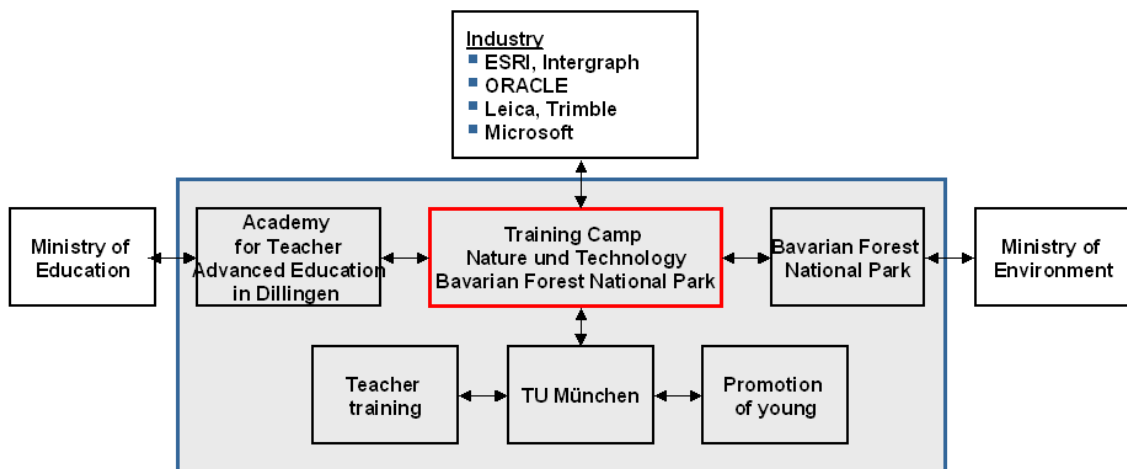


**Figure 3: target groups**

**Synergies**

Ministries, universities and industry take part in this project. It was initiated by the “Runder Tisch GIS e.V.”, whose aim is to support the young scientific generation. There is a cooperation with the Bavarian Academy for Teacher Advanced Education in Dillingen, which has already arranged GIS-courses for teachers. Thus, it would be possible to offer the Training Camp as an advanced training course and to harmonise the didactical contents with the academy in Dillingen.

Since the courses will take place in Bavarian Forest National Park, the National Park Administration, the Bavarian Ministry of Education as well as the Ministry of Environment also take part in the project. Last but not least, the assistance of the industry like major GIS vendors is very important to bundle all interests.



**Figure 4: cooperation partners**

## Method

### Scenario: Spatial-temporal analysis of deadwood spread due to bark beetle outbreak

Since 1996, the Technische Universität München cooperates with the Bavarian Forest National Park Administration. Within the scope of the “High-Tech-Offensive Bayern” numerous research projects have been realized. Thus an immense amount of extensive official, forestal, climatological, touristical geodata and metadata on the unique ecosystem of the Bavarian Forest National Park has been gathered. This quantity of high quality data and the existence of the technical equipment in the National Park manifest the training spot.

GIS enables the combination of nature (deadwood) and technology (2D/3D/4D representation), so that the phenomenon of bark beetle and deadwood spreading can be live demonstrated and analyzed in the Training Camp.

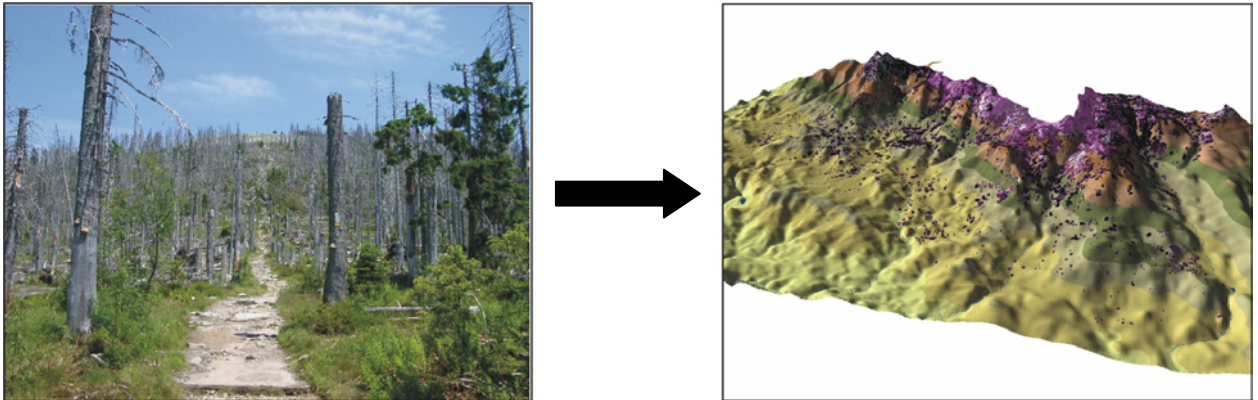


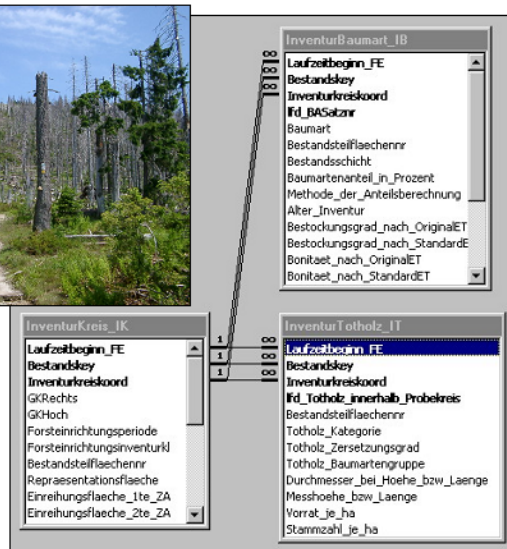
Figure 5: combination of nature and technology

To analyze a certain section of the real world in a computer with sophisticated techniques and methods, a datamodel of the real world is necessary.

### (1) Real world



### (2) Modeling



### (3) GIS

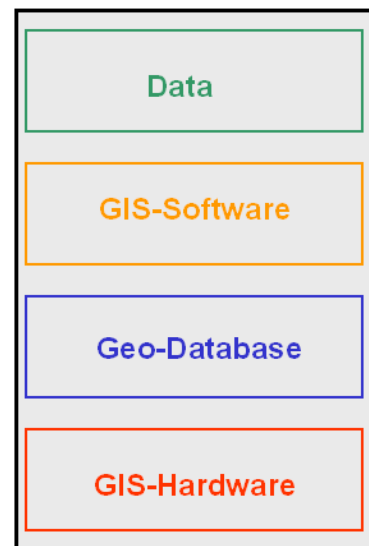


Figure 6: from the real world to a GIS data model

This signals a simplification and restriction of reality, which means that the model implies a grade of abstraction. So in this data model, the objects of the real world and the relations among them are represented, as well as their properties. The data model and the geometric data are implemented in a complex geographical information system. Now it is possible to present heterogeneous spatial data and to select their attributes with a specific request.



According to the motto “With High-Tech on the tracks of nature” the government of Lower Bavaria has promoted the project “Forest Ecosystem Research”. Different institutes and chairs of the Technischer Universität München, the Institution of Forest and Forestry (LWF) and the Institute of Atmospheric Ecology (IFU) in cooperation with the Bavarian Forest National Park take part in this interdisciplinary project.

To improve data availability and value of this precious datapool, the GIS-platform has been web-enabled by migrating all its data content to a new integrated and highly scalable 3-tier GIS-environment, using ArcInfo, ArcSDE and Oracle(Spatial). Currently, seven applications of different university chairs and institutions have access to this central geodata server for reading and writing, guided by metadata, to build an interdisciplinary sustainable GIS-platform with unique data on analyzing the ecosystem’s short and longterm natural processes, like for example its recovering behaviour and forest development after bark beetle outbreak. Thus, the datapool is updated and extended automatically through its distributed write-access concept in an interdisciplinary network.

## Results

The main concept has already been completed successfully. The main tasks of the phase were to demonstrate and to weigh the chances and risks of this project. These were the results:

- Tuning of GIS-teaching-modules
- Choice of data and training area
- Cooperations (networks, synergies)

In the year 2004/2005 the realization of the project „Training Camp Nature and Technology“ shall start. An Interreg-project in cooperation with cooperation partners of Czechia is planned.

## Conclusions

### *Outlook: mobile GIS-Applications: a pedagogical teaching trail*

The pedagogical teaching trail, which is prepared with didactical methods, is designed for pupils, who - fit out with mobile devices – walk in the Bavarian Forest National Park on this trail. Thereby they receive information about nature and environment which depends on their temporary location. Thus, the pupils learn without much efforts to deal with modern technology, science and ecological aspects.



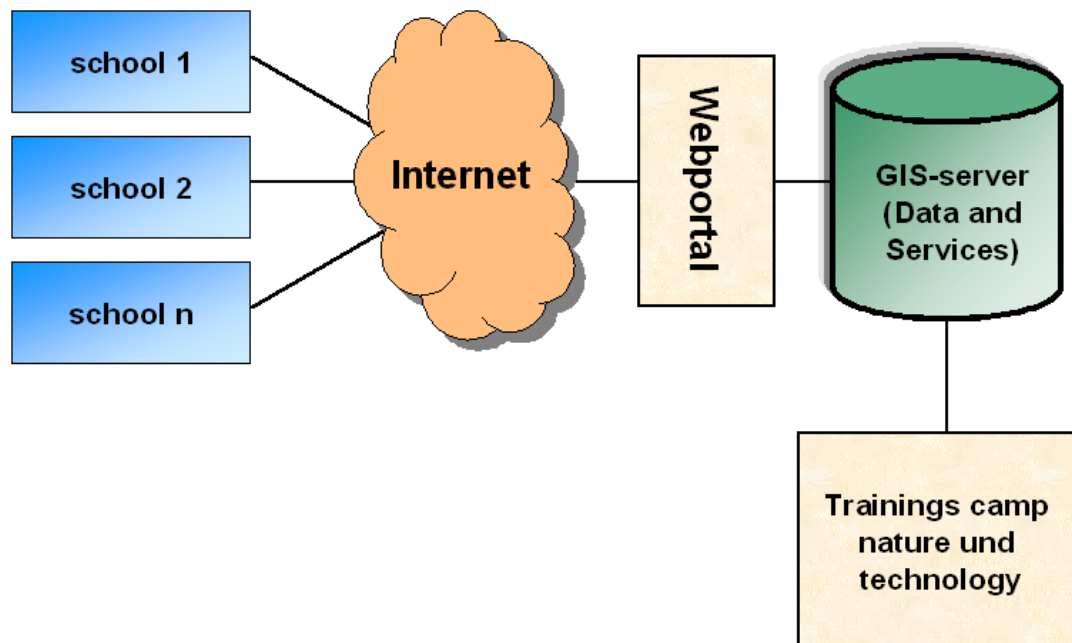
**Figure 9: a pedagogical teaching trail**

The requirements for a pedagogical teaching trail is the development of mobile geo web services for tourism and conservation in the region. With the individual use of location based services it is possible to locate a device that is switched on (e.g. mobile telephone) and to offer – based on this location information - corresponding information. A focus on region specific aspects (e.g. spread of bark beetle) can be realized for this project.

That conception was developed after a visit at the Swiss National Park. In cooperation with partners from different countries it will be realized as the EU-project WebPark. It is an European research and development project that aims of composing a platform for location based services in an recreational area and nature reserve.

**Outlook: A portal for GIS at schools**

An internet portal for GIS at schools would be the best solution to address many schools and provide GIS data and lessons for both pupils and teachers. Via internet learning materials, tasks and use cases can be offered, and teachers get the possibility to prepare and rework their lessons.



**Figure 10: GIS-Portal for schools**

In addition, a contact forum can be implemented additionally, so that teachers have the opportunity to compare notes and exchange advice. New use cases and online documentation can be integrated anytime. The web-based GIS-portal offers the opportunity for teachers and pupils to easily access the information, that is provided by many training courses in the "GIS Training Camp".

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### *preparatory project activities*

- Visit of the Swiss National Park and the National Park of Berchtesgaden
- Visit of the Universität Zürich
- ESRI-Konferenz in Innsbruck (1. European ESRI Education User Conference)
- Conversation with the Bavarian Forest National Park Administration
- Introductory course „GIS macht Schule“ in the Academy for Teacher Advanced Education in Dillingen
- Visit of the National Park of Berchtesgaden at the Technische Universität München
- Conference about a cooperation in future with the Academy for Teacher Advances Education in Dillingen