Abstracts of Exercises Mytilini meeting 29-09 / 3-10-2009

Exercise: Exploring the world of Maths

In any area (city, town or village). Choose a local car park (could also use fields with different crops) that you can see on the aerial photos (or satellite image) where the white-lines of the parking spaces are easily discernable. Get the children to count the total of car park spaces. Now count the cars that are currently parked. Ask for a percentage calculation of the cars in the car park! Can they express this as a fraction?

Look at the school playground, tennis courts, football field etc. What is the area? Estimate what the area is. Now measure using the measure tool. To check this calculation take the children outside and measure the area.

Pythagoras and trigonometry. Using a map with contours on we will can calculate the hypotenuse as we have the other two sides of a triangle.

Exercise: My route to school

Firstly, ask the children to estimate their route to school and to write this down. Suggest ways that will help them, e.g. how big is their stride if they walk to school or how far is it from one end of the street to the other. Now get them to identify their house and the school on the aerial photography. Using the measuring tool, ask the children to measure the exact route that they take to school. Teacher can collect all measurements and determine the closest to the original estimation or take into excel and calculate average route to school.

An extension of the above exercise would be to associate a calorie value to distance walked to school or a pollution value to those children who are driven to school. The school run is taken twice a day, five times a week and thirty or more weeks a year amounting to a significant calorie burn or CO2 emission. By using these simple calculations a very local and mundane event like the school run can be shown to have significant impact on nation and global issues. (Use http://www.smmtco2.co.uk/co2search2.asp for CO2 emission values for cars at g/km)

Exercise: Where do the black storks live?

Aim: to discover the different nesting habits of black and white storks by visualizing data on digital map

Age: 12-19 y

Subject: biology, nature protection, geography, forestry

GIS learning: editing tables, adding event tables, creating layers, using symbols, linking photos, managing and processing information

Description:
White storks are very urbanized birds. The are used to human company, we can often meet them in villages. They like to build their nests on chimneys or on top of electric pylons. But what about their cousins, the black storks? Where are they hiding? We can easily get the proper answer if we indicate their nests on a digital map.

Marking both white and black stork nests on a digital map will give a very spectacular result. This task shows us a very useful way of processing and visualizing results of research works in the field of biology and nature protection. It also teaches pupils how to gain complex information from maps.

Task:
1. Arcview:

- Open a new project by using a digital map
- Making layers for white and black storks
- Make a table with the coordinates of the nests
- Locate and mark the nests on map using the coordinates given
- Link the photos to the corresponding nests

2. Google Earth:

By using GPS receivers students can directly transfer their data to the computer.

- Find Csokonyavisonta (Hungary) on the Google
- Open new layers for black and white storks
- Locate and mark the nests on map using the coordinates given
- Open new layer for the photos
- Visualize the nests with their own photos
- Share this file with your friends on the net

Exercise: GM- and non-GM Maizefields

The EU is struggling to implement coherent coexistence regulations on genetically modified (GM) and non-GM crops in all member states. Participating in the SIGMEA project, a few years ago, the Centre for Food- and Agricultural Economics of the Catholic University of Leuven investigated the effects of the introduction of GM crops in European agriculture, with a rigid spatial regulatory framework.

A case study was conducted for the region Beauce in France. Based on GIS datasets representing fields in the case study landscape, researchers investigated problems that might occur when genetically modified crops would be adopted in the situation where the authorities would impose rigid spatial coexistence regulations.

In this exercise we repeat this research, and use the same methodology to analyse the possible impact of the introduction of GM crops (assuming 50% adoption), together with rigid spatial regulations (compulsory buffer distance of 50m), applied to a nearby area.

The exercise starts with a data layer with a number of maizefields (polygons) in the area. In a first step, course members have to create a table in Excel that can be used as an attribute table in ArcGIS. Layer and attribute table can be joined, based on a shared data field. In this table the adoption of GM or non-GM will be simulated by adding a column that contains the values 0 or 1 in random order. 0 stands for non-GM, 1 stands for GM.

In a second step, the data layers have to be copied and queried in order to end up with a layer representing GM fields and a layer representing non-GM fields. At this point, the course member is asked calculate the surface of the maizefields in order to check to what extent the simulated situation complies to the assumption of 50% adoption.

In a third step, course members have to create a buffer zone of 50m, surrounding the non-GM maizefields. This layer with buffers will be intersected with the layer representing non-GM fields. The new layer that results from this intersection will represent the situations where a GM field would lie closer than 50m to a non-GM field and thus cannot be sown with GM maize because of the rigid spatial regulations, imposing a buffer distance of 50m.

Exercise: Industrial zones in your area

Students start with a blind local map and look up the location of industrial zones in their area on the website of their local authorities, or, the students make a field trip and draw the location of industrial zones on a physical map. The students look up/gather information about the companies located in the industrial zones, their activities and the number of people that work for them.

The students draw the industrial zones on a digital map and create a database table for storing the information they collected. In a final phase, the students visually present the information they gathered on the map by using graphs/categories… from layer properties/symbology.

Possible extension:
The exercise can be extended by starting to analyse the location of industrial zones, companies or shops. This analysis has a direct link with another item in the curriculum LICAP D2005/0279/014, see p. 33, the 4th “P” of the marketing mix “Place”. Examples: Is this company/industrial zone located near a railway/canal/road and why? Do you think this company/shop has the best location suiting its activities? Are there location-specific traits that all industrial zones have in common? Is there a difference in the type/activitey of companies that are located in an industrial zone that is located near a canal and an industrial zone that is not? Do you think this is pure coincidence?

Exercise: Earthquake and volcano in Greece

Suitable for: Secondary Schools' students

Learning objectives:
Students have to collect data, manage information, process reflections, analyze space and finally represent a map. More specifically:
The familiarization with space via a rational tool such as a map -writing
The creation of a map in order to achieve the geographic conception of space –language
-Knowing: the location of earthquake and volcanoes in their country. Rationalization of space-Euclidean space. That is, the student has to change his perception into reality. In other words he needs to learn when seeing "pictures" from above to change them into ground plans and concrete shapes into geometric forms.
-Understanding: the relationships between data. It leads into projecting relationships in space as a unified geographic framework. As result the introduction to the graphic principles to the rules and to the syntactic of mapping initiate cognitive processes that help the geographic thinking of students.
-Planning: application of mathematical model. This process involves the integration of spatially referenced data in a problem solving environment. That is, maps or models constitute tools for facilitating geographic knowledge and not an end in themselves. They are used in formulating hypothesis and in confirming the dynamic nature of space.

GIS Learning objectives:
- Use georeference (Coordinate system)
- Arrange themes in point, line and polygon
- Learn tables and identify the characteristic of data
-Manage attribute tables in Arc Catalog
-Identify absolute and relative location
-Select feature by attributes and by location
-Form Boolean structure (queries)
- Add and edit shape files (point, line and polygon)
-Create buffers
-Create associations and intersects in space
- Draw and include graphs on the map (statistics)
- Represent maps using systemic tools (optical variables)

ICT learning objectives:
- Spatial and database management

Description:
Students start by using several maps and looking up the location of earthquakes in their country on the according file, or, the students make a "field trip" in web site and learn about earthquakes. The students look up/gather information about the influenced cities and the damages due to earthquakes or volcanoes.
The students "see" the location of earthquakes on a digital map and the relation with volcanoes. Then, they create a database table for storing the collected information and manage the data by adding or deleting. Then, they analyze space using buffers, union or intersect. In a final phase, the students visually present the information they gathered on the map by using graphs/categories… from layer properties/symbology.

Exercise: Sustainable way to school

Suitable for: age 10 to 14

GIS Learning objectives:

- to locate some points (school, house,..) on a map
- to measure distance
- to create new shapefile
- to digitize the way to school
- to join tables
- to link pictures or text to a black point

Description:
Over recent years a distributing tendency has developed - of children being driven to and from school by cars. As consequences: traffic increasing, lower road-safety standards, higher level of pollution and negative effect on pupils and adults ' health.

The exercise promotes the use of sustainable mean of transport to go to school. By comparing their house location, and their route, students elaborate way to go to school in groups with schoolmates with safe and (more) sustainable transport (walk-buses, bike-buses, public transport, car pooling,...).

Steps:
Using the map of the area get the pupils to plot their house and route to school using drawing tool. Ask the children to estimate the distance and compare the result with the measuring tool. Challenge them to find two or three different routes. What would be the advantages and disadvantages of these other options?

Get group of pupils on the "field" to take pictures of black spots and write down their location. Add those points to the map.

Collect the different house location and route, is there any group of schoolmates that could go to school together? How? Children should make proposals based on several criteria: distance, safety, beauty of the route (park,...).

Exercise: world population and economy studies

Want to know more about the world population? Want to know at a glance what the countries are with the highest income? Or who has the highest percentage of mobile phone users? These are just some questions that can be answered easily using GIS.

This basic exercise will guide you to:

- Make a simple project with world data.
- Make a map with the data and answer your questions easily.
- Depending on what you would like to examine customize the view.
- Make a printed map including the legend, scale bar, north arrow.
- That map can be added to the report of your investigation.

Exercise: How did my region change through time?

We all know that landscapes evolve through time, and using GIS we can study into detail this evolution.
This can be done in some countries using web based GIS tools (f.i. in France Geoportail), in other countries using GIS software.

In this exercise we will use both.

- Firstly using Geoportail we will use the transparency tool to visualize an 18th century map with as background today's topographical maps. By selecting other layers we can take as background the aerial photos or show urbanized areas, transportation network … This can be used as basis for the study of the landscape.

Secondly we use GIS software, making a real GIS project with the necessary layers of information. Therefore we may need to add older maps (or aerial photos) to the project, a process called georeferencing. Using slider and transparency tools we can visualize the evolution in the landscape. By making new layers we can also make a thematic interpretation of the landscape in different times to obtain a more accurate of the evolution.