Research Best Practices

Instrumental Language and ICT Resources

Content and Language Integrated Learning
RESEARCH BEST PRACTICES

INSTRUMENTAL LANGUAGE AND ICT RESOURCES

FOR

CONTENT AND INTEGRATED LANGUAGE LEARNING

An Educational Proposal by Manuel Madrid García

CONTENT: Geospatial Technologies

LEVEL: Secondary
Lesson 3: Making the population map of Spain

What is a population map?
What do we need to make a population map?
Let’s do it!
Getting the population data
Getting the administrative boundaries
Making the map with Carto
Merging the alphanumeric and the geographic data
Configuring the choropleth symbology

administrative boundary
alphanumeric data
choropleth map
Geographic Information Systems (GIS)
geospatial technology
merge
Open Data
population
statistical variable
symbology
Web Mapping

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APPENDIXES

SELF-ASSESSMENT

MULTIPLE CHOICE QUESTIONEER

DOUBLE BLIND PEER REVIEW

FIRST REVIEWER
SECOND REVIEWER
BASIC DESCRIPTORS

UNIT DESCRIPTORS

Unit: Web mapping  Subject: Technology  Lessons: 3  Ed. Level: 3rd/4th ESO

Teaching objectives

- To introduce learners to geospatial technologies.
- To get to know the main open data sources.
- To learn what a choropleth map is.
- To learn how to get statistical data of a country.
- To learn how to show statistical data in a map in order to know how a given variable performs in different regions.
- To get familiar with the geographic regions of a country.
- To get familiar with socio-economic data such as demography, Employment rates, etc.
- To learn how to create and publish a map through the Internet.
- To get familiar with English terminology related with geospatial technologies and socio-economics.

Final task

Create a choropleth web map showing the demographic distribution of Spain

Evaluation criteria

- Differentiate larg-scale maps from small-scale maps
- Differentiate topographic maps from thematic maps
- Define a choropleth map
- Find open source socio-economic data of your country
- Create a web map
- Merge geospatial and alphanumerical data
- Create a choropleth map
- Understand the information that a choropleth map gives

Key Competences

- Competence in linguistic communication
- Competence in knowledge and interaction with the physical world.
- Mathematical competence
- Learning to learn competence
- Social skills and citizenship competence
- Digital competence

Material Resources

- Presentations
- Videos
- Computer with Internet connection
- Realia: paper maps

Material creat i adaptat de diversos autors pel Servici d'Ensenyaments en Valencià – Conselleria d'Educació 2010
Unit: Web mapping
Lesson: 3

Content
- Coropleth maps
- Open Data sources
- Socio-economic data available at the INE web site
- Web mapping
- Creating a web map

Communication
- Specific vocabulary: symbology, country, region, province, municipality, coropleth map, demography population, geospatial data, alphanumerical data, record, column, merge, depict, color ramp.
- Instructions: go to, find, click on, expand, check, look at.
- Description: it is, it looks
- Prepositions: in, to, at
- Asking for help: Can you repeat? Could you speak slower?
- Checking: Is that clear? Any questions?
- Asking the learners: Does anybody know…?
- Discussions: I think, I agree.

Cognition
- Cognitive skills: identify, classify, analyse, deduce.
- Information processing Skills: locate, classify and process data.
- Learning strategies: make questions, ask for Clarifications, focus on an interest element, use learning resources, write up notes, team working.

Culture
Get familiar with the social and geographical environment

Introduction/Revision
- Short quiz about the content given in the last two lessons
- Show the learners some examples of interesting coropleth maps and the information we can get from them.

Warm up Activities
- Show how to find and dowload socio-economic data from the Spanish INE web site.
- Show the learners how to create a coropleth map.

Main Activities
- In small groups (2 to 4 people):
  - Explore some web maps in order to get familiar with web maps and web mapping tools.
  - Find and download population data of Spain by municipality
  - Load the data into a web mapping tool
  - Create a coropleth map
  - Explore the distribution of the population in Spain
  - Discuss the main findings
- All the class:
  - Every group shares its thoughts on the activity: problems found, Findings, applications, etc.
  - Find other interesting coropleth maps in the Internet and share them with the class
  - Create more web maps from showing the distribution of other variables such as unemployment rates, level of finished studies, etc.

Want to know/Reinforcement/Extension

Assessment/Reflection
- Digital board
- Computers
- Internet connection

Material/Resources

Material creat i adaptat de diversos autors pel Servici d'Ensenyaments en Valencià – Conselleria d'Educació 2010
ABSTRACT

The birth of Information Technologies and the Internet have changed the way Cartography is produced and consumed. Nowadays, Geographic Information Systems or GIS let us do much more things than paper maps did in the past. We can link the geometric elements of a map (i.e.: polygons, lines and points) that represent real world elements to alphanumerical data or attributes and then analyze them for multiple purposes.

Furthermore, thanks to the Internet and the Open Data initiatives we are nowadays able to access tones of data, both geographic and alphanumerical, for free, which exponentially increases the number of studies that can be done.

This learning object looks into Web Mapping, which are easy-to-use GIS web services that allow mapping and geospatial data analysis.
Lesson 3: Making the population map of Spain

What is a population map?

A population map is a particular case of choropleth map, which is a map that shows the distribution of a statistical variable across a region, like for example a country, by using a color scale. In the case of a population map the variable is the number of inhabitants or population. The aim of a population map is to easily identify which areas are more populated and which ones are less populated.

What do we need to make a population map?

We need basically three things: First, of course, the population data of the region we want to work with. In our case, we're gonna make the population map of Spain by municipalities, so we need the population data of all the municipalities of Spain. We'll talk about how to get this information later on. The second thing we need is the administrative boundaries of all the municipalities. And finally we need a GIS software like for example Carto, which is a free web mapping service.

Let's do it!

Getting the population data

The first step is to get the population data. We can download it at the Instituto Nacional de Estadística web site (www.ine.es) where we can find, not only data about population but also about many other statistical variables. So, in our case, we just have to find the population section, select the geographic scope (municipalities) and go to the download link. Both the .csv and .xlsx file formats that are available would be fine.
Getting the administrative boundaries
For that we'll go to the Instituto Geográfico Nacional web site (www.ign.es) where the official Spanish cartography is available for free. There we'll have to find any of the products that include the municipal boundaries and we'll download it.

Making the map with Carto

Merging the alphanumeric and the geographic data
Once we have both the population data, which is alphanumeric, this is, a table containing numbers and text, and the municipal boundaries, which is geographic, this is, polygons, what we have to do is to link them so that each polygon is associated with one record in the table. We can do that with the web mapping service Carto in just four steps: First, we'd create a new map. Secondly we'd upload the municipal boundaries file. Thirdly we'd upload the population data file. Finally we'd merge them. As a result, each municipal boundary polygon will have its population data.

Configuring the choropleth symbology
At this point the only thing left is configuring the choropleth symbology by using the Carto corresponding tool. We'd select the column that contains the population data and leave the rest of the options as they come by default. Automatically we'll see how the map symbology changes and we'll be able to explore the differences on population of all the municipalities.
GLOSSARY (A-Z)

administrative boundary
portion of a country or other region delineated for the purpose of administration.

alphanumeric data
consisting of both letters and numbers and often other symbols.

choropleth map
thematic map in which areas are shaded or patterned proportionally to the measurement of the statistical variable being displayed on the map.

Geographic Information Systems (GIS)
a geographic information system (GIS), or geographical information system, captures, stores, analyzes, manages, and presents data that is linked to location.

geospatial technology
commonly known as geomatics, refers to technology used for visualization, measurement, and analysis of features or phenomena that occur on the earth.

merge
to combine or unite.
Synonyms: blend, commingle.

Open Data
content that can be freely shared by anyone for any purpose.

population
the collective human inhabitants of an area.
**statistical variable**

a variable having discrete values that differ through random causes and when arranged in order form a statistical distribution or array.

**symbology**

the use of symbols; symbolism.

**Web Mapping**

the process of designing, implementing, generating and delivering maps on the World Wide Web.
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Learning contents are key in education. The success of a class, this is, whether the students get the knowledge or not, mostly relies on the quality of the contents. That’s why, in my opinion, teachers should consider creating their own contents in order to use the best ones in any case depending on the education stage, the English level and any other factor that may affect the way the students learn and get the knowledge.

Creating contents doesn't necessarily mean to make them up from scratch. Nowadays teachers can find almost every content they need in the Internet. The work, thus, is finding the proper information chunks and join them in order to make a learning object.

This learning object has been created with that idea in mind. Each section has been written separately and then they have been merged in a single document. In this case the main section, i.e. the content itself, has been written by me as it is quite specific but, as I said above, I may have used existing content. It shows how to make a population map, particularly how to get the necessary data and how to build the map using a web mapping service. A population map is an example of choropleth map which shows how a given statistical variable is distributed along a region. In my opinion this learning object is interesting for Geography and Technology related subjects.

I think this is a very useful way to generate and provide learning objects. Also it's very important that we, teachers, are aware of all the resources that the new technologies provide so that we can take advantage of them in order to improve the way we teach.
Choose the correct answer for each question. There is only one correct answer.

**Q1:** Complete the sentence: A choropleth map is a map that shows...
- a) ...the geographic distribution of the population within a country.
- b) ...the geographic distribution of a statistical variable such as population, by using a color scale.
- c) ...the choroplethic distribution of a statistical variable.
Correct answer: b)

**Q2:** In order to make a population map we need basically three things:
- a) Population data, administrative boundaries and municipal boundaries.
- b) Population boundaries, administrative data and a GIS software.
- c) Population data, administrative boundaries and a GIS software.
Correct answer: c)

**Q3:** In the case of Spain, in which website can we find and download data about population and other statistical variables?
- b) Instituto Geográfico Nacional (www.ign.es).
- c) Agencia Estatal de Meteorología (www.aemet.es).
Correct answer: a)

**Q4:** In the case of Spain, in which website can we find and download administrative boundaries?
- b) Instituto Geográfico Nacional (www.ign.es).
- c) Agencia Estatal de Meteorología (www.aemet.es).
Correct answer: b)

**Q5:** Once the population data and the administrative boundaries are merged with a GIS software the only step left, in order to make a choropleth map, is:
- a) Configuring the scale of the map.
b) Configuring the title of the map.
c) Configuring the symbology of the map.
Correct answer: c)
DOUBLE BLIND PEER REVIEW

FIRST REVIEWER

SECOND REVIEWER