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GEODATA AND LANDSCAPE: FROM THE CLOUD TO LECTURES

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I. INTRODUCTION

Most current data has a geographical component, hence the name *geodata*. *Geodata* is data that has a spatial reference which means it can be located on a map. It is possible to visualise data displays on a map (cartography) or on a graph (statistics) and both can be integrated into digital maps which provides the ability to navigate the maps. This has meant a fundamental breakthrough in Geographical Information Technologies or geotechnologies and an important challenge for teaching and learning geography in university lectures.

This assignment is based on the results of the Innovation and Improvement of Educational Quality Projects of the Complutense University and their application to lectures. The Storytelling technique was used, which means teaching and learning through narrations based on data visualisation in maps, graphics, videos, etc., in this case, using the ArcGIS OnlineTM platform, Esri®. With these tools, the approach to landscape in geography is shown in two ways: one, based on geographical itineraries and another based on comments of georeferenced images of agrarian landscapes which are located on a collaborative map. The work has opened new horizons to synergies in teaching and learning on the Cloud when it comes to Geography at universities.

II. CREATING ITINERARIES, GEODATA AND SPANISH LANDSCAPE

The first study case is on learning Spanish landscape using geographical itineraries. ArcGIS Online platform allows image integration (photographs and videos), graphs, data and comments on cartography. It has been possible to create several geographical

itineraries throughout Spanish territory while inviting reflection upon landscapes. This has encouraged spatial thinking, as well as environmental awareness, heritage, spatial and technological competencies and scientific literacy in teaching and learning innovations and lifelong learning.

The data for this piece of work has been mainly obtained from The Complutense University Innovation and Improvement of Educational Quality Project called "Learning Spanish Geography with Web 2.0" (PIMCD 165/2013) which has been coordinated by Dr. Alcolea. The landscape approached was done using material developed by students themselves. ArcGIS OnlineTM platform, Esri® and storytelling will give a better and deeper understanding of territory and of the main geographical scientific concepts.

Any created itinerary should be four hours long on foot and have some common key points or consensus on relevant issues to work on, such as a title beginning with the name of the place and any relevant characteristic which deals with the landscape. The responsibility of each itinerary has been carried out by an expert on the locality, as noted below in brackets. Here it is a list of the itineraries according to the province to which they belong: (http://ucmadrid.maps.arcgis.com/apps/PublicGallery/index.html?appid=e855e451f33d4d8d97b71ac22a0b7521&group=8a3cfca16dc74e70aebdb0e0a3d0cf39)

Madrid:
- Madrid, historical center and old walls (Dr. Miguel Ángel Alcolea Moratilla)
- Getafe, urban functions (Dr. María Luisa Gómez Ruíz)
- Alcalá de Henares, world heritage city (Dr. María Eulalia Ruiz Palomeque)
- Peñalara Lake, mountain natural landscape (Luis Alfonso Cruz Naïmi)

Other provinces:
Ávila:
- Ávila, tradition, history and current challenges (Dr. María Teresa Palacios Estremera)

Badajoz:
- Badajoz, city border (Isaac Buzo Sánchez)

Granada:
- Granada, the city and its gardens (Miguel González Castañe)

Jaén:
- Baños de la Encina, a heritage to preserve (Dr. María Luisa de Lázaro y Torres)

León:
- León, old town squares (Dr. María Jesús González González)

Málaga:
- Antequera, religious, simbology and reconquest (Dr. José Jesús Delgado Peña
- Oriental Axarquía, historical and natural landscape heritage (José Manuel Crespo Castellanos)

Pontevedra:
- Pontevedra, vestiges, pillars of present and future (María Sotelo Pérez)

Zaragoza:
- Zaragoza, old town roman remains (Dr. Rafael De Miguel González)

Previous work on georeference was necessary to elaborate the itineraries. It consists on taking a GPS tracking on a device on the ground in GPX format. The raw track was rebuilt on a Spanish National Geographical Institute application called Iberpix (http://www.ign.es/iberpix2/visor/) which allows one to create a track that can be integrated onto the ArcGIS Online (AGOL) platform.

The track made it possible to display and visualise the topographic slope and deduce if there is any difficulty with the inclination of the ground surface. It is also possible to link other elements such as Open Geospatial Consortium (OGC) connections like Web Map Service (WMS) to visualise for example aerial images from previous years, such as the American flight of 1956.

Methodology is based on the selection of representative and original images of the stops on the itineraries and the comment of the images following a common script of some key points, as already mentioned. The first key point is a general introduction with the background of the chosen landscape, afterwards, an image of any stop with a comment on it and the spatial reference. After, some key questions to be solved by students for a better learning can be added. Some Web links for a deeper understanding of the landscape will end the information of the worksheet.

The exact point where the image has been taken are the stops of each itinerary. The coordinates have been obtained from AGOL in order to avoid projection problems.

Understanding of the landscapes has been the target point of the teamwork. They have been working with students on observation, analysis, commentary, evaluation, sustainability and heritage of the landscapes. Key questions placed on pop-ups help encourage reflection upon territorial problems and think prompt action regarding geographical knowledge.

III. SPANISH AGRARIAN LANDSCAPES AND COLLABORATIVE CARTOGRAPHY ON THE CLOUD

This second study case is based on commented images for landscape approaching. This is a work line of the Complutense University research group into Innovation in the Teaching and Learning of Geography under the EHEA (GEODIDAC). It have been implemented in the subject of Geography in the Master's degree in teaching (academic year 2013-2014). Then future teachers will have a better knowledge of the Cloud computing possibilities for students in landscape approaches and in learning, teaching, spatial and digital competences. For these reasons we focused on:

- Access to open geodata available from many Spanish public organizations or government agencies such as the Spanish National Geographical Institute and the Ministry for Agriculture, Food and Environment among others.
- Creating our own geodata and then integrated it with other data which means a good knowledge of geolocation tools.
- Showing visualisation and navigation tools for a better understanding of rural landscapes in order to have a subsequent impact in future teachers' classrooms.
- Learning agrarian worlds from a storytelling collaborative map made by students in a flipped classroom process.

It was necessary to work on the Cloud. This has been made possible due to technological improvement and the emerging concept of smart learning. Each student should chose an image. The selection of the image should be suitable in the way that all the images represent different landscapes, different places, etc. The image could be taken by students themselves or from the Internet. In the second case it should be under public domain or a Creative Commons Licence. As many students do not have a clear idea about CC licences was necessary to provide them with guidance. This was done by providing a list of places with this kind of image and by making students aware of the importance of quoting authorship of every image in their work.

Information about the chosen image should be collected on a worksheet using a conventional text processor. After that, this information should be added onto a Google Drive collaborative spreadsheet created by the teacher. The content of the spreadsheet will be uploaded to the final collaborative map. A further discussion took place during lectures, as is explained below.

The worksheet should include:

- The image and the geographical coordinates of the place where it was taken. Again the geographical coordinates in decimal degrees are collected from ArcGIS Online to avoid any possible problems associated with handling the datum.
- A significant title about the agrarian landscape and the main activities that the image reflects.
- A description of general characteristics and existing landscape units (previous information about rural landscape was given by the teacher).
- Some key questions about the landscape in order to reflect upon.
- A link to a relevant website in order to get more information about the landscape.

After reviewing this information on the student worksheet, the information was uploaded by the students to a Google Drive collaborative spreadsheet previously created. The geographical coordinates on the sheet made it possible to find the exact location of the landscapes on the collaborative AGOL map. It is an easy task to export the spreadsheet to the necessary format (csv, comma separated) to upload data onto AGOL (http://ucmadrid.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=db455dc4e4214f58a491b8858b9e0af5).

Collected geodata visualised on a collaborative map resulted in a brief summary of the general Spanish agrarian situation from students' knowledge. The subsequent exhibition organized by students was done according to each biogeographic area and their predominant agricultural use, with a final debate on the map obtained. This implies a significant content as the students worked on an image of a well-known area using relevant scientific content. Lecture discussions about the landscapes from the work already done highlighted the main problems of the Spanish agrarian world. Thus, the collaborative and cooperative work became an experiential learning process with the participation of all the students.

Thus, the project is currently underway at the Complutense University by the research group GEODIDAC on Innovation and Improvement of Educational Quality Project called "Learning Geography with the Web 2.0 and the evolution of the Spanish agrarian landscapes" (PIMCD 98/2014) coordinated by Dr. Lázaro, which has been recently granted.

We wish to point out the following results which students obtained teaching and learning, spatial and digital competencies:

a) Teaching and learning competences: students saw an innovative way of looking at a single map, with several layers and getting a perception of Spanish agrarian landscapes. Part of the work was done outside the classroom with the teacher's materials. Technological work on AGOL and on Google Drive were done in the classroom in order to avoid technological barriers. Students' explanations and final discussions were done during practical classes. Thus, we can label part of the learning process as a *flipped classroom*.
b) Spatial competencies: students' understanding of agrarian landscapes improved with students own explanations, image visualization and subsequent discussions.
c) Digital competencies: students were able to improve their digital literacy teaching purposes as they needed Cloud computing and some tools that they had never used before. Their materials are now on AGOL available anywhere and anytime. They also learned how to search for and find quality open information online and how to behave in a proper way with the intellectual property rights.

The advance in the acquired competencies has been demonstrated in the successful outcome of conventional final exam and in the use of the same methodology on their own final dissertations of the Master teaching degree.

We cannot say that the experience was without problems as servers update their work and denied them access from time to time. There was one big challenge: to hinder Information and Communications Technologies (ICT) from being a barrier. A difficult task, if we take into account the limited number of hours for classes and the initial uneven illiteracy of many of the students.

The majority of the students were happy with the experience and they offered to bring their own devices to practical classes and share them with others in order to work in a collaborative way.

IV. OUTCOMES AND CONCLUSIONS

There have been improved learning results with geodata and GIS. The increasing integration of GIS on the Cloud is improving chances of learning and teaching, and also for research.

This methodology integrates geographical itineraries, comments on images and Geographical Information Technologies which provide many new possibilities, all of them not yet explored. We consider that the work presented can be extrapolated to other spatial, professional and educative realities.

The work we did took full advantage of emergent technologies that are making geography a science on the rise, in the midst of an ever greater demand for more and more geolocation and geoservices tools all of which reinforces geospatial thinking, ICT skills, spatial competencies and scientific literacy. We can conclude along with our Spanish colleague Dr. Antonio Moreno (2013) that changes in the generation process of geographical knowledge

based on geotechnologies are so important that they have an epistemology range and are changing the scientific paradigm (Koutsopoulos, 2008, 2011). It implies understanding and a new research praxis different from others previously used, not only for research, but also for teaching and learning processes that demand new methodologies in practical classes, in lessons and in lectures, as we have tried to contribute to this work.

All of this means that the work already done has a huge potential based on the development of the AGOL platform and storytelling for collaborative working during practical classes. The quick integration of other layers, data, images, videos, texts, graphics, etc. and the possibility of having many people working on the same map from many different places and devices give us some idea of the advantages of working on the Cloud.

The AGOL platform provides an open tool on which it is possible to add easily new geodata with a clear and easy visualisation. Storytelling and AGOL facilitate work on the Cloud in our practical classes in order to deal with landscape, image comments and collaborative mapping on geographical and didactics itineraries and certain problems of the Spanish agrarian landscapes.

We explored some tools that build on new knowledge and will help our students deal with professional challenges, as well as future teachers and other professionals in the Geography field and other sciences and in this way obtaining the objective OE3 – Education Objective of the Excellence campus of the Complutense University of Madrid.