

## **INQUIRY-BASED LEARNING, ACTIVE TEACHING AND GEOINFORMATION: INNOVATING GEOGRAPHICAL EDUCATION**

Rafael de Miguel González

### **1. ACTIVE TEACHING OF GEOGRAPHY: STATE OF THE ART**

The creation of the Group of Teaching Geography at the Association of Spanish Geographers, organizing National and Iberian Congress of Teaching Geography, and the recovery of *Didáctica Geográfica* Journal have allowed to disclose a series of works related to the subject of active teaching of Geography. For the President of this Group (Marrón, 1995; Marrón, 2003; Marrón 2005; Marrón, 2007a; Marrón, 2007b; Marrón 2011), unlike passive forms of education in which the student is a mere recipient of content, active teaching it consciously involved in their own learning process a Geography adapted to the challenges of the XXI century: geographical space and social space, space capabilities, education in values, ICT. Thus, the active teaching of geography promotes complete learning (knowing, knowing how, knowing how to be) and encourages multi-causal explanation of events and phenomena.

A second is the essential reference book *Didáctica de la Geografía* (Souto, 1998) who developed three types of procedures that enable active learning of geography: understanding the information received, formulating a working method and presentation of information geographically and learning outcome. In all three procedures, the mapping information plays a key role, with statistics, iconic and verbal information. However, the printed mapping has traditionally been substituted for other types of geographical information. Instead, geoinformation allows four types, as students may be able to work with digital mapping and GIS viewers associated with information, for example, data population or economic activities, images satellite referring to geographical phenomenon reflected in the map, and explanatory text boxes.

Comes (1998), for its part, considers that there are three basic skills that must be acquired by the students in their learning of geographical space: spatial conceptualization, orientation in space and graphic representation of space through the cartographic language, including initiation into GIS .

The three authors cited have continued to expand its research related to active teaching of geography, as is reflected in the First European Conference in Teaching Geography ([http://didacgeo.unizar.es/index\\_en.htm](http://didacgeo.unizar.es/index_en.htm)) (De Miguel, Marrón & De Lázaro, 2013 ) in which were updated knowledge about them through contributions concerning interdisciplinary , geographical education for citizenship or connectivism, respectively.

## **2. GEOINFORMACIÓN AND KEY COMPETENCES FOR LIFELONG LEARNING**

In recent years there has been an explosion of new resources related to geographic information. And not only cartographic displays, digital mapping programs, virtual globes , GIS Online, etc. But with the popularity of smartphones and digital tablets (and their use as GPS) , social networking , geo-location applications, etc. (González and De Lazaro, 2011; De Lazaro and González , 2006; De Lazaro 2011; De Miguel, 2011; Milson, 2011). The emergence of geoinformation has occurred both at home and in the pockets of middle school students, and has also revolutionized the tools, techniques and procedures for teaching geography. Its proper educational use in the classroom is essential to expand the resources and activities based on active methods that enhance student motivation, self confidence and love of learning Geography. In other words, geoinformation is a fundamental factor in the acquisition of competence of learning to learn, and also on digital competence.

The International Declaration on Geographical Education, drafted by the Commission on Geographical Education of the International Geographical Union (1992 ) stressed the need for students to acquire knowledge, skills and values, that is, conceptual, procedural and attitudinal specific geographic education. Also indicated how the Declaration geographical education is contributing to the development of social competence and environmental competition, and intellectual and personal skills, especially through the achievement of skills and procedures of geographical techniques related to: identifying problems, collecting, processing and interpretation of information and logically, its expression through cartographic representations.

In conclusion, the Statement directly linked, more than twenty years ago, active learning and skills training to mapping procedures, since in that time the development of digital cartography and geoinformation were not as developed as today. However, this issue has been solved in the latest Commission Statement in Lucerne (on Geographical

Education for Sustainable Development, 2007) to place special emphasis on the importance of ICT, so that the link between geoinformation and inquiry-based learning through key competences is stronger.

The use of geo-information contributes to implementing active learning methodologies such as Inquiry-Based learning (Donert , 2013) (Kritz et al., 2013) and enhance the effectiveness of learning Geography (Kerski , 2003) , contributing in turn to the acquisition two specific additional issues: spatial thinking (NRC, 2006) and spatial citizenship (Gryl, Jekel & Donert, 2010). The first comprises three functions: descriptive, analytical and inferential, and their structures and processes that are central to the development of spatial intelligence, in the terminology of Gardner's multiple intelligences. The second includes three specific skills: management techniques and methods of spatial information, evaluation and reflection on the spatial representations, and communication and participation with spatial representations.

For the definition of the curriculum standards at U.S., the National Council for Geographic Education has contributed to the publication of two recent reports (Heffron & Downs , 2012) (Edelson et al. , 2013). In both is pointed out that the use of geoinformation and GIS to help students acquire skills such as creative thinking space, personal initiative, responsibility, critical spatial thinking, problem solving. Thus, students should consider using geospatial technology - both inside and outside the classroom- to increase motivation, increase understanding of space and develop competence to access, evaluate, analyze , produce and share geographic information.

### **3. GEOINFORMATION AND INQUIRY-BASED LEARNING: COGNITIVE PROCESSES**

The previous American document of 1994, which established standards in geographic education (reviewed by the reports cited above) defined a model of learning by discovery of geography based on five activities: ask geographic information, acquiring geographic information, organizing geographic information, analyzing geographic information and respond with geographic information, which has been slightly modified later by Kerski (2011, p. 5). On this basis, it has been reworked model integrating Inquiry-based learning with the use of geo-information during a recent doctoral thesis (Favier , 2011). Its second part develops an empirical investigation from the defined model and consists of following parts: ask geographic questions, acquiring geographic resources (geo-data gathering ), visualize geographic data, geographic information processing, respond with geographic information and present the results of the inquiry process.

Other studies have indicated additional cognitive processes in the use of geo-information to achieve an autonomous learning. Hof & Michel (2013) have developed a model based

on three processes: spatial conceptualization, spatial representation and spatial reasoning. Zwartjes (2012), meanwhile, provides four levels for learning with geoinformation: perception, analysis, structuring and implementation of geographic information. Bednarz (2004) has defined relations between the processes for learning geography and cognitive processes developed by geoinformation, concluding that the use of geographic information technologies are essential procedures to understand the complexity of current geographical space as well as the world and contemporary societies.

#### **4. GEOINFORMATION AND INQUIRY-BASED LEARNING: EDUCATIONAL INNOVATION VERSUS SCHOOL ROUTINE**

Several studies indicate that the use of the textbook and classical narrative methodology remain predominant in the high school classroom social studies (Martínez, Valls & Pineda, 2009), and especially in the High School Geography (Buzo & Ibarra, 2013; De Miguel, 2013), with the effects this has become unattractive, difficult, complex subject for. Against this, there are different inputs that encourage develop the concept of creative class (Bocconi et al. , 2012 ), which in the case of geography is essentially influenced by the constructivist assumptions (Roberts, 2011). One way to break the school routines is the use of geo-information because of its novelty, diversity, and support for dynamic visual resource that makes geography more attractive and the students are more motivated to learn.

There are collective works based on educational experiences to prove it (Milson, Demirci & Kerski, 2012) (De Miguel & Donert, 2013): the implementation of geo-media and GIS in the classroom encourages the use of active and inductive methodologies, the Inquiry-based learning (learning by doing), independent learning, critical, practical and constructive. Thus the student has an active and dynamic protagonist of the mapping that takes himself, on which he correctness, reliability and accuracy of the data is questioned, and that helps the student's own list and evaluate the contents geographical processes and current social issues for understanding the world today. In short, it is believed that the student should plan, organize and indicate new geographical educational knowledge, through functional and meaningful learning.

The extensive diversity of geo-media resources, attractive interface design of cartographic displays, its ease of use, immediate representation of the requested map and accessibility of students to Internet, promotes their educational use. If at the beginning of the use of GIS in the classroom, several traits justified their educational potential (ESRI, 1998), the most recent references affect these virtues (Boix & Olivella, 2007; Luque, 2011; De Miguel , 2011), especially when some GIS are available online. For these authors, GIS are important educational assets that contribute to the educational, methodological and

curricular reform (meaningful learning, simultaneous learning of teachers and students, exploring alternatives from different methods, development of educational research as a mean of learning acquisition of complementary value of the local scale), increases intellectual abilities (critical thinking, logical-mathematical intelligence, linguistic intelligence, interpersonal intelligence or communication and all spatial intelligence), increases capacity on access to information and what to do about it, enhances creativity and skills in the use of information technology, power active, autonomous aware of student work their own learning while enabling collaborative work helps to identify the surrounding landscape and to understand its symbolic representation, etc.

From a comparative perspective, the maintenance of school routines in the teaching of geography in secondary and implementation of technologies geoinformation with the promotion of active methodologies, we can conclude that there are a number of features inherent to educational innovation:

- functionality
- comprehensiveness
- possibilism
- contextualization
- connectivity
- exclusiveness
- identification
- diversity
- permanence
- variability
- individualization
- integration
- dignity of geography

## **5. CONCLUSIONS**

New technologies of geographic information are assuming a real opportunity for school renewal of teaching and learning of Geography. Comparative analysis of European curricula and other countries in the top ranks of international reports, agree that the teaching of a Descriptive Geography is giving way to a comprehensive learning Geography, explanatory, analytical and even proactive. Each time the references on the relationship between Inquiry-based learning of Geography, active learning and use of geoinformation is greater .

In Spain , despite the Geography curriculum allows the use of expository methods, especially in high school, however, there are some items containing methodological change that promotes learning the procedures of Geography. All the advantages mentioned above (active learning , skills training , cognitive processes) converge in one: in promoting educational innovation. Miralles et al. (2012) argue that, despite the difficulties, innovation is possible when the change process is creative. Undoubtedly, the development of space creativity is the feature that best summarizes the empirical research on the active teaching of geography through the technologies of geographic information.