A Cartographic Approach to help Students in Developing Geo-Reaction

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Abstract

The goal of the paper is to investigate the role of HyperAtlas as a tool to invigorate instructions and provide innovative content deliverables in teaching geography as well as in using it as the means to increase student's spatial perception and reasoning. In order to accomplish this goal there is a need for a series of processes/stages aiming at familiarizing students with the three major components of spatial thinking, namely: **situation, distance** and **structure** of space. Based on these, this paper presents a framework based on examples in France and in Greece, of how to reinforce cognition in space, through instruction with maps, in order to enhance geographical education. It is based on the fact that maps can facilitate the combination of numerous questions and their answers through active inquiry as students are investigating their environment. In this way maps became an effective way to teach geography via problem solving. More specifically, based on a multi-level tool that is used to measure, and map territorial disparities developed by researchers in geography and information technology (ESPON Program), two kinds of materials were designed; the first one, intended for teachers, presents them with tools that help them to work with HyperAtlas and the second one, targeting pupils, provides students with the necessary lessons' guide.As a result, different representations of space reflect a dialectical and interactive relationship between reality and space-policy consensus action in Europe, thus bringing students into a geo-reaction.

Keywords: spatial thinking, spatial disparities, didactic process, mapping, geography

1. Introduction

Changes in Europe and all around the world require new ways of understanding, new knowledge, attitudes and skills to work and live. Geography, in this analysis of the relationships between society and territory, has a very relevant role in the development of spatial thought of future citizens. Changes in the societies touch all levels of education including the diversification in curriculum structure, the introduction of new subjects, and the adoption of new perspectives.In additional, tools

introduced in teaching the approaches must be adapted to new methods in order to enhance the geographical thinking process.

The introduction of information technology and communication for teaching (ITC) is an ongoing process that is adapted entirely in the context of the "Strategy for Rethinking Education" launched in 2012 by the European Commission. This strategy aims to develop transversal skills including IT, among European students and increase access to education through free online resources. In this perspective, France has adopted a Strategy for the Digital School in December 2012. Thus, digital tools are being developed such as digital work environment, digital manual, text book online, touch pads, whiteboard interactive, etc., to enable students to acquire a computer and internet certificate (B2I). Many practices are being developed in class based on curriculum in geography. For example, the use of Google Earth is recommended in the sixth grade (first year of high school) to analyze near space in France. The use of digital mapping program and geographic information system (GIS) is recommended by the official instructions. In Greece, the digital tools are diffused massively in schools since 2010, such as interactive whiteboards, tablets, software, portals etc. These tools are designed to make students "young researchers". These pedagogical tools aim to encourage students to discover new concepts, to generate knowledge and develop skills and that is without a preparatory stage of using it. These a-didactic situations, differing in each country, question the objectives of both disciplinary and digital learning as it promotes a fragmented use of digital tools. In contrast to France, in Greece has not integrated digital practices in disciplinary curricula in secondary school.

Based on the above, we are convinced that the teaching of geography by using IT should play a powerful role in the training of the new generations of students in secondary school. That is because of its focus in the relationship between the society and the territory, Geography should contribute to a critical thinking and socially active values, and so, to the understanding of its structures as a common way of geographic thinking between curriculums. Based on this perspective, under the ESPON program a common framework has been designed and applied to the two countries, aiming at understanding the content of geography. To achieve this goal, two axes were followed: the first axis concerns the choice of the theme and the second one the spatial analysis tool. The theme in the form of “Spatial disparities” was chosen for exhibiting a basic knowledge of the content of geographical education. The analysis tool designed that contains those rules of cartography, will help in understanding the cognitive process of space and in its turn will be used as a vehicle for enhancing students’ spatial thinking.

In order to accomplish this goal the hybrid tool Hyperatlas and its components will be presented in the first section. The didactic theoretical and practical framework will be shown in the second section. Finally, in the third one, the experiment in France and in Greece that took place in October and November 2013 will be presented. The paper concludes with some suggestions for moving beyond it.

1.1 HyperAtlas as a hybrid tool for invigorate “disparities”

HyperAtlas is an innovativeweb application tool, creating a bridge between European policy makers and research in geography. This is not an interactive atlas or a geographic information system. It is a web application created in 2006, well before

the outbreak of Smartphone and tablets. This application was developed by researchers from the LIG laboratory (Joseph Fourier University) and Géographie-city in connection with the UMS RIATE, as part of a European research project Espon. The user can directly utilize existing files available on the ESPON site (http: //hypercarte.espon.eu/), or create his own files (format.hyp) by downloading the source program to create a file and incorporating the desired data. This is a mapping tool that illustrates where disparities are, to analyze whether all disparities are inequalities and whether to fix or not. This tool covers the basic characteristics of space: Where? What? How? What for? Why there? HyperAtlas questions geography disparities and inequalities within the European Union by showing their relative nature. It is based on the assumption that the situation of a region or a territory, must take into account its relative position and location. Regions belong to territorial and spatial systems. Indeed, from a geographic point of view and in a social science perspective, contrasts and gradients have of much more interest than absolute values. Furthermore, aggregating and disaggregating territorial units allow seeing how local values add up to form territorial contexts and regional positions.

1.2 Function of Hyper Atlas as an cognitive artifact

The introduction of technology in the didactic process creates a dual cognitive artifact (Genevois, 2008). That influences the nature of actions and the way in which actions are carried out. Maps and digital tool are both cognitive artifacts. HyperAtlas is a tool that allows “spatializing” demographic and socio-economic disparities in order to understand their structures throughout the European area. To achieve this goal HyperAtlas incorporates different variables and processes that help students familiarize with space. In other words, it is a tool for multivariate spatial analysis. Hyperatlas is a spatial analysis tool that may bring fresh methods in teaching geography and help to renew the common understanding of the European territories and the European Union as a political space. In using this tool, students will thus learn to deal with new geographic issues.

HyperAtlas contains:

A data base: by choosing variables, a user can select the related to a chosen theme: demographic, social, economic and the criteria for land use. Students have access to data that has been uploaded but they can’t modify. That is, they are required to select indicators, the level of scale at which indicators are represented and to view modes.

Study area: the selection of the area for study may be done from onEU-15, EU-27 or countries involved in the research program ESPON which of course determine the data measurement.

Measurements: It is also possible to change the scale level at which information is represented such as large, medium and small which are differentiated by the study area (NUTS 0; NUTS 1; NUTS 2,NUTS 3) determines how inequalities are measured. The territorial study area measures the deviation from the average spatial extent territories and the distance space from neighboring areas (spatial contiguity) depending on the chosen standard, which present different perceptions of space.

A cartographic representation: this can be visualized by different combinations, of the number of classes, size and color which are determined by the user. It is also possible to combine the database indicators by forming ratios. This process is close to

GIS, without HyperAtlas users having write-access to data. In this way, the challenge of the use of HyperAtlas in classroom is that it provides a double context: educational and citizen-wise (fig.1).

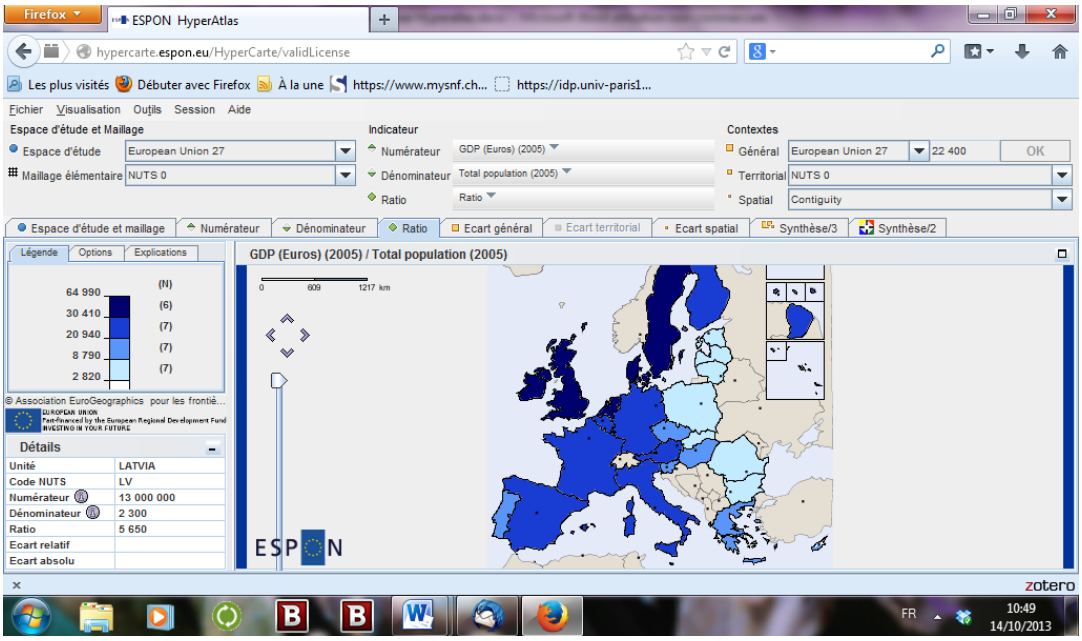

Figure 1:Function of HyperAtlas

Based on this perspective, the didactic process via Hyperatlasleads in two approaches:

- **as an index to stimulate spatial information**

Hyper Atlas helps students comprehend, as an instrumental process (spatial thinking), the following political actors: to simulate the effect of redefining the criteria or the hypothesis; whether it is a matter of changing indicator using a different statistical threshold (e.g. 75% of the average); and redefining the territorial units used for understanding spatial information.

- **as an indicator of explaining spatial data**

In this case, HyperAtlas provides measures of disparities for each region, thereby helping students to consider different perspectives on regional or territorial development and formulate approaches in order to apprehend their spatial structure. That is it is an instrumentality process (spatial acting).In addition however, Hyper Atlas can also be used as an index tool and as an indicator of contradictions or conflicting values.

Based on the above, a theoretical approach in need to be considered in order to understand spatial thinking and spatial acting pathways via ICT and it will be presented in the next section.

2. Teaching spatial thinking via ICT

The digital nature of mapping tools necessitates a different way of spatial thinking and map usage, as they relate to learning. A theoretical and practical framework will

be presented below, in order to establish a cognitive process using a digital cartographic tool in the development of spatial thinking and spatial acting.

2.1 Spatial thinking pathways

A map is a cognitive construction that is part of a socio-constructivist learning approach and is aligned to the epistemological principles concerning spatial analysis (Fontanabona, 2000). Within framework, space is defined as a system of areas whose interactions depend on their distance, their position and their hierarchy, while each map its scaled representation (Brunet, 1987). In other words, a map is a metaphor of geographical space, used as a research tool (Pigaki, 2000). Students, through shapes and symbols, can apprehend space and observe spatial information. This allows a series of spatial questions such as: location (where?), shape (what?) and spatial organization (why? how? relationship?). The challenge of a didactic process is to organize and support students' questions. Sylvain Genevois (2008, p. 107) modeled the processing of information in an educational GIS in 4 steps: first problem description which presents the problematic situation's perspectives (Gérin-Grataloup, Solonel and Tutiaux-Guillon, 1994). The second step concerns data research to address the problem, third building an argument (3rd step) and forth produce results, which can be visual or statistical. This is shown in the figure below.

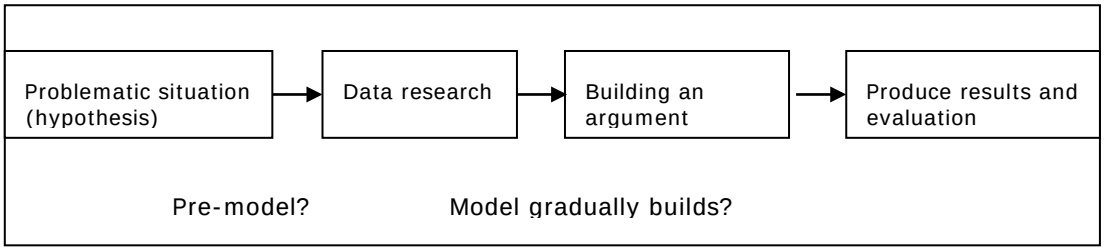

Figure 2: Steps of managing information in pedagogical GIS(According to Genevois 2008, p. 107 – free translation)

The map as a spatial tool seems to represent a hyphen between the two processes mentioned previously (instrumental and instrumentality). This is due to two factors: fist to the fact that space, is organized as a complex system which leads to abstract concepts and even more abstract systems. Second, space is depicted in topological terms that are schematic and conceptual constructions of relationships via geometry and mathematics that induce the notion of contiguity, continuity and content. As a result, there is a need to organize concepts and propose a cognitive process both adapted to technological progress and leading to modifying the paradigm of teaching space.

2.2 Towards a new paradigm for spatial thinking

For a geographical area to become perceptible there is a need for a series of processes, which constitutes the cognitive tool for the transmission of spatial thinking and spatial acting and which follows. The approach suggested is based on both processes of HyperAtlas, instrumental and instrumentality and allows linking the two processes towards a new paradigm to teach spatial thinking and spatial acting. In other words,the procedures (presented in Fig. 2) needed to familiarize students with the three components of space, namely, **initiation in structure, familiarization in distance and assimilation in situations**, which constitute the basis of spatial thinking

and spatial acting. As it can see to figure 3, the process from spatial information to spatial thinking and acting proceed through two operations. The first one which refer to instrumental and its related to the operation of creating space as an organization (see left side of fig.3). The second process refers to instrumentality which represents the operation by which space transform as a model. More specifically, space as an organization determined by the parameters and their intellectual expressions (see right side of fig.3). As for the space as a model, which refers to instrumentality is clearly depends on cognitive and mathematic processes. In sum in order for spatial information to substantiate spatial thinking and spatial acting, the didactic process of utilizing the basic spatial components (structure, distance, situation) is necessary (see center portion of fig.3). In other word, this process concern student's transposition **on** space, **in** space and **with** space (Pigaki, 2013)

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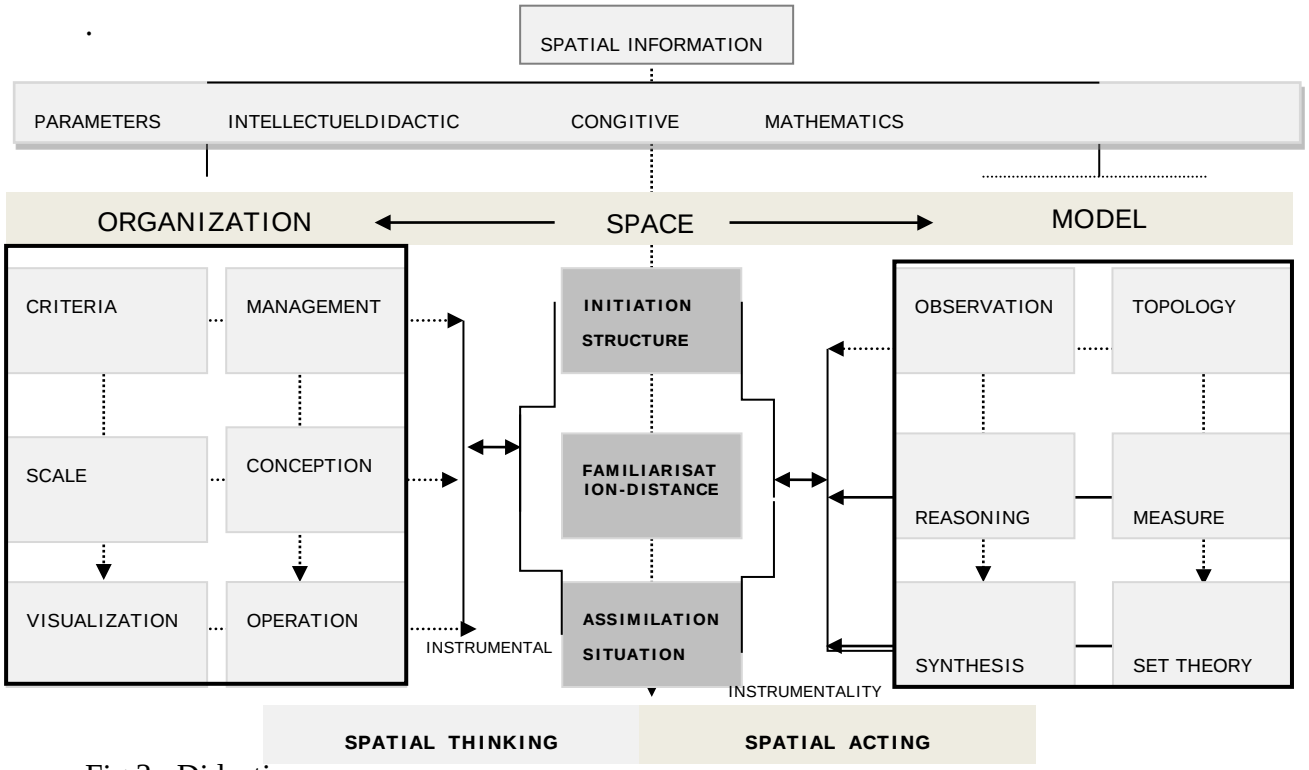

Fig.3: Didactic process

3. Experimentations in Greece and in France

With the ESPON program, the experimentations took place in October and November 2014 in both countries in public schools in Athens (2nd high school of Kaisariani) and in Paris (Lycée Charlemagne).

3.1 Framework and conditions of experimentations

The experiments although they use the same methodology in both countries the conditions on them force a different approach to the context, the program and the conditions (Table 1).

Experimentations	Greece	France
context	Project	Subject matter of the curriculum
Programing	5 sequences/ 2 h	1sequence/1h
Conditions	Computers lab and tablets	Computers lab
Methodology	Common :Work in individual groups	Common: Work in individual groups

Table 1: The conditions of experimentations

As a result the objectives of both applications were common as following:

- Identify and locate the territories of the European Union
- Reflect how to measure and to define the territorial inequalities
- Locate, describe and characterize the socio-spatial inequalities across the EU

Skills to achieve:

• Identify and locate
• Changing scales and relate
• Develop a critical sight at the statistical data
• Collect, link and compare information
• Describe and relate geographical data
• Read a document and express the key ideas
• Change reading level
• Use digital tools to build a geographical reasoning

3.2 Spatial thinking and spatial acting analysis

On the other hand given the differences mentioned previously, the curriculums of both countries were providing us a good picture of the philosophy of these different academic systems. In more detail, the two applications in theses counties which have as an objective to convert the spatial information into spatial data, leads to two approaches:

Space as an organization and space as a model

Both of these approaches as it mentioned previously, concern the transposition of the subject related to space. In order to apply process effectively, it must first be mentioned the pre-cartographic step which it is experimented in Greece.

- Students' spatial representations: A pilot study(in Greece)

Space as an organization contains the following 3 steps:

- Initiation in structure (in Greece and in France)
- Familiarization in distance (in Greece and in France)
- Meta-analysis spatial operations (in Greece)

Space as a model contains the following step:

- Assimilation in situation (in Greece and in France)

3.3. Students' spatial representations in Greece: A pilot study

This stage includes the pre-cartographic activities that lead to cognitive development 'on space" and represent the first step. More specifically:

Parameters: The role play is the first approach of understanding geographical and social notions. Roles were assigned based on place of birth, residence, employment status, the condition of social security, social status of the parents, wealth etc. following question students, depending on their role either take a step forward or stay put. At the end of the game students apprehend differences between them in social or economical level.

Intellectual: It's a preparatory stage where the subjects begin to have a significant part as a citizen. Therefore, the structure for recognizing the situations, the questions and the activities for solving the problem (why?) increase their awareness that every phenomenon is reflected in space. Understanding the changing space activates social and political parameters.

Cognitive: The "horizontal reading" is a notion that is projected "on" space in relation with others. In other words, the subject's movements in space increase his ability to observe the others and become aware of its own situation.

Analysis: This role play is used to show the subject's preexistent knowledge, their mental representations and conflicting emotions related to abandonment or companionship. Through this role play some images are created which can sometimes be related in their reality or not. It is remarkable, the fact that the behavior and the emotions of students and in this age, are coming from social stereotypes such as recognition and authority. Moreover, the students that were left behind and felt powerless, they tended to observe the ones that were in front of them. On the other hand, the students that were in front they were indifferent and dominant. The students that were representing the middle space were more competitive than the rest. This step is significant for the transition of the subject "in" space. In that way space becomes the **object of action**. The visualization of socio–economical results in the municipality of Attiki helps students in **initiating** "vertical reading". This process makes it easier for them to **observe** partial and global vision. The districts that don't have any information about them, during the mapping were calculated and visualized with simple mathematical operations by students (value/distance). The characteristics of each district, if it is an industrial area or an area with a high socio-economical level, begins to have a more important role, in comparison to the previous stage where the subject was active "on" space without taking into consideration spatial data. Thus, space gains functionality and content. In other words it gains topological traits. Through visualization, students separate the different or similar traits "in" space. This process constitutes the second step of cognitive chain that goes from role play to spatial transcription, in order to provide spatial thinking and spatial acting (fig.4).
Following is a presentation of the three steps in the didactic process shown in figure 3.

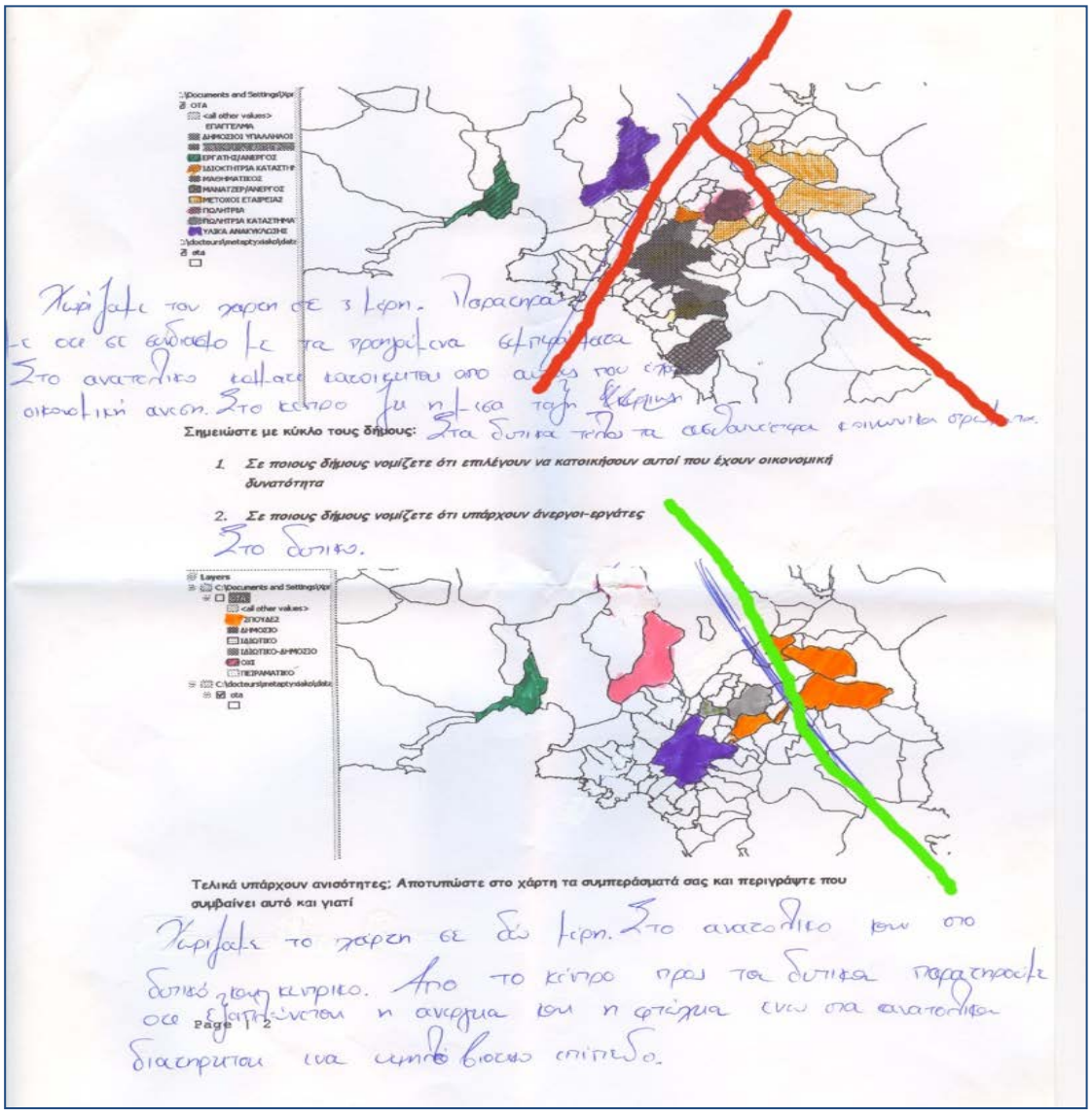

Figure 4: Maps of Attiki region realized by students

3.4 Space as an organization

In this stage HyperAtlas is used as an “instrumental” tool, that activates “instrumentalities” in order to transform space as an organization.

3.4.1. Initiation in structure: this the first stage and includes the following factors. Parameters are the basic components of the database. That is, by using data which is included in the Data Base, students choose topics to formulate their hypothesis. This stage constitutes the base of understanding the problem in spatial terms. More specifically, students tried to answer the questions: “where is it?”, “what is it?” and “How is it?” That is it to investigate through the choice of criteria how students consider the characteristics of the space and ultimately understand the basic geographical notions using appropriate vocabulary. As a result, this is a transition stage introducing both notions of mathematics and space that help students to rationalize their approach to mapping.

The second component, Intellectual, by using data which are included in the Data Base, students in addition to choosing topics to formulate their **hypothesis**, they sort the information which have been collected, compare and finally visualizing the results, through mapping, to evaluate information. This stage of **management of information** is important because it helps students to understand the structure of space. That is, students by possessing information interact in differently situations that exist or forced upon space. The management of information aims to “distant” the subject from their “subjectivity’. As a result, mapping expands their understanding “on” space and helps them to formulate a **concept** of the undergoing conditions defined as structures. Students learn to link space to its characteristics and this leads to spatial reflections at the economic and social level.

The third component, Cognitive, provides information for the **observation** of a map given that a map raises questions which in order to be answered the construction of a new map is required. As a result, information allows students to transform the space as an object of knowledge through mathematics representing the well-known notion of **topology.** That is, viewing information helps students observe, think and argue about space (fig 5).In addition, students acquire appropriate spatial vocabulary.

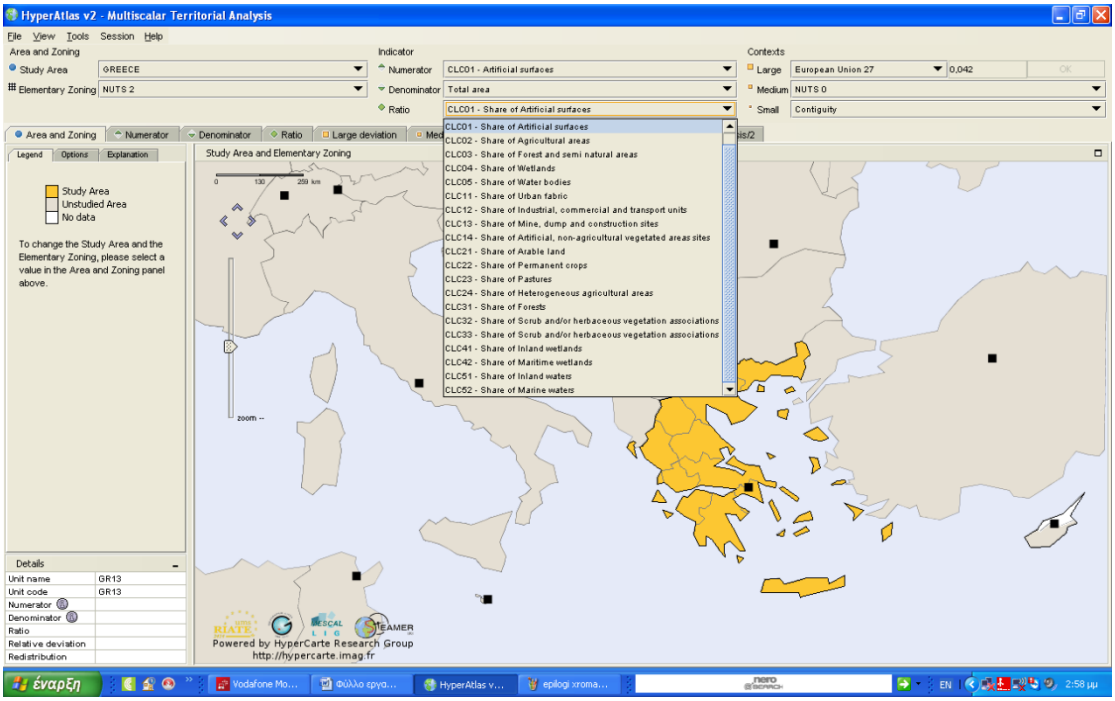

Fig.5. Management of information by the students

3.5 Familiarization in "distances"

This is the second stage treating the known factors as follows: In the area of parameters the process creates complex reasoning and the usage of more complex parameters and so on. In building up "**distances**" from structure, there is a need to use certain repeatedly operations such as choice of criteria, choice of scale and visualizations. The cognitive process comes through "reasoning" with the parameters of HyperAtlas which can be used as a tool that links spatial conception with the reality. The connection between cause and causality consist the mean of this stage.

Intellectual: For achieving this goal, Greece was selected as a geographical background, focusing on regions and prefectures (NUTS 2, 3).Through scale, students associate different level of reading and thus produce equalities and inequalities. The **Disparities** which are formed depend on elementary zoning. Students **observe** deviations **reasoning** the new spatial framework. The mathematics behind structural design and analysis reflect this fact and is usually of a simpler nature than that which deals with dynamic effects.

Cognitive: Visualizing of a map is the result of the student's hypothesis. This process helps students to **conceptualize** the undergoing conditions. At the same time, the concept of **distance** forms different points of view and transforms space into new **structures**. Students apprehend space as the base of socio-economical notions. Through these new structures they can correlate local and global space. On this stage the vocabulary of students is enhanced because this process demands words and expressions that are more accurate and sophisticated (fig.6).

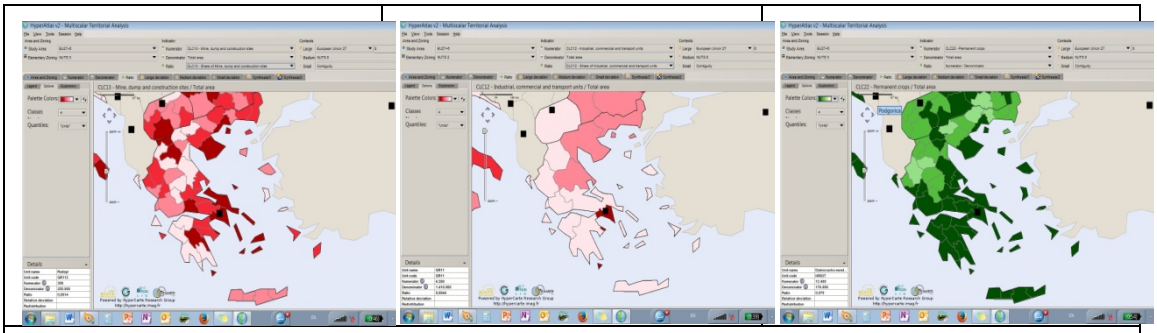

Fig. 6. Visualizations depending criteria and scale

Meta-data analysis is a preparatory middle stage which contains the activities that transform space as a model. Using tablets and a specific design application, students draw **on** the spaces that they took from HyperAtlas. This stage utilized in Greece, has significant importance for the progress of spatial thinking and spatial acting. It is an operational stage **between space as an organization and space as a model.**

Parameters: Through logical operations students became familiar with the various structures and distances of space. Students operate "with" space by using union, subtraction or intersection in order to provide multiple spatial functionalities, such as tourism, agricultural activities etc.

Intellectual: Students understand the structure of space through its analysis. In other words space becomes **an object of function**. It's a dialectical stage between different spaces. This step helps students to evaluate as well as manipulate the data displayed in an active and rational way by logical operations in space. Relationships and interactions lead students to formulate sets and subsets in space by mathematical compilations such as intersection, union or subtraction. Therefore, the rationalization of space through correlations promotes the linking of meanings thus, it creates an "open boundary condition" of the spatial thinking and spatial acting. That is, students are learning to overcome typical spatial boundaries.

Cognitive: The functionality of the area through operations helps students to create new associations "**with**" space. The spatial continuities and discontinuities create the necessary cognitive processes to answer the "how" and "why". This process is to understand complex notions of geographic space, using different reading levels (NUTS2, 3) combining them with a different period of time. The concepts of continuities and discontinuities are questioned in that students organize their data in a worksheet, a fact that helps them to understand the **relationship** and **interaction** of spatial attributes. This process was completed without any difficulties (fig.7, 8, 9).

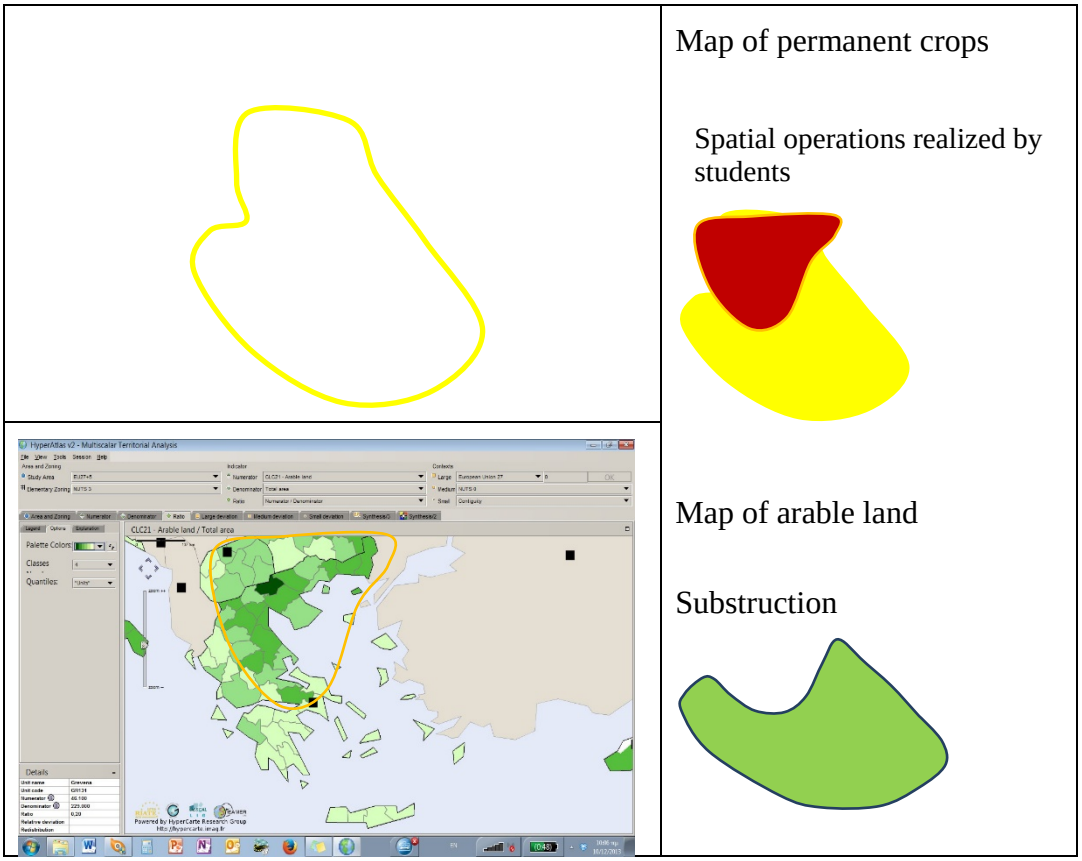

Figure 7: Identification of land use data via HyperAtlas

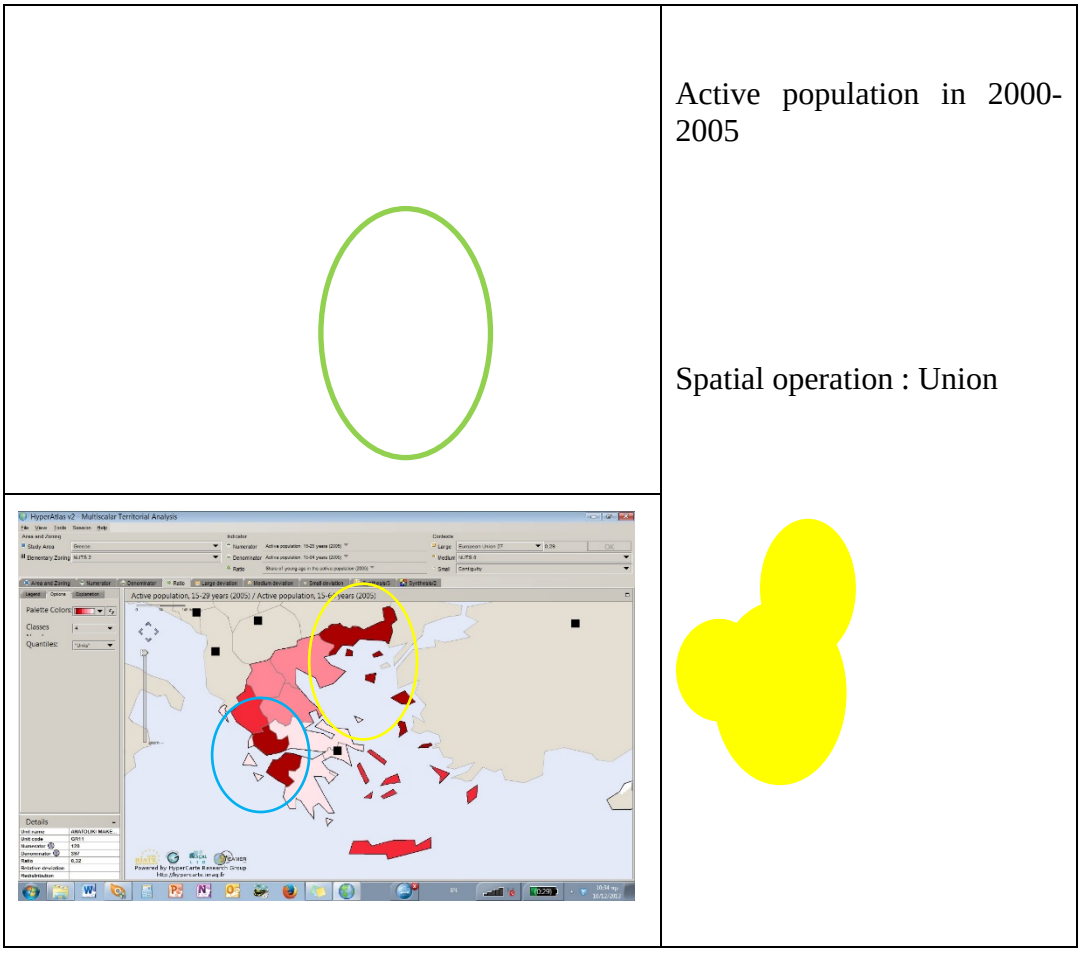

Figure 8: Identification of economical data via HyperAtlas

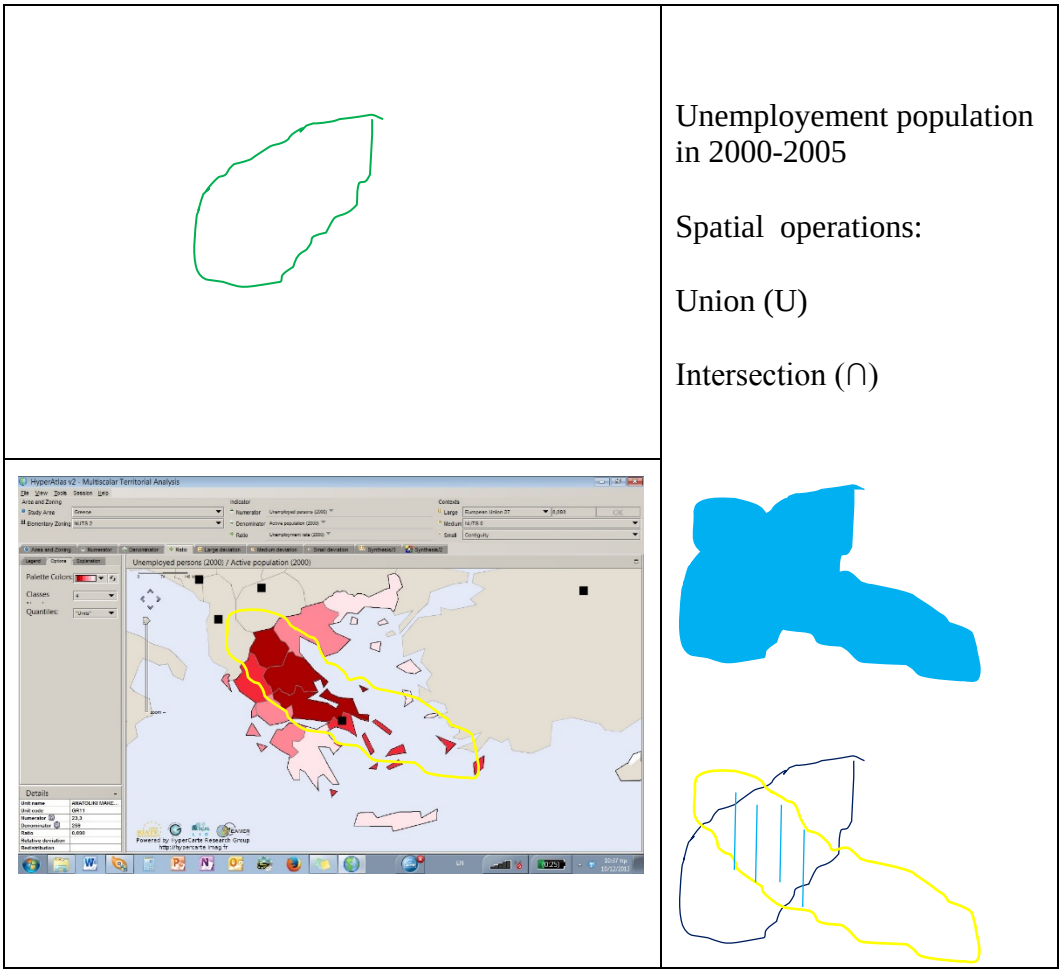

Figure 9:Spatial operations using demographic and social data

3.6Assimilation in situation

In this third stage, the data provided by 'HyperAtlas, are freely chosen from the Data base using either given ratios or by formulating their own ration by determining a new nominator and denominator. In addition, students use data in different periods of time. In this way, students perceive **systems** as derivatives of the conditions in a certain period of time and they are related to specific socio-economical situations**.** Through this process students are active by proposing different ways to decrease inequalities at a European level.

Parameters: This process is to identify the ability of students' in **synthesizing** using various **scales** and **criteria**. It aims to enhance spatial thought and in addition qualifies spatial systems to be **assimilated** in various spatial **situations**. In conclusion, students should be able to answer the questions “why and what if?”

Intellectual: For achieving this goal, Europe was selected as a geographical background focusing on European subdivisions (NUTS 1,2,3).The choice of these subdivisions (parameters) is a crucial operation to apply the conceptual network. That is students apprehend socio-spatial inequalities. In contrast, the production of different

maps can measure the progress of their vocabulary and thus enable them to become active in civil and political debate.

Cognitive: "Vertical reading" becomes understandable through the spatial classification, which functions as transition link between different spaces. The **sets and the subsets** that are created via logical operations, contain the correlations between space and socio-economical parameters that affect them. The understanding of spatial disparities creates a form of a "spatial prototype" related to contrasts such as North/South, center/periphery etc. The maps that are constructed through the selection of criteria help the students to model space and understand the principals of a defined area. In other words, the formed **sets and subsets** create systems that include other smaller systems. The students act "**with**" space and thus space becomes **an object of reaction**. When questioned, what they will do if they had the ability to decrease the inequalities, students by **synthesizing** the map and the results of the criteria; they can explore different proposals (fig 10, 11).

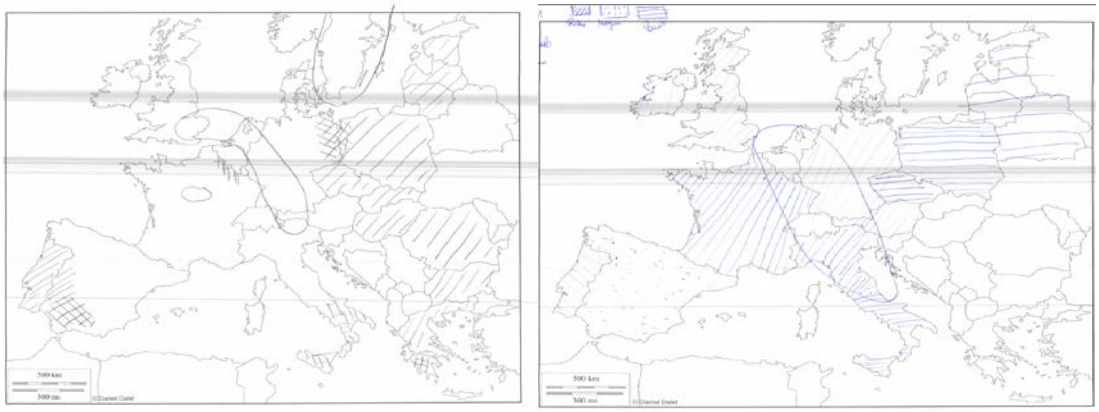

Figure 10: Spatial disparities in Europe effectuated by students in France

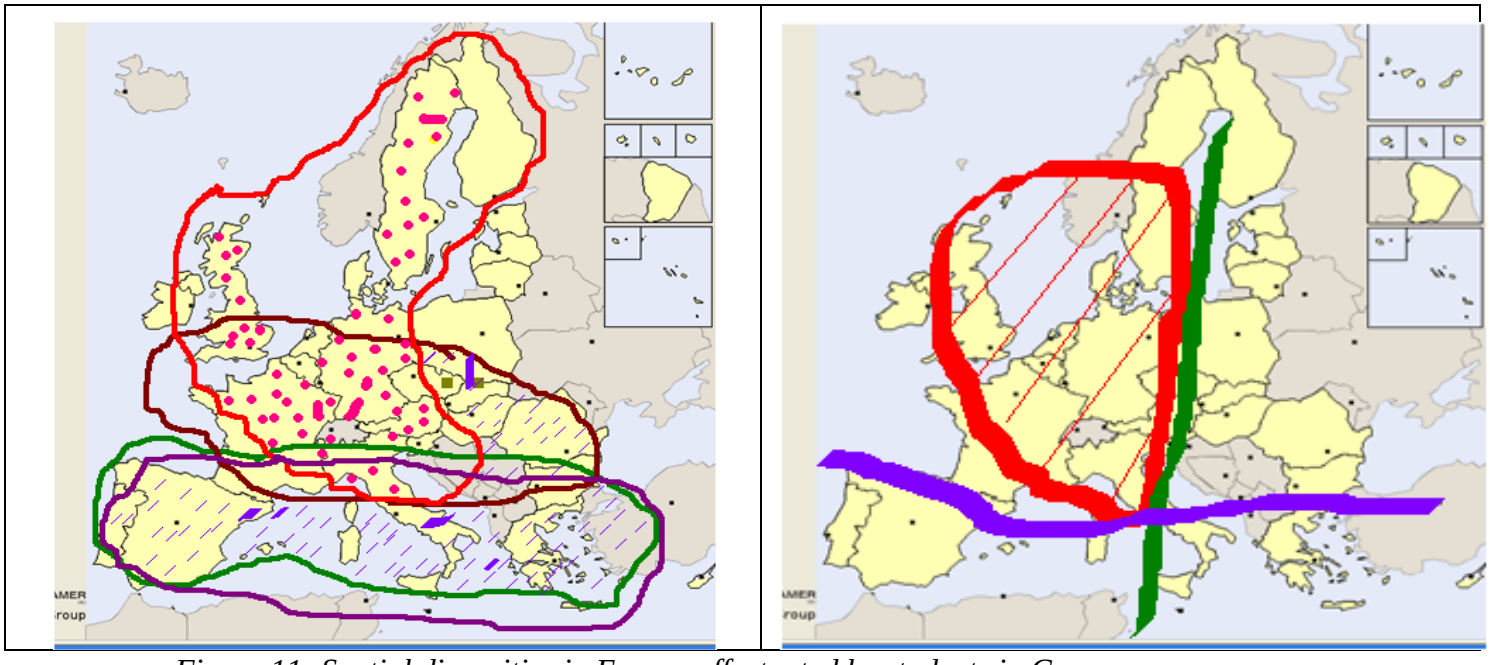

Figure 11: Spatial disparities in Europe effectuated by students in Greece

4. Comments and limits

The science of space faces two challenges: to demonstrate its theoretical power and to prove its political and social value. In addressing these issues, the development of new cartographic tools for visualizing social, economic, environmental disparities and inequalities play an important role. Cartographic tools can be used to meet the needs of teachers and students by making information more widely available. At the same time, when the task of selecting the most effective strategy for reducing inequalities is concerned, they can create doubt and confusion by showing measurements of territorial inequality.

In testing HyperAtlas in Greece and in France; the results were relatively successful for the following reasons:

- it is friendly towards the user
- it is designed in a way that keeps the students focused on their goal
- it contains functions that promote students' spatial thinking

Greek students aged 15 to 16 have difficulty relating socio-economic data with space. Space by itself does not express any functionality or content thus space is not contained in their mental associations. The students tend naturally to use the database without having first formulated any hypothesis. This is corrected by the visualization of data. The meaning of ratios does not cause problem to the students who compute them from raw data (as numerator / denominator). The only exceptions are the ones who use already made ratios. In any case, map reading gives a meaning to their hypothesis but, they do not manage to create combined indicators from different maps. The maps are used as an image by the students and not as a tool for research. Some students have an initial difficulty to visualize the phenomena without taking the administrative borders into account, such as the municipal boundaries of Greece. This can be solved by logical operations that turn space into an object. The transition from concrete to abstract is reachable under some specific didactic process. Students in Greece used more complex criteria such as demographics and life span, while students in France used the stereotypes of regions (North-rich/South-poor).

In conclusion, in Greece the discussion that occurred during the experimentation shows that students, through specific processes, understand the social and political dimensions of space. These processes train students to become active members of the society (citizens).

In contrast, in France, students have pre-established hypotheses, which are the result of the curriculum and the data used to prove this pre-existing knowledge. French students have difficulties to form meaningful ratios by themselves. However, their maps follow better the rules of mapping. But as in Greece, the maps are not used as a tool of spatial analysis but as a document (Fontanabona, 2000). Their vocabulary didn't have the same progress as in Greece where students had more time for experimentation. The students in France show difficulties by not taking into account the pre-existing historical borders. Space is not considered as a whole, but as bits and pieces used to confirm a pre-existing knowledge.

Nevertheless, in both countries, students didn't have an integrated consideration of space, despite the changes in curriculum and the maps produced. Therefore, didactic practices must take under consideration the experimentations to adapt to new needs. In conclusion, the positive results of these first experimentations led us to the decision

that there is a need to invent a new cartographic tools which should implement the stages, available online for anyone interested to use them.

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Appendix1:Worksheet proposed in Greece

Les inégalités spatiales				
Land Use	Demographical data		Economical and social data	
indicator	indicator	time	indicator	time

Appendix 2: worksheet proposed in France

Connectez-vous à Hyperatlas : http://hypercarte.espon.eu/

Phase 1

- A quels territoires correspondent les maillages élémentaires du logiciel (NUTS 0, NUTS 1 et NUTS 2) ?
- Choisissez trois indicateurs qui vous semblent pertinents pour analyser les inégalités dans l'Union européenne. Complétez le tableau ci-dessous à l'aide des questions 3 à 5

	Ratio 1	Ratio 2	Ratio 3
Nom du ratio			
Dénominateur / numérateur			
NUTS 0 (2005)			
NUTS 1 (2005)			
NUTS 2 (2005)			
NUTS 2 (2000)			

- Observez chaque indicateur choisi à l'échelle NUTS 2 en 2005 ? Queconstatez-vous ?
- Observez chaque indicateur choisi aux autres échelles (NUTS 0 et NUTS 1) en 2005. Que constatez-vous ?
- Observez chaque indicateur choisi à l'échelle NUTS 2 en 2000. Que constatez-vous par rapport à 2005 ?

- Choisissez un numérateur ou un dénominateur et modifiez-les figurés ponctuels. Toutes les cartes produites ont-elles du sens ?

Phase 2

A l'aide du fond de carte de l'Europe fourni, identifiez les différentes régions européennes au regard des indicateurs choisis.

Phase 3

- A partir du PIB par habitant en euros [GDP (Euros)/Total population(2005)], observez l'écart général, l'écart territorial et l'écart spatial. Qu'observez-vous ?Qu'enconcluez-vous ?

	Observation	Analyse
Ecart général		
Ecart territorial		
Ecart spatial		

A l'aide de ce logiciel et après cette activité, comment pouvez-vous caractériser les inégalités territoriales à l'échelle de l'Union européenne ?