# Using a Social Web 2.0 Tool in Geography and Environmental Research Project: A Content Analysis of Greek High School Students' Learning Exchanges

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## Abstract

The first part of this paper refers to the contribution of geographic education in the development of knowledge, attitudes and skills for environmental protection in the context of sustainable development of the world's societies. Thus, specific concerns identified regarding the young people participation in research and collaborative actions using Web 2.0 applications, in the context of geography and environmental education, through sociocultural constructive view of learning. In particular, the concerns relating to the way of the young people interaction using an educational online environment and how it can help to improve their learning process. Accordingly, the study considered the following research question: Does the sociocultural constructivist interaction of students in an educational online environment affect their cognitive development and their geography and environmental approach to the research issue? The answers to above question is given by the empirical part of the research that is based on results which focused on the analysis of sociocultural constructivist interactions of high school of Athens students (N=16) during an eight-month geography and environmental for sustainability research project in a social computing and specifically a free social bookmarking site, Diigo. The results indicated that the quality of their interaction was at a satisfactory level with most complete learning exchanges, progressively developing essential skills for an organized and integrated geography and environmental approach, throughout the project.

**Keywords:** Geography and Environmental Education, Web 2.0, Sociocultural Constructivist Interaction

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## Introduction

In recent decades, the progress of sciences, has been rapid, thus contributing to the creation of new education fields, in which young people will acquire skills in order to respond to the demands of the time. Thus, recent initiatives to education reform indicate the importance of the development of thinking skills, data analysis skills, understanding of real world applications, using the power of technology in teaching and learning. Regarding science of geography, researchers increasingly propose the creation of learning environments that are aligned with the goals of the second edition of Geography for Life: National Geography Standards (Heffron & Downs 2012; Edelson et al. 2013) and are focused on the high quality research and collaborative process in geography, using Web 2.0 applications, practices and extensions.

The rapid development of geospacial technologies including geographic information systems (GIS), global positioning systems (GPS), Global Visualization Tools (such as Google Earth, WorldWind, ArcGIS Explorer, etc.), and Web-based 2D and 3D visualizations of Earth's landscapes, oceans and associated geographic, has further enhanced the online provision, accessibility and dissemination of geographical capabilities and knowledge. These technologies allow for visualizing, mapping, organizing and analyzing multiple layers of georeferenced data, promoting the understanding the environment and of making responsible environmental decisions (NRC 2006; Lambrinos 2009; Scharl & Tochtermann 2009; Apostolopoulou, Klonari, Lambrinos & Soulakellis 2009; Klonari et al. 2012; Exarchou & Klonari 2012, 2013; Downs 2014).

Thus, through their studies in geography, students are encouraged to explore and develop knowledge and understanding, personal and social skills, particularly with regard to the spatial dimension of daily life and to international understanding, and attitudes and values, moving from the "knowing" level of thinking to the "applying level" of thinking (Koutsopoulos 2010; Granados Sanchez 2011; Heffron & Downs 2013). Specifically, S. W. Bednarz, G. Acheson and R. S. Bednarz (2006: 398-404) contend that "the ability to use images and spatial technologies intelligently and critically is becoming a requirement to participate effectively as a citizen in modern society". In addition, the ability to use, analyze and interpret images and maps is becoming a social collaborative process, using social web 2.0 tools (i.e. the user-generated content and social networking capabilities) that "are totally transforming these web mapping information and capabilities by democratizing the creation and dissemination of geographical content (and media) to Internet users and networks" noted Sigala (2009: 1-8).

On the basis of the aforementioned, specific considerations were found regarding the participation of the young people of a small southern European country, Greece, in research and collaborative activities with the use of Web 2.0 applications within the framework of geography and environmental education. Specifically, in the greek educational system, the linking of geography and environmental education and digital technology is centered on the digital literacy (Klonari & Mandrikas 2014). The aforementioned framework of the linking in the greek area occurs mainly through the use of internet applications, interactive multimedia, GIS, simulations, and virtual reality. However, research is limited and often found the lack of evaluation of these

applications, a factor which sometimes characterizes the environmental education in Greece (Ioannidou et. al., 2006).

## The research

### Methodology

A research under actual teaching condition was chosen to be conducted for the research of the above considerations. In particular, a TdCS (Transdisciplinary Case Study) was designed with ethnographic elements and action research elements for the course of Research Project during about one whole school year and it concerned students of the 1st grade of Athens General High School. The design was based on the functional–dynamic model of participation by Scholz et al. (2006). The basic exploratory process was divided into the following six phases: a. Definition of a guiding question, b. Facet the case, c. System representation by a system model, d. Creating scenarios, e. Conducting a Multi-Attribute Utility Analysis, based on both scientific arguments as well as individual stakeholder preferences, and f. Developing robust orientations for future development.

The students-members of the study group have the possibility to take advantage from their participation in this research activity on multiple levels: a) they actively participate in the learning process with research, collaborative and educational activities within a framework of interaction between the science and the society (transition from science for the society to science for the society) and b) they act on the basis of their previous experiences and thoughts with a view not only to solve a problem they have experiences but also to enrich their theoretical approach contributing to the research community (Stauffacher 2010; Stauffacher et al. 2006). Furthermore, it is suggested the use of multiple research tools with qualitative and quantitative characteristics in order to ensure the credibility and the validity of the collection of data sources. This is achieved with the application of methodological triangulations both during the production process and the interpretation of research data. In this study we used: observation, questionnaires and the products of the students' activities, taking advantage of the content analysis (Olsen 2003; 2004). According to Cohen & Manion (1994), this methodological pluralism (methodological triangulation and combined levels of triangulation) helps to achieve an as far as possible pluralistic view and understanding of the research conditions while overcoming the problems of the methodological restrictions, cross-checking the collected data and utilisation of more than one analysis level (deriving from the three main levels used in social sciences), namely individual level, interaction level and level of cooperative activities, particularly useful for the TdCS (Cohen et al. 2007; Hammersley & Atkinson 1995). Observation is analysed in the study of participation and of the overall behaviour of the students participating in the research learning activity, through active involvement (as intermediary) of the researcher in this activity. Moreover, the questionnaires are used in the initial stage of the research for the recording of ethnological elements of the students/ participants, as in detail referred to in the presentation of the case studies below.

Further analysis of the students'/ participants' activities is made through the products produced by their activities. For better understanding and analysis of the students'/

participants' activities in a research learning Web 2.0 community a QCA (Quantitative Content Analysis) was effectuated with the use of "exchanges" between the learning community, through bookmarks, tags, annotations, interactive sticky notes, digital highlights, images and documents. Cerratto and Rodriguez (2002) define exchanges as analysis unit for the communication in Web 2.0 communities. An exchange mainly includes two expressions/ declarations, which are determined as initiative and response. However, we may see also a third expression/ declaration to be part of the exchange. Referring to Kerbrat-Orecchioni (1992), the aforementioned note the following regarding the form of the produced exchanges: "In codification, the production of exchanges with two expressions/ declarations is considered as minimum exchange and is interpreted as indication of minimum participation in the conversation. A more significant production, with three expressions/ declarations is considered as full exchange and is interpreted as indication of participation in the community's activities". Thus in this research process, we compared the number and form (minimum or full) of learning exchanges (regardless their type) of the groups that work in a Web 2.0 learning community through QCA.

For the aforementioned analysis, we applied the codification system or five - phases interaction analysis model (IAM) developed by Gunawardena, Lowe and Anderson in 1997: a. Sharing/ Comparing Knowledge, b. Dissonance, c. Negotiation/ Co-construction, d. Testing Tentative Constructions and e. Statement/ Application of Newly-Constructed Knowledge. According to Lockyer and Patterson (1997), "these stages are characterised by cognitive evolution of the students that may reach even the highest mental operations. This model is used quite often to analyse the speech or a social interaction taking place between the students/ participants in an "online" environment". Thus, we followed the approach of Gunawardena, Lowe and Anderson (1997) to codify the learning exchanges produced between the students/ participants during their research in a Web 2.0 community.

**Sample**

In this study a small sample of 4th high school of Maroussi (Athens, Greece) students (N=16; 10 females and 6 males; aged 15 – 16) participated in an eight-month geography and environmental for sustainability research project, using the new applications and extensions of the Web 2.0. They also varied in their socioeconomic and cognitive background. Before this project, most students had a previous experience in geography and environmental actions, while half had used social computing for educational and research purposes.

**Procedure**

The case study was effectuated in accordance with the curricula within the allowed time frame from October 2011 until May 2012, three (3) hours weekly, at the Informatics Laboratory of the school within the framework of the course "Research Project". Sixteen (16) students of the 1st grade of Athens General High School participated, divided into groups of four (4) persons within the framework of research geography and environmental activity, with the use of Web 2.0 tools Diigo and Google Earth. Specifically, the research process was the following:

(1) *Objective*: The ultimate objective of the procedure is to create a learning community for geography and environmental sustainability having as subject the "Nuclear Energy", moving from information search, elaboration, evaluation and organisation to higher levels of education, such as the interactions between them, the co-construction of knowledge, the development of ability to separate relationships, the formulation of generalisation, the use of mapping, the comparison and exploration (according to the available possibilities by the aforementioned Web 2.0 tools).

(2) *Initialisation Process - Settings*: Download and install Diigo and Google Earth.

(3) *Stage I:* a. Introductory discussion regarding the objectives and the procedure of the course "Research Papers – Project" between the students and the researcher, b. Completion of questionnaire by students regarding the socio-demographic data, c. Choice of the subject to be explored by the students: Nuclear Energy.

(4) *Stage II*: a. Definition of the main research question by the students in collaboration with the researcher: Nuclear energy: How does it affect the society, the environment and our health? b. Creation of four working groups by the students themselves: a. Nuclear energy, nuclear reactors and safety measures. b. social consequences, c. environmental impact and d. effects on health.

(5) *Stage III*: a. First contact of students with the subject of investigation and the tools Diigo and Google Earth, b. Distribution of selected sources to the working groups by the researcher for the needs of the investigation process, aiming to the reduction of risks of uncontrolled search on the internet, c. Conduct of the investigation activity by students, using Diigo and Google Earth, d. Students discuss and comment the value, quality and usefulness of related sources (texts, videos, maps, websites etc.) and classify them with the use of personal tags.

(6) *Stage IV*: a. Students create a network with useful electronic sources regarding the investigation subject, b. Students plan the procedure that each working group will follow. The distribution of the proposed sources (with their elaboration by the students) from one group to another, the communication and collaboration between them, create a new learning community, c. Students pass from research, elaboration, evaluation and organisation of information to higher learning levels, such as the development of the ability to discern relationships, the formulation of generalisation, the use of mapping, the comparison, the exploration and empathy.

(7) *Stage V*: a. Students evaluate the research work of all groups and decide its final form, b. The investigation activity of the groups includes also the social interaction between the students of the same and of different groups, c. The researcher and the students discuss about the overall investigation process, suggest ways of exploitation of the final project and its communication to the wider community.

(8) *Problems during the research - Troubleshooting*: There occurred technical problems mainly due to the way of the students' access to the internet, but also due to unforeseen technical problems to the individual computers, while the Informatics Professor was available for troubleshooting.

## Data collection and analysis

### Content analysis

In this section we compared the number and the from of the learning exchanges (regardless their type) of the groups in a Web 2.0 learning community, Diigo, through quantitative content analysis (QCA). The number of the learning community exchanges was 312 at the end of May. Each active student has had more than twenty five (25) learning exchanges and more connections with others, thus creating a dynamic research group and reinforcement of the procedure.

**Table 1.**

*The enhanced IAM with five geography and environmental skills*

| Phase | Dimension | Additional Indicators: Geography and environmental skills |
|---|---|---|
| I | **Sharing/ comparing of information** <br> A. A statement of observation or opinion [PhI/A] <br> B. A statement of agreement from one or more participants [PhI/B] <br> C. Corroborating examples provided by one or more participants [PhI/C] | **a. Asking geographic and environmental questions:** Students should be able to ask why things are where they are and how they got there as well as why such distributions are important. They begin by asking where, what, why, and so what? [PhI, PhII/a] |
| II | **The discovery and exploration of dissonance or inconsistency among ideas, concepts or statements** <br> Operations which occur at this stage include: <br> A. Identifying and stating areas of disagreement [PhII/A] <br> B. Asking and answering questions to clarify the source and extent of disagreement [PhII/B] <br> C. Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participants experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of | **b. Acquiring geographic and environmental information:** Students should learn to use a variety of tools and sources to gather geographic and environmental data. The skills involved include locating and collecting data, observing and systematically recording information, reading and interpreting maps and other graphic representations of spaces and places, interviewing and using statistical methods. [PhI, PhII/b] |
| III | **Negotiation of meaning/ co-construction of knowledge** <br> A. Negotiation or clarification of the meaning of terms [PhIII/A] <br> B. Negotiation of the relative weight to be assigned to types of argument [PhIII/B] <br> C. Identification of areas of agreement to overlap among conflicting concepts [PhIII/C] <br> D. Proposal and negotiation of new statements embodying compromise, co-construction [PhIII/D] <br> E. Proposal of integrating or accommodating metaphors or analogies [PhIII/E] | **c. Organizing geographic and environmental information:** Students should learn a variety of methods for systematically organizing and presenting geographic and environmental data. [PhIII, PhIV/c] <br> **d. Analyzing geographic and environmental data:** Students should be able to identify, understand, explain, and analyze information presented in maps, tables, charts, and graphs. Through such scrutiny, students should seek patterns, learn to infer relationships, make |
| IV | **Testing and modification of proposed synthesis or co-construction** <br> A. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture [PhIV/A] <br> B. Testing against existing cognitive schema [PhIV/B] <br> C. Testing against personal experience [PhIV/C] <br> D. Testing against formal data collected [PhIV/D] <br> E. Testing against contradictory testimony in the literature | predictions, make inferences, evaluate bias, and synthesize information using maps, tables, charts, and graphs. They should be able to use statistics in order to describe data, identifying trends, sequences, correlations, and relationships. [PhIII, PhIV/d] <br> **e. Answering geographic and environmental** |
| V | **Agreement statements(s)/applications of newly-constructed meaning** <br> A. Summarisation of agreement(s) [PhV/A] <br> B. Applications of new knowledge [PhV/B] <br> C. Metacognitive statements by participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference | **questions:** Students should be able to: present geographic and environmental information in oral and written reports and on maps; make generalizations and apply these generalizations in order to solve real-world problems; and use geographic and environmetal information to assess the feasibility of proposed solutions [PhIV, PhV/e] |
| Note: Students can develop a and b geographical and environmental skills in the first two phases, while the c, d and e skills in the other phases of the enhanced model. |||
| Source: Gunawardena et. al. 1997; Heffron & Downs 2012; Edelson et. al. 2013 |||

The codification system or interaction analysis model (IAM) was applied for the aforementioned analysis. Then, on the basis of the objectives set for our research, we improved the aforementioned model with other indexes and in particular with five skills, which were in accordance with the second version of Geography for life: National Geographic Standards (Heffron & Downs 2012) and form an implementation guide of a geographic and environmental research project on sustainability (Table 1). The above skills are essential elements of an organised and integrated geography and environmental approach which is necessary for the students in order to fully explore the environmental issue. It is noteworthy that Brown and LeVasseur (1981) mention that the geographical perspective is interdisciplinary and allows the investigation of complicated issues, including those resulting from the interaction between humans and the environment, using all available tools. This is a very difficult role if we consider that there is an interactive relationship and they influence each other in many ways.

**Findings and Discussion**

The IAM consisted of five phases of development in the knowledge construction process with geography and environmental for sustainability approaches and enables researchers to identify the different elements of the learning exchanges through phases that correspond to a progression in the thought building process. Each phase develops into a set of operations that are used to identify the elements of meaning contained in the learning exchanges. According to Gunawardena, Lowe and Anderson (1997) learning exchanges ranked in Phase I and Phase II are considered to "represent the lower mental functions", while notes rated in Phase III, Phase IV, and Phase V "represent the higher mental functions" (Lang, 2010). The 312 learning exchanges were coded according to the enhanced IAM schema. The study interest was the cognitive thinking process of high school students participating in online geography and environmental for sustainability research project work. 88.8% of the total scored exchanges was classified as low level exchanges (Phase I or II), promoting the first and the second geography and environmental skills (33.4% of exchanges in these phases). High level exchanges (Phase III, IV, or V) showing the evidence of communication and collaboration that are associated with the co-construction of knowledge accounted for only 11.1% (approximate) of the total exchanges, promoting the other three geography and environmental skills (45.7% of exchanges in these phases). The above percentages suggest that there is a change over time that reflects a decrease in exchanges of high phases of knowledge construction and certain increase in exchanges that shows the progressively developing essential geography and environmental skills of students. The following exchanges thread shows an example of high level exchanges and how the discussion moves from a lower phase to a higher phase. The coding of student's exchange is indicated at the end of the note, in parentheses. Students' names have been coded St01, St02, St03 and so on to maintain anonymity. The thread started off with statement of opinion of a member of the research group on our dependence on the environment and the threat of radioactivity (Table 2).

**Table 2.**
*The learning exchanges thread (indicative source)*

| |
|---|
| I believe that we directly depend on the environment because it is necessary first of all for our survival and secondarily for our convenience and enrich our lives. Radioactivity is undoubtedly one of the major threats to the environment and therefore our survival. **[St09, Group C, PhI/A]** |
| St03, your group has searched the internet for information about radioactivity. Can you write what is radioactivity? What are the risks for humans? **[St06, Group B, PhI/a]** |
| Yes, the scientific definition of radioactivity from Wikipedia is: Radioactivity is the phenomenon of emission of particles or electromagnetic radiation from the nuclei of certain chemical elements, which for this reason are called radioactive […]. Of course it has many effects. In the literature, we found effects on human health, society and the environment. **[St03, Group A, PhI/A]** |
| Yes, I agree, radioactivity affects all areas of our lives. A good example is the nuclear accident in Fukushima, which has brought incalculable ecological damage and put an immediate danger to the lives of millions of people. **[St11, Group C, PhI/B, PhI/C]** |
| But, if you stop the use of radioactivity, we will lose what it offers!! **[St01, Group A, PhII/A]** |
| What do you mean "we will lose what it offers?" What gives us the radioactivity? **[St13, Group D, PhII/B, PhII/a]** |
| I mean that radioactivity has offered to medical area. For example, the ionizing radiation used in medicine for diagnostic or therapeutic purposes, such as X-ray diagnostic radiology, or radiation from accelerators and radiopharmaceuticals for the treatment or detection of tumors. **[St01, Group A, PhII/C]** |
| It is very interesting what you write above. However, the radioactivity has many negative consequences and it is good to think and to present the effects of radiation on humans. It is noted that the cancer occurs in humans because they are exposed to large amounts of radioactivity in the past. For example, the average person consumes two liters of water and a liter of food a day, inhaling 10 -20 thousand liters of air. The atmospheric air is the first component of the ecosystem, which is contaminated after nuclear explosion or accident,and connected to leakage of radioactive material into the atmosphere. Inhalation of radioactive burdened air is more dangerous than radioactive contaminated food or water. **[St13, Group D, PhII/C, PhII/b]** |
| Then we need to explore the appropriate safety of these plants. **[St09, Group C, PhIII/A]** |
| As a group we worked on this issue. We searched the factors that have been proposed in recent years by scientists and arrived at the following: <br> a.  geographical position, <br> b.  whether a region is seismic and if after earthquake there is a risk of tsunami. <br> c.  how far is the nearest residential area etc. **[St03, Group A, PhIII/A, PhIII/c]** |
| The group wrote very important things. We need more information!! **[St11, Group C, PhIII/C].** |
| Looking at the map, all nuclear plants in the world that either operate or are in the planning stages or construction, there are 23 nuclear power plants with a total of 74 nuclear reactors, which are in hazardous areas. **[St09, Group C, PhIV/D, PhIV/c]** <br> http://www.theguardian.com/environment/interactive/2012/mar/08/nuclear-power-plants-world-map |

| |
|---|
| Yes, the nuclear tragedy in Fukushima could happen again in 23 more nuclear power plants located in coastal areas at risk of tsunami, warns study in the wake of the accident. **[St09, Group C, PhIV/D, PhIV/c]** http://news.pathfinder.gr/scitech/811616.htm |
| The above study by researchers from the Spanish Foundation for Science and Technology based on a global map of the geographical areas which are threatened by tsunami based on historical, archaeological and geological data. **[St09, Group C, PhIV/D, PhIV/c]** http://www.tovima.gr/world/article/?aid=476052 |
| In Chernobyl, for example, a thick layer of cement was enough to reduce leakage. Now things are worse we have four reactors which have been damaged along the coastal shore. As you understand can to make the cementation of the coast? notes J. Ratslin. **[St12, Group D, PhIV/D, PhIV/c]** |
| The same source states that, in China, 19 of the 27 nuclear power plants, which are currently under construction, are located in danger zones. In Japan, there are, apart from the damaged plant, seven other factories to 19 reactors, in high-risk areas. In risk areas are also two reactors in India and one in Pakistan. **[St12, Group D, PhIV/D, PhIV/c]** |
| Looking at the map of nuclear power plants, I see that around our country there are many factories. The country is located in seismic zone and potential earthquake can have terrible consequences! **[St03, Group A, PhIV/D, PhIV/d]** |
| I would like to point out something on the subject of ionizing radiation, which is used for the treatment of cancer. This radiation is dangerous for the ages between 0-14 years. In Ukraine after the Chernobyl accident observed increase in the incidence of brain cancer in children. The number of cases increased by 5.8 times in children and by 10 times in newborns. **[St13, Group D, PhIV/D, PhIV/d]** http://www.tovima.gr/science/article/?aid=3904**06** |
| The destruction of the nuclear accident in Fukushima due to the earthquake that took place in March 2011 and is one of the biggest ecological disasters of the century. Main cause of explosions that occurred after the earthquake was non-cooling function of reactors as a result of inadequate planning protection for a natural disaster of this magnitude. But the poor condition of the reactors (age, cracks, previous accidents concealed) and increased production with simultaneous budget cuts at the expense of safety. **[St11, Group C, PhIV/D, PhIV/d]** |
| The biggest problem is the inability to control the quantities of radioactive leaks, but the technology and location of nuclear reactors in Fukushima and other plants. **[St09, Group C, PhV/A, PhV/e]** |
| I really very concerned with this issue and the whole process made me understand how it affects both the immediate future and the distant **[St06, Group B, PhV/C]** |
| Both nationally and globally have tragic consequences. **[St02, Group A, PhV/A, PhV/e]** |
| I think we should not forget all the victims of this disaster and try to find solutions to this problem. **[St11, Group C, PhV/C**] |

The content of phase I exchanges was mostly about students' stating their opinion, asking geography and environmental questions, posting statement of agreements and giving examples. These interactions focused mainly on students' asking and responding to questions that included expressions of social interchange among participants. For example, the exchanges thread in Table 2 shows students concerns and questions on issues that are significant and directly affect their lives, such as energy and environment, encouraging the search and gathering geography and environmental data on these issues. Also, the students were focused on radiation and its effects on the environment and health, taking data from the recent nuclear accident in Fukushima,

"which has brought incalculable ecological damage and put an immediate danger to the lives of millions of people", as noted by St11. However, the different views of members on the reappearance of "nuclear solution" because of the offer to medical area, the direct addressing climate change and high energy demands led to the discovery and exploration of dissonance, the exchange of arguments and the further exploration of the sources and promotion of other members views, and resolve their group conflicts (phase II).

Then, some of them agreed that it was necessary to explore the factors that have been proposed in recent years by scientists and related to creation space of nuclear plants. During the exploration, some students organize and present geography and environmental data with photos, satellite images, maps and charts on the number and location of nuclear power plants worldwide. Students agreed that most factories are located or planned to be in hazardous areas and a possible accident can cause severe damage to health, society and the environment (phases III and IV). The thread ended with metacognitive statements from students illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of their interaction (phase V).

## Conclusion

Agreeing with previous studies (Gunawardena, Lowe, & Anderson, 1997; De Laat, 2002; Aviv, Erlich, Ravid, & Geva, 2003; Houtsonen, 2003; Fisher, 2004; Houtsonen, Kankaanrinta, & Rehunen, 2004; Sing, & Khine, 2006; De Wever, Schellens, Valcke, & Van Keer, 2006; Lockyer, & Patterson, 2008; Lynch et al., 2008; De Wever, Keer, Schellens, & Valcke, 2010; Baker et al., 2014; Favier & van der Schee, 2014), the findings of this study have helped us to understand the complexity of knowledge construction with enhancing essential geography and environmental skills in a Web 2.0 era. With the use of Diigo applications, the students seemed to follow an auditing process of search, comparison and sharing relevant information, exchange of arguments, further exploration and promotion of other views, and also assessment the feasibility of proposed solutions, reading and interpreting maps and other graphic representations of spaces and places.

All these actions led participants to reach the higher phases of sociocultural constructivist interaction, progressively developing essential geography and environmental skills. So, the results need to be assessed in the light of the following limitations: the small number of the sample, the lack of previous experience of the sample in regard to use Web 2.0 tools, but this is not necessarily negative, as is assumed. Finally, continued research is needed because we need to examine study suggestions and parameters, such as: (a) the teachers' role in this research process and the training in the use of digital technologies and (b) the need to continue to explore the issue with other sample of high school students from various places of Greece.

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