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Geographical Education: A Journey Through Time

Abstract. Geography has always played a steady role in education and it is a basic lesson at almost all levels. From the Middle Ages to the Great Pedagogues of the 16th-19th century, Greek translations were dominant and Geography was an integral part of education. Comenius makes a very detailed description of the birth of the world, Rousseau refers to place as the place that nature chose to place man, Pestalozzi gives a significant impetus to the teaching of Geography and Friedrich divides the cluster of Physics into three areas: "Geography", "Science" and "Mathematics". In the twentieth century, pedagogues Rudolph Steiner, John Dewey and Ovide Deckroly are distinguished. The contribution to the teaching of Geography of Maria Montessori, Roger Cousinet and Célestin Freine is also important. In 1950 the didactic of Natural Sciences was born, and then "New Geography". Modern teaching trends are reflected in national curricula, as well as in national studies and international evaluation programs such as Pisa, which places countries such as England, USA, Canada, Australia, Finland at the top of educational excellence for lessons in Physics.
KEYWORDS: Natural Sciences, Geography, Education.

MIDDLE AGES

The history of medieval science is essentially the history of the dissemination of ancient Greek science from the Byzantine Empire to Islam and finally in Western Europe (Grand, 1994: ix). By the early 15th century, medieval science had reached full development based largely on Aristotle's work (Grand, 1994: 25-30).

Aristotle's studies that were systematically studied at Medieval Universities were, among others, "About the Sky and the World", which dealt with the movements of the celestial and earthly bodies, the "Meteorological" that described and explained a wide range of phenomena such as the wind, rain, lightning and even comets and the galaxy. In spite of the Aristotelian views, the image of the structure of the world presented by Aristotle remained completely dominant until its overthrow in the 16th and 17th century (Grand, 1994: 93).

16th-18th CENTURY

The pedagogue John Amos Comenius (1592-1670), throughout his deeply religious text, makes plenty of references to Nature. There is a very detailed description of the birth of the world, starting with the sun, the moon, the stars, the Earth, the air, the water and many others (Comenius, 1633-1638, Keatinge, MW 1907: 33). He also argues that education must imitate the laws of Nature in order to be effective. By the age of six, the child should adopt notions such as water, earth, air, fire, rain, snow, frost, etc. (Comenius, 1633-1638, trans. Keatinge, M.W., 1907: 259). From the age of six to twelve, the child should learn the most important principles of cosmography and should also be aware of the cities, mountains, rivers and other remarkable features of his country (Comenius, 1633-1638, trans. Keatinge, MW, 1907: 269).

The philosopher and writer Jean Jacques Rousseau (1712-1778) in his work, "Emile, or On Education," refers to land as the place that Nature chose to place man as part of the chain of life and nothing and no one can remove him against his will (Rousseau, 1762, trans. Bloom, 1979: 83). Rousseau, concerning the teaching of Geography, rejects the sterile memorization of the names of cities, countries, rivers, and the teaching of the sites only through maps, as this leads to students thinking that cities, countries and rivers are simple names on maps rather than actual places. (Rousseau, 1762, transl. Bloom, 1979, 109-10). According to Rousseau the teaching of Geography is preferable to be done in the countryside so that the pupil can learn about the subject studied. Maps and globes distract students from the subject and make it seem isolated while it is closer than anything. Particular importance is also given to cartography and it is suggested that teaching should be started from very simple things accessible to every student, such as the representation of the city that they live in and their dad's cottage, and then they will extend to the surrounding areas, rivers, mountains and will try to build a map enriched with elements. (Rousseau, 1762, transl. Bloom, 1979, 171).

The pedagogue Johann Heinrich Pestalozzi (1746-1827), like Rousseau, encouraged learning through the senses and introduced the teaching of the "lesson through the study of an object", its material, its function and its usefulness which always resulted in a moral lesson (Noddings, 2016, 18). Pestalozzi gives significant impetus, among other things, to the teaching of Geography and Natural History (Houssaye, 2000, 57). Pestalozzi's graduate students were assigned with teaching duties. Professor Vulliemin made the first geographical steps, under Pestalozzi's instruction, in a narrow valley near Yverdon (Switzerland), where students studied the relief in detail, and took samples of soil material. When they arrived at school they re-encompassed the relief had studied and in the end they constructed a map (O'Mahony, 1988, 29-30). Pestalozzi's pedagogical approach to fieldwork methodology has spread across Europe and America, and has introduced a new way in geographical teaching that influenced Ritter and Humboldt that established those principles in Geographical science (O'Mahony, 1988, 53). Ritter had stated that Pestalozzi knows as much geography as a child, but he was the one who opened his spiritual horizons, and all his pleasure for this science is due to this teacher (O'Mahony, 1988, 32-3).

Pedagogue Johann Friedrich Herbart (1776-1841) does not distinguish History from Geography, the former being a humanistic science and the latter one as a physical one, but believes that there is a natural connection between them and therefore should be studied together. According to the Herbart's principles, the local History that should be taught in small classes is the introduction to real Geography. This includes the garden plants, the trees and the creatures of the forest, the city and provincial industries, as well as a detailed study of hills, plains, rivers, streams and neighbouring countries. Lessons often take place outside the classroom, in the garden, in the forest, in the meadow, by the river, on the hill or in the valley. (Dodd, 1898, 74-5).

Ufer (1894, 108-12) in the «Introduction to the Pedagogy of Herbart» proposes for the study of Geography the use of historical events such as Columbus journeys, which can offer abundant topics of study, island complexes, volcanoes, sea and air currents, temperatures, moon eclipses, geomorphological issues, global sphere issues (mathematical Geography) and others. It is observed that the concept of interdisciplinarity, which is very contemporary nowadays, and many lesson plans which have been based on the co-operation of professors of various specialties, comes from the Herbartian practices.

Pedagogical Trends of the 20th Century and The Teaching of Geology-Geography

Rudolph Steiner (1871-1932), who was a philosopher and architect, claims that man represents the world in miniature while the world represents man in a large dimension. The kingdoms of Nature are four, minerals, plants, animals, and humans with man gathering in himself all four worlds, and this marks the completion of creation (Houssaye, 2000: 140-1).

Philosopher John Dewey (1859-1952), argues that Geography and History should not be given as simple and ready knowledge to students, but knowledge must also be accompanied by an activity that will trigger curiosity. When the task of education claims that it teaches Geography to the students it means that it gives them the power to perceive the spatial, natural and the correlations resulting from a simple activity; and since all human activities take place on Earth, the study of Geography is considered very important. Dewey points out that the classic definition of Geography as the study of the Earth as the residence of man expresses the educational reality, but Geography is essentially a heterogeneous mixture of various seemingly unrelated elements such as the height of the mountains, the amount of gravel produced from one place, the displacement of a ship, the borders of a country, and the adventure, travel, exploration, inhomogeneity of people and landscapes (Dewey, 1915: 227-9).

In 1901, Ovide Deckroly (1871-1932), pedagogue and psychologist, founded a special education institute, and his work, as well as the work of the pedagogues discussed above, is characterized by a connection of pedagogical concepts with Nature, with particular emphasis on minerals and the study of the universe. The method of observation, and actually of scientific observation, is also widely used in the schools of the pedagogue, doctor and anthropologist Maria Montessori (1870-1952) and the principle is always from the close environment of the pupils (Gutek, 2004, 108). In Montessori methods, the concept of Nature and the environment is everywhere, and even the first contact with education is based on them.

The method of pedagogue Roger Cousinet (1881-1973) is based on the spirit of the group and is called a "method of free work in groups"; experiments are carried out in the classes and in the study of the sciences the children first of all observe the plant, the animal, the natural phenomenon (rain, temperature, storm), minerals, simple machines, and all things they have at their disposal depending on the science subject of the course (Houssaye, 2000: 263). Particularly geographical work requires specific equipment such as maps with railway, roads and other networks, documents, objects, plants, minerals and photographs; then students - based on an imaginary plan such as a hypothetical travel - make a small exhibition and illustrate it with drawings (Houssaye, 2000, 263, Raillon, 1993, 225-236).

The Birth of the Education of Physical Sciences (1950-1990)

In 1950 the didactic of Natural Sciences was born. The fact that marks its birth occurred on October 4th 1957, the day the Soviet Union set the first artificial satellite Sputnik in orbit around the Earth. This fact, apart from surprise in England and America, has also led to changes in teaching Natural Sciences.

The Pedagogical trends that were born in the 1950-90s are: The «Traditional trend», based on «Behaviourism» the predominant theory in psychology, with the key feature that knowledge is treated as «something»

that can be transferred from the teacher to the students, The «Discovery learning» which is chronologically placed between 1960 and 1975 and teaching of natural sciences is based mainly on laboratory activities designed to encourage students to behave as scientists and at the same time to train them in these activities. Finally, the "Constructive Approach" which is the dominant approach of the 1980s and the key feature that differentiates it from the previous is that it takes into account and exploits the students' pre-existing ideas of concepts and phenomena. The entire decade of 1980s is characterized by an extensive study of students' pre-existing ideas, on every single sector of Physical Sciences.

An important feature of the «Constructive Approach» is the introduction of the metacognitive process; the term «metacognition» means the student's awareness of the cognitive procedure that has followed (Koumaras, 2009, 13-22).

The «New Geography"

The 1960s are characterized by an in-depth review of how Geography deals with the analysis of space. The impact of these methodological changes was so significant and «New Geography» provided the geographers with a series of new methods of description and analysis (Davies & Mitchell 2006:46-7). The impact of «New Geography» on education is obvious, as most countries are restructuring the school programs related to the Geography lesson and new textbooks are being written based on new scientific developments.

Children who are taught Geography in the twenty-first century will face a variety of challenges in their adult lives which they will have to deal with not only locally or internationally but they will be called upon the burning issue of the survival of the planet. These challenges have already been identified by geographers and the most outstanding of them are global warming, the immediate need to reduce greenhouse gas emissions, the sustainable use of physical resources, the need to reduce pollution, the stabilization of the population, the need to prevail in social justice and the elimination of prejudice and inequalities and the protection of biodiversity (Butt, 2002: 41).

Today

The National education systems of every country are shaped according to country-specific criteria and the educational goals they want to achieve. These systems are sometimes successful, and sometimes they are not. Pisa, which is the Programme for International Student Assessment, is conducted every three years and acts as a barometer of educational excellence. It intends to measure the knowledge and the skills of pupils at the end of their compulsory education. Starting from a commonly defined and accepted framework, the Pisa Program gathers information on the performance of 15-

year-old students and at the same time detects the effectiveness of the education systems of the participating countries. Therefore, each participating country has the potential, through this Program, to get useful information about its educational system and also understand the positive elements and weaknesses of its educational programme design and, ultimately, to feed back on the effectiveness of the education and training practices of the other participating countries. Pisa, in the field of science points out countries like America (Canada and the USA), Finland, Australia, China, Japan, Germany, and England. A study on the educational practices in the systems of Finland, America, England, and Australia is given below.

The Finnish education model is considered to be the best in Europe and is at the top of the PISA competition. In Finland, the science course is divided into subjects such as Physics, Chemistry, Geography, Biology, and Health Education. The contents of Biology, Chemistry, Physics and Physical Geography focus particularly on physical systems, on living systems, on Earth and on space and technology systems. Also, the properties of materials, the basic elements of astronomy, people and populations, ecosystems, Earth's history, space and changes in Earth systems. Specifically for Geography - which in the Finnish curriculum is linked to the teaching of Biology at levels 5-6 (13-14 year old students)- students learn to observe and research Nature outdoors, recognize the main flora and compare and classify observations, make measurements and conclusions, learn to use and interpret physical and thematic maps and other sources of geographical information such as charts, statistics, and photographs including aerial and satellite photographs. They also learn to understand the effects of planetary events on Earth, to conduct simple scientific experiments that clarify the properties of phenomena, organisms, substances and objects and their relations among themselves (Niemi et al., 2016: 142).

Geographical teaching for levels 7-9 (which is the highest level of compulsory nine-year education consisting of 15-16 year-old-students) focuses on the world and its various regions and local phenomena. The aim is to develop the students' geographical perception of the world, their ability to examine the Natural, built and social environment and the interaction between people and the environment from local to global level. Students, as at the previous level, will learn to use natural and thematic maps and other sources of information (Niemi et al., 2016: 143).

Concerning the trends in *geographical education in America*, associations such as the American Association of Geographers (AAG), an organization that promotes Geography and geographical education, the American Geographic Society (AGS) which is recognized globally as a pioneer in Geographical Research and Education, the National Council for Geographic Education (NCGE) an organization that promotes geographical education and supports it in schools as well as the community of National Geographic, took over in 1984 Geography Education National Implementation Project (GENIP) which aims to improve the status and quality of Geographical Education in the United States.

The guidelines provided a plan that improved teaching and learning of Geography and also fulfilled the National Geographical Standards published a decade later in 1994 in «Geography for Life», with its second edition in 2012 containing the key elements that modern educational practice in the field of Geography should have. In particular, students should learn to approach the world from a spatial and ecological perspective with the ecological perspective studying the world as a network of relationships between living organisms and non-living elements.

Geographical knowledge is grouped into six basic elements: 1) The World in Spatial terms, 2) Places and Regions, 3) Natural Systems, 4) Human Systems, 5) Environment and Society, 6) Uses of Geography. Also, there is a reference to the geographical skills that pupils should have and describe how students can systematically perform geographical surveys. The five categories of skills include: 1) Being able to formulate geographic questions; 2) Gain geographical information, and organize it, 4) Analyze geographical information and make geographical questions. Students should be able to think critical and make assumptions, analyses, conclusions and predictions[1].

Furthermore, in America, an extensive national study, entitled Project 2061, has been carried out by the American Association for the Advancement of Science (AAAS) since 1985 (and is constantly being updated) to motivate and promote a modified teaching of Natural Sciences in schools (2061 is the year that comet Halley will be visible again from the Earth). The first report of this effort supports science literacy for all students in American schools and the curriculum structured in such a way as to encourage scientific thinking (Matthews, 2007, 132-4). Students at the end of secondary education should be aware of experiments that take place under the same conditions and may have different results and this is something that should be investigated. In addition, according to the 2061 announcement, which is continuously being updated, students should be aware that although significant discoveries in the fields of science, mathematics and technology have been made by people of different tribes, different cultures, at different ages those findings are available all over the world.

In *the National Curriculum of England*, which is somehow the adversary of the American educational approach, a high-quality science education, in secondary education, must lay the foundations for understanding the world. As far as Geology is concerned, students should already be able from elementary school to compare and categorize different rock types based on appearance and simple physical properties and, as far as Geography is concerned, which is taught up to key stage 3, (ages 11-14), the knowledge that students should receive consists of spatial knowledge that includes the countries of the world and focuses on areas of environmental interest such as deserts and polar regions, human characteristics and cities[2].

Furthermore, students are taught human Geography and natural resource management. Students should understand how natural and human processes interact, influence and differentiate natural landscapes, environments and climate, and how human activity relies on the effective functioning of the natural system. Finally, regarding the skills that pupils should acquire, as well as field work, they should be able to make use of their knowledge of the globe, maps and atlases in the classroom and in the countryside, interpreting the maps of the cartographic service in the classroom and in the field using the scale and network reports correctly, topographic and other thematic cartography and satellite photographs. They should also be able to use geographic information systems and appreciate, analyze and interpret places and data.

The Australian curriculum is designed to help all young Australians become successful students, self-confident, creative and informed citizens. The implementation of the approved Australian curriculum is a matter for the authorities of the school and curriculum of each territory; in most states the programme has been adopted in various publications and variants and the general picture regarding the geosciences[3] is that in the Australian program the lesson «Science» is divided into «Biology», «Chemistry», «Earth and Environmental Sciences» and «Physics». The field of «Earth and Environmental Sciences» includes the study of four thematic units.

The first section studies the Earth's systems (geosphere, atmosphere, hydrosphere and biosphere) and their interaction. Students use scientific tools to understand modern earth systems and participate in a series of surveys that help them develop knowledge and skills that geoscientists use to interpret geological, historical and scientific information in real time[4]. In the second section, students are taught that processes of earth systems require energy. For example, they study how the transport and transformation of energy from the sun and the Earth's interior allow and control the processes within and among the geosphere, the atmosphere, the hydrosphere and the atmosphere. Students examine how transfer and transformation of the heat and gravitational energy in the Earth cause the movements of the tectonic plates. In particular, they are taught the development and evolution of the theory of the tectonic plates, the calculation of plate displacement, the geothermal energy and so on. Finally, in the third section students study the management of the Earth's natural resources. They study renewable and non-renewable resources and analyze the impacts of mining, use, overexploitation and the removal of their waste into the Earth's systems and human communities. They learn about the benefits of ecosystems and how natural changes as well as human interventions in the biosphere, the hydrosphere, the atmosphere and the lithosphere affect the availability of resources and sustainable management.

Students use scientific research skills to collect, analyze and interpret data related to waste management of renewable and non-renewable resources. They critically analyze the factors that determine the management of renewable and non-renewable resources[4].

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