International Journal Of

Recent Scientific Research

ISSN: 0976-3031

Volume: 7(11) November -2015

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THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
http://www.recentscientific.com/ recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 6, Issue, 11, pp. 7365-7368, November, 2015

International Journal of Recent Scientific Research

RESEARCH ARTICLE

A DISTANCE DISCOVERYTEACHING ON MINOAN BIODIVERSITY IN CRETE AND CYPRUS: DESIGN AND STRUCTURE

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ARTICLE INFO

Article History:

Received 06th August, 2015
Received in revised form 14th September, 2015
Accepted 23rd October, 2015
Published online 28st November, 2015

Key words:

ABSTRACT

The teaching intervention prepared for students of High School 15-17 years old of two Lyceums of Crete and Cyprus with the subject of biodiversity in Minoan period. Minoan civilization was developed in the Bronze Age in Crete. Minoan art is characterized by imagination, delicacy and love for nature. Utensils, jewelers, frescos, the stone seals and the decorative objects are evidence of advanced social organization and quality in daily life. In this interdisciplinary approach, with ecological and cultural views of biodiversity, special educational material was prepared with photos and texts coming from archaeological excavations which used in real and virtual learning environments, synchronous and asynchronous, in αjointed discovery of Natural Sciences' and History' sdidactic objects.

INTRODUCTION

The need for education for and from the Nature emerged before the latter half of the twentieth century, as the natural and social environment, scientific discoveries and technological applications, the daily civilization were differentiated with extremely fast pace and in directions dangerous and unpredictable for the sustainability of life on the planet. Natural Sciences have historically a close relationship with the Environmental Education (EE) and this because one of their main features is the emphasis on research of phenomena and issues of human and social structures, dependent directly by its very Nature (Robottomt, 2004). As Alexiou *et al* (1970), preface the volume A "Prehistory and Protohistory" of the "History of the Greek Nation", it must begin the History going through to the humans and their historic path by the earth and the environment, in the natural and geographical context. Thus, history will refers to areas where studies of Natural Sciences developed. School courses of Sciences and History have a lot to draw on content, objectives and methodology from EE and vice versa.

The student-centered nature of the School Projects of the Environmental Education (SPEEs), and the used discovery teaching approach, can contribute to shifting the teaching of Science and History in high school, from the frontal and traditional way of storytelling and questioning-answering to more modern, attractive and effective ways (Xochellis 1987). Teaching History with research, through the systematic practice, brings about the strong and weak aspects of the curriculum with positive impact on the competences and skills of students, in a critical approach and use of resources (Mavroskoufis, 2006).

Plants can constitute a connecting link in teaching of Sciences and History as they grow centuries in Greek and Cypriot land, in co-evolution with insects, other organisms, humans and the millennia culture developed (Rizopoulou, 2008).The following described teaching intervention designed to meet multiple objectives of school courses of Biology and History and projects of EE, supported by new technologies. The main target of this teaching innovation was the correlation of the illustrated forms to the archaeological findings of Minoan period with the current forms. Also to think thoroughly about the environmental conditions that might prevailed at that time in Crete and Cyprus, emphasizing the sociopolitical context in the eastern Mediterranean. Minoan civilization was developed in the Bronze Age in Crete. The marble and ceramic utensils with their peculiar shapes and original decoration, the marble figurines, architectural remains of settlements and works of metallurgy are all evidence of peaceful and sophisticated organization of social life of the dominated Minoans in the East

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Mediterranean (Mastrapas, 2014). Minoan art is characterized by imagination, delicacy and love for nature. Utensils, jewelers, frescos, the stone seals and the decorative objects are evidence of advanced social organization and quality in daily life. The teaching objectives of cognitive, social, aesthetic, psychomotor content related to completion of general education of students, the development of cooperative relations in teamwork, raise awareness of caring the local environments and civilizations, detection and cultivation of deeper artistic, technical and scientific inclinations, skills, peculiarities and aesthetic sensibilities of students.

Constructivism, having Natural Sciences as primary and main field of research and application, sheds light and gives weight to existing perceptions, ideas and representations of the students, with respect to the subject they are studying every time. As aim of learning is the modification of pre-existing knowledge, so individuals, with an active process, attribute the meanings through their experiences (Olssen, 1996; Ausubel in Vlachos, 2007). Knowledge is not transferred or accepted passively by the learner, but is actively constructed with assimilation of new knowledge to the existing cognitive structures (Komis, 2004). New knowledge is gradually subjected into preexisting, differentiating and integrating with. Taking into consideration these theories of learning, teachers designed and structured the teaching of Minoan period's biodiversity in Crete and Cyprus, by exploiting Nature as concept, entity and school learning environment.

METHODOLOGICAL FRAMEWORK

The idea of teaching intervention, based on the appearance of Natural History, in the way that naturalists used of scientific study of plants and animals, who, in their time, developed new perspectives in the study of the natural world, a new classification and correlation system, which was more detached, more objective, and less anthropocentric than the previous (Ritvo 1999).The jointed teaching, entirely unusual in schools, designed to introduce students to scientific research, wandering in the paths of inquiry learning through guided discovery. The correlation between morphological features of plants and animals was intended in the frescoes, the stone seals and vases, historical and social realities of the Minoan era and modern times in Hera klion of Crete and Limassol of Cyprus. Due to the lack of time and because of the distance of the two school communities were not possible the face to face encounters and discussions, therefore utilized web2.0 technologies as means of communication, teaching tools and objects. The emails, teleconferences via Skype, uploaded indicative literature and photos at the common, exclusive and of bilateral access wikispace, contributed in improvements and modifications of the shared developing ideas, with daily exchanges, between teachers of the two islands. So, within a few days, finally organized the whole venture, that attended by 4 teachers and 45 students, who participated in of five hours duration lessons, held with simultaneous connection via Skype of two distance classrooms. The interdisciplinary approach attempted in teaching courses of History and Philosophy of A class, Principles of Environmental Sciences and Literature of B class and Biology of C class of the Lyceums, which addressed as research and discovery, escaping substantially from the traditional teaching methodology in the exams-centered Lyceums of Cyprus and Greece. Students were introduced to the ecological and archaeological research, with team work and use of ICTs. The description of teaching intervention is a personal narrative of the writers, based on the archival material concentrated in the design and implementation as well as to what they experienced.

RESULTS

Building up the Teaching Intervention

To meet the jointed and distance lessons' needs, teachers organized special educational material consisting of photos of archaeological findings from Minoan periodin Knosos, Festos and Archanes and Late Bronze period in Cyprus, witnesses of life 3,500 years ago. They were vases, decorative objects, jewelry, gems and frescoes, which portrayed various forms of plants and animals of Minoan era. Literature source was the following books: "Prehistory and Protohistory, History of the Greek Nation Volume D" (Alexiou *et al*, 1970) "Crete: all Museums and Archaeological Sites" (Kofos, 1990), "Heraklion Museum Illustrated Guide" (Sakellarakis, 1997), "Phaistos-Gortyn-St. Triada-Prinias-Kommos-Miamou-Lendas-Matala-St. Galini-Inatos "(Vassilakis, 1986), "Crete Archanes" (Sakellarakis, 1991), "History of Cyprus from the Neolithic to the Roman era-school book" (Pantelidou *et al*, 1990), "History of A Class Lyceum-school book", Mastrapas, 2014), "Biology of C Class Lyceum-General Education, school book", (Kalaitzidaki& Pantazidis, 2003. The digitization of photos from the books, and the simultaneous viewing of the students, enabling zoom, rotation and more detailed look, as if they were face to face the object-finding, with easily observable detail from all sides, as the researchers biologists and archaeologists accustomed with magnifying glasses.

The produced educational material exploited to answer the following queries: 1. Names of plants and animals of Minoan times mentioned in textbooks and the rest used literature with the names of existing plants and animals that are similar 2. Correlation of the existence of illustrated figures with geophysical environmental conditions, probably prevailed at that time in Crete and Cyprus, and the sociopolitical data of that period in the eastern Mediterranean. 3. The connection of two islands with Egypt, Militos, and Phoenicia-Peloponnesus Mycenae and Gythio and its impact on art.

Activities

Teaching proceed in two phases. In the first phase, there were two separate traditional teachings of Minoan civilization, of 2 hours duration, face to face, in Crete and Cyprus, with speeches, presentations and questioning-answering, following the usual teaching model, corresponding to the school books. In the second phase, students from Crete and Cyprus, participated simultaneously in three hours guided discovery lesson with fixed questions that flowed conversation, while watching the same digital presentation of the online course. During the first period, teachers showing on the computer screens images from archaeological findings, were asking about the historic names and those of contemporary organizations that resembled more.

Of course, even the most easily recognizable flowers (like the yolk) there is complete unanimity on the displayed genre, as for isolated instances there is more than one view (Tranta, 2007). Artists had always in mind a physical model, for example a real flower, which ascribed sometimes more faithfully and sometimes with more decorative disposal, according to trends in art (naturalism or removal). Even in the more naturalistic depictions discern a significant amount of artistic freedom.

Discussion was further developed about the link to the presence forms of these organizations with geophysical and climate conditions, cultural data of the studied period, the chemical composition of the archaeological finds, such as sardonyx, stearic, hematite, clay, gold, copper and more. The geographical position of the island in the center of the eastern basin of the Mediterranean Sea, the terrain in the fertile but small plains between large mountains and the warm climate determined the organization of life and the development of civilization since Neolithic times (Mastrapas, 2014).

In the following two periods, students navigated the photos of the archeological findings and recorded the names of the current animals and plants, those were similar. They also made some notices of the most impressive legends, illustrated on frescoes, like spirals, rosettes, whole plants or their parts as flowers, also rocks, animals etc. (Kalathaki & Papastef anaki, 2015). Indicatively some legends of photos that discussed more, such as "head from the royal scepter from shale in leopard shape and ax, rhyton made of dark chlorite shaped bull's head, found in the palace of Zakros", "In the farmhouse Vathipetro Archanes wine press (winery) was installed". Minoan art is characterized by imagination, delicacy and love for nature. Minoan structures were adapted to human scale, avert massive and monumental. The walls of the palace widely decorated with frescoes. Their themes were inspired by nature and royal ceremonies. The miniatures' art (seal carving, jewelries, figurines and pottery) decorated with similar performances. The effort of artists to perform as faithfully as could the human form and the forms of animals, the depiction of scenes from everyday life or rituals, combined with the variety of colors, are elements that give the impression of a peaceful society faces with pleasure everyday life (Mastrapas, 2014).

In the third phase, some issues were given to students, for further investigation, as homework aiming to deepen further, answer better and more closely the related questions. Isolated phrases from school books of History of Cyprus and Greece investigated more in other bibliographic sources and discussed also with else teachers of the schools. The knowledge of science gave explanations mainly for metallurgical processing of copper in Cyprus and trade in the Eastern Mediterranean (Crete, Cyprus, Phoenicia, Egypt, Peloponnese)."Treatment of copper on the third millennium brought wealth and commerce in Cyprus." "In the form of ingots found copper imported in Minoan Crete". "With pyro-metallurgical treatment of copper roasting and smelting. By mixing and fusion of copper with zinc and tin respectively produced the brass and bronze alloys with more toughness and durability for making tools and weapons (Pantelidou *et al*, 1990). Transfer the research topicsat home, enabled the involvement of student's family in teaching research, support and expansion of the recipients and dissemination of the results. The teaching intervention was further extended in space and time, as the acquaintance of students through Facebook proceeded to twinning and educational exchanges, hosted in both islands.

DISCUSSION AND MEDITATION

The naturalistic illustrative art involves the power of imprinting of the diverse visible world. The variety in the naturalistic rendering is undoubtedly linked to artistic maturity and technical experience of the author (Orfanidou, 1998). Absolute naturalism does not exist, as artists, while failing to deliver very lively the general, fleeting impression of the plant, rarely true image of the individual characteristics. The floral motifs in the art of prehistoric Aegean divided into two broad categories: the trees and flowers. With the exception of palm, olives, and without prejudice, the fig tree, trees attributed not recognizable. This, rather, due to the indifference to the well describing of a particular kind than to an archetypal performance of the concept of the tree (Tranta, 2007).

The teaching intervention focused on the theme of diversity, ecological and cultural, in the Minoan and current years, with jointed and distant, interdisciplinary, discovery of teaching objects in Cretan and Cypriot Lyceums by using archeological findings. The discovery learning processes are difficult in implementing, but consist challenge to those teachers seeking more effective teaching methods. Lord and Orkwiszewski (2006) recorded higher performance of students in classes applied the inquiry/ discovery teaching than in traditional and laboratory classrooms. Also for teachers, the benefits from the application of discovery teaching methods are many. Being developed professionally because they learn from their colleagues and networked gaining valuable skills for research in the classroom (Avery *et al*., 2003). The teachers had the opportunity to take joint action in specific issues in the Greek and Cypriot school curriculum with use additional literature, to design original activities, worksheets and flow charts for their teachings, different from those they used before. For most teachers, the shift from traditional educational approaches in discovery is a difficult transition. Despite the consensus that has been developed for the value of teaching and learning based on research, the implementation of such practices still brings difficulties and challenges to teachers.

Neither the enthusiasm of students for inquiry based educational projects are given. Students, familiar with learning only those required for exams, trouble in educational projects in which there is not only one single and correct answer, the certain amount of curriculum is not definitely defined (Trautmann & Ma Kinster, 2005).The most common barriers in the application of discovery teaching methods at schools are mainly due to the centrally defined curriculum, the national exams held at the end of the school year, that have high demands, the insufficient time available for research in schools and at homes, the expectations, capabilities and skills of students and teachers, the concern of teachers that they may not

achieve to cover the curriculum, all the learning objectives, and, of course, the fear of unknown.

From ancient times until today the plants are seen and used for food, been praised and associated with the glory of victory, many of them are considered holy. The Mediterranean plants are grown for centuries in the Greek and Cypriot land, in the crossroad of three continents, acquired the particular morphological and functional characteristics in an evolutionary "path" centuries, having reached significant adaptations to local environmental conditions (Rizopoulou, 2008). Neolithic habitation in Cyprus and the Law Balkans (Greece) there already from 7 thousand BC. These samples clearly differentiate these areas from those in the East (Orfanidou, 1998). In the Bronze Age, Crete gradually dominated the Aegean. The Minoan thalassocracy was already known in tradition of the ancients. The lack of fortifications in the palatial centers created the theory of peaceful prevalence of the known Pax Minoica (Minoan Peace). The contacts of Crete in Minoan period to areas of the eastern Mediterranean was continuous (Mastrapas, 2014). The discovery of copper ingots and ivories demonstrate direct contacts with Cyprus, Egypt and Syria. Sake of this intervention, students and teachers from the two islands abolished the walls of the classrooms, surpassed the sea separating them and coexisted in the same learning environment, for a few hours, to study the Nature and the two civilizations of the same period, to seek what connected and separated them in the past and unites them today and tomorrow.

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How to cite this article:
Maria Kalathaki, Anna Papastefanaki and Nandia Karageorgiou., A Distance Discovery teaching On Minoan Biodiversity In Crete And Cyprus: Design And Structure. *International Journal of Recent Scientific Research Vol. 6, Issue, 11, pp. 7365-7368, November, 2015*

ISSN 0976-3031