DOLPHINS IN MYTH AND REALITY
A Constructivist Approach to Teaching Critical Thinking using I.C.T.

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Abstract: In a Secondary School in Central Greece ten students worked on a project titled "Dolphins in Myth and Reality" and published their work on their school's web-page. Dolphins' biological and social aspect, environmental dangers and threats, Ancient Greek myths and the dolphin-theme in several arts (Literature, Painting, Sculpture, Cinema and Music) were the sections the students worked cooperatively with an extended use of the Internet and I.C.T. This publication formed the basis of an experimental teaching for ten younger students whose initial ideas and cognitive deficiencies were taken into consideration in order to design several activities. The joint axis of the activities was the interpretation of myths about dolphins with the help of scientific and literary information found on the Internet and the raising of awareness on ecological matters concerning the survival of dolphins in the Mediterranean Sea. The initial hypothesis that the cooperative, constructivist model assisted by I.C.T. leads to better learning outcomes, compared to traditional teaching methods, has been confirmed, even if the results cannot be generalized.

1 INTRODUCTION

The complementary and oppositional relationship between Myth and Reason was exploited in a research project which took place in a country High School in central Greece (Omvriaki, Fthiotis). "Dolphins in Myth and Reality" gave the students a chance to search and find information, to compare and evaluate, to discuss and coach cases so as to come to logical conclusions. They also had the opportunity to publish their work in their school web-page and thus offer other students material to work on.

Constructivism provided the framework for this research project: the initial ideas and knowledge of the students were taken into consideration while scheduling the activities. Their mistakes were exploited to set the teaching objectives and organize the project.

Aiming at enhancing critical thinking, the activities should help the students construct their own representations based upon each one's experiences or, if needed, even to reconsider their initial ideas.

Interaction between students leads to higher awareness of what is known, to what extent and accuracy, and thus to better conceptual and cognitive constructs due to internal motivation (Solomonidou, 2006).

Besides, an extensive use of I.C.T. contributes to creating an enriched learning environment which may enhance critical thinking and lead to higher cognitive levels (Jonassen, 1996).

2 THE PROJECT PRESENTATION

2.1 Aims and Objectives

The constructive use of I.C.T. in everyday school reality, as well as the design and implementation of a research project based on cooperation and group teaching, have been the general aims of the work presented in this paper.

The teaching objectives could be divided into three categories: cognitive, procedural and value/attitude creating. The students should be able to work cooperatively on web-based projects and acquire the information needed; they should also be able to ascertain their relevant to the subject knowledge in order to cover their gaps by further research conducted in cooperation with their

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classmates and teachers and thus to create a publication of their own. Last but not least the project should raise the students' awareness of the risk of dolphins' extinction.

The most important goal, though, would be to develop critical and creative thinking by formulating and testing hypotheses, while learning how to cooperate and discuss democratically (Scardamalia, 1997).

2.2 The Research

Twenty students living in a village called Omvriaki in Central Greece were the subjects of this experimental research. The ten older students (14 years old) worked on the project to create a publication for their school's web page and the ten younger ones (13 years old) used this publication and the Internet in general to expand their knowledge on dolphins. The small number of subjects in this research does not allow generalization of the results. The intention has only been to engage the students in an active and creative way of learning and evaluate the effects of such an intervention (Cohen, Manion & Morrison, 2008).

The same semi-structured test was given to the students twice (before and after teaching) in order to compare and estimate the progress made. The questions were either open-ended or multiple-choice, aiming to trace cognitive gaps or misunderstandings. The students, whose former experience in working this way had been limited, worked for the project in the computer laboratory of their school for six hours during November 2008.

Extensive research into the bibliography and the Web did not result in finding similar studies as far as the issue of dolphins in Myth and Reality was concerned. Although a large number of projects, lesson plans and activities found on the web deal with dolphins, the main idea of this work is quite original.

The use of the project method as the basis of designing a school web page and the Constructivist and Activity-oriented approach to teaching can be found on numerous studies (e.g. Miao & Holst, 2000; Arapoglou et al., 2003; Arkün, S. & Akkoyunlu, B., 2008).

2.3 Creating the Web Page

The first team of students was divided into five couples. Each couple worked on the same computer. They were asked to create a Word document and open the Internet Explorer.

After this the teacher proceeded to brainstorming about dolphins using a photocopied Smart-art graphic, which was used as a Mind Map and later as the menu of the Web page. Mind maps and Brainstorming strategy develop mental capacities, enhance the project method and help to achieve teaching objectives, as research has shown (Buzan, 1995).

Each couple should find and save information on a certain topic or section in their Word documents. Then they would create a specific page of the publication, which would consist of text, pictures and music. In this way Information and Computer Literacy are being promoted while students become familiar with the creation of multimodal texts (Cope and Kalantzis, 2000).

In the middle of the Mind Map a beautiful dolphin picture was set and then lines connected it with bubbles-links titled Biology, Ancient Greece and Modern Art. From the bubble Biology one can go to the sections Animal Being, Social Life and Ecology. From the bubble Ancient Greece one can visit the sections Etymology, Ancient Greek Religion, Geography, Ancient Greek literature and Arts. And finally one can go to Modern Art to find Literature, Music and Cinema works of Art inspired from dolphins.

Using the Microsoft Publisher 2007 the teacher showed the students how to place texts, music and pictures on a web page and then upload it on the Greek School-Web (http://gym-omvriak.fth.sch.gr). This way the students and the teacher became partners to produce a collective work according to the principles of Situated Cognition (Brown, Collins and Duguid, 1989; Philips, 1998) and Cognitive Apprenticeship (Collins, Brown and Newman, 1987).

2.4 The Teaching Procedure

The findings of the pre-test formed the basis on which the teaching objectives were set. The activities should be based on the special cognitive needs of the students but they should also be meaningful and interesting, so that the construction of knowledge could be accomplished by the active involvement of every single student in the group (Raptis and Rapti, 2001).

The common axis of the first three activities has been the possible interpretations of Ancient Greek myths about dolphins according to their biological substance and social attitude.

In the primitive and archaic stages of social development the mythical way of thinking has been

prevailing so that human mind could be able to explain physical and social phenomena using imagination and feelings as cognitive tools. Thus Myth acted as the means of finding and attaching meaning to a mysterious world. These mythical constructions were being transferred to each generation gaining validity and universal applicability over the times, which later proved to be very difficult to overturn (Karakantza, 2004). *"The gradual transition from Myth to Reason – beginning with the Presocratic Philosophers from Ionia, Minor Asia - means the birth of the Greek and European philosophy"* (Veikos, 1985, p.3).

A beautiful picture of a dolphin is the first thing to see on the Worksheet and the home page of the publication on the Web. The dolphin asks the students to help it find some answers.

The first activity involves the students in searching and saving information about the way dolphins breathe, their sonar system and the way they behave and communicate with each other. Then they proceed in reading myths about dolphins saving human lives e.g. the Arion myth, and they are asked to interpret them in a scientific way. A relevant documentary by Jacques - Yves Cousteau ("A sound of dolphins" 1972) is used to prove that dolphins instinctively move upwards in order to breathe and they tend to do the same with every sinking body.

In the second activity students are asked to read what Claudius Aelianus has written about dolphins in "De Natura Animalium" and watch the same scene Aelianus has described in Cousteau's documentary: on a coast in northwestern Africa fishermen cooperate with dolphins to catch as many mullets as possible. Thus students come to the conclusion that the legendary love between men and dolphin is due to eternal solidarity and fellowship.

The third activity has to do with Apollo, Neptune and their relation to dolphins and also with Delphi and its etymological connection with dolphins (their common root is the word "delphis" meaning uterus).

The last activity aims to raise students' awareness of the risk of dolphins' extinction. The students are asked to read relevant articles and watch videos on http://www.pelagosinstitute.gr. They are also asked to design a postcard addressed to WWF, which will be posted on their Web page.

In the end the students watched the film "The little dolphins of the Amvrakikos Gulf" by Dinos Demopoulos (1993). This movie deals with the issue of sincere, honest and true friendship between three children in Greece in early 30's. One of the children lives in a hut excluded from society because of poverty and tuberculosis which was contaminating and difficult to cure at that time. Nevertheless, the love and friendship of the other two children saves him from death and provides him with a better life. The correlation with dolphins is obvious.

3 RESULTS

The whole teaching procedure since the filling of the pre-test up to the assessment of the post-test was met with enthusiasm and interest by the students. It was a surprise for them to choose their partner and to be allowed to talk during the lesson- provided that it had to do with the project. There was a low noise level and satisfactory efficiency in the use of the computer. They also enjoyed watching the documentary and the film and listening to several sounds of dolphins on the Web.

The combination of multimedia sources with written and oral speech were extremely appealing to the students .The fact that the activities did not seem like usual exercises but more like puzzles or problems proved to be a stimulating factor for the children to get involved.

While the intention was to cover the cognitive gaps and modify the initial wrong ideas, this was not made clear to the students. It seemed better for them to come up to the right answers "accidentally" while working on activities that stimulated their mind and urged them to express ideas and build their knowledge in their own pace and mode.

The comparison between the results of the pre-test and the post-test leads to the conclusion that there has been a remarkable difference in the number of right answers and in the quality of the answers given before and after the teaching procedure.

For instance, from the beginning every child knew that the dolphins were mammals and not fish. They also knew the seas dolphins usually prefer. They were not quite sure, though, about the length, the color, the speed and the sonar system of the dolphins. But in the post test everybody could answer correctly.

When asked in the pre-test about the dangers and threats towards dolphins, no child knew the answers exactly. They also ignored the etymological connection between Delphi and dolphins and they could not mention more than one or two myths each. But in the post-test everybody could answer correctly.

Most of all they enjoyed debating on their ideas and explanations, testing their hypotheses and rejecting what could not be supported. And certainly

they were moved by the shocking pictures of injured or dead dolphins they saw on the Internet and became more aware of the dangers and threats towards this species.

4 CONCLUSIONS

The main conclusion to be drawn not only from this study but from many others as well (e.g. Miao & Holst, 2000, Arapoglou et al., 2003, Arkün, S. & Akkoyunlu, B., 2008) is that applying the principles of Constructivism, Exploratory and Cooperative Learning in an enriched learning environment, where computer is being used as a cognitive tool, contributes to building knowledge through critical information processing. Even simple tasks, as those described in this paper, may enhance critical thinking since students learn to doubt, search, discover, argue and speculate instead of absorbing anything they read or learn.

Besides, according to Seymour Papert, the use of I.C.T. transforms learning from a process of discipline and suffering to one offering exploration, enthusiasm and satisfaction (Solomonidou, 2006). Since this has been quite evident to all the participants in this research project, the intention is to design and implement similar projects in the future based on students' interests and needs.

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