

# **Wetlands of Cyprus: A learning environment for developing inquiry skills through the use of webquests and field studies**

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The project *Wetlands* aims to develop research-based curriculum for enhancing inquiry skills and ecological insight in the context of selected wetlands in Cyprus. The web based learning environment will include webquests and a series of educational fieldwork activities. Webquests are organized learning activities that support inquiry. A large part of the information in webquests is placed on the internet and students work in groups following a procedure of extracting information from various sources. Webquests are structured teaching interventions that support utilization of the new potentials of collective and interpersonal communication that the internet provides, development of inquiry skills and information processing and active familiarity with decision making procedures.

The project addresses the needs of 11-15 year old students interested in developing conceptual understanding of the processes that are characteristic of Mediterranean ecosystems. During the first year, data concerning the students' inquiry skills, attitudes and conceptual understanding regarding ecosystems and the water cycle were collected through interviews and written tests. The students' conceptual models and cognitive constraints that emerged from the data analysis will guide the curriculum development effort. The initial design of webquests draws on detailed epistemological analysis of specified learning objectives. Once initial development is complete, the webquests will be refined through an iterative process of classroom implementation, assessment and refinement.

In this paper, we describe the interview protocols and the data that emerged from them, as well as our approach to developing research-based curriculum. Specifically we are going to focus on the conceptual models and cognitive constraints that emerged from the interviews about the water cycle and the way these influenced the development of the webquests. Analysis of the interview data showed that the majority of students (even primary school students) explain that the phenomenon of evaporation as a transformation of liquid to gas and they believe that clouds are made of water vapor. Also, they understand that water vapor comes from water evaporation and they perceive of water evaporation as an essential part of the water cycle. However, the majority of students do not explain the phenomenon of condensation as the transformation of gas to liquid. They do not understand the reversibility between evaporation and condensation and do not explain successfully the cause of rainfall. They believe that rain starts when clouds collide or when many clouds are gathered together. Finally, students do not have a coherent model of flow in the whole water cycle since they only understand where rain starts and ends and they don't understand the relation between underground water and surface water.

From the results described above, we were able to locate many difficulties that children have in their attempt to understand the phenomenon of condensation. One of these is that students do not understand abstract concepts, like the existence of water vapor in the atmosphere, because they have ambiguous ideas for the concept of gases. Specifically, students do not understand that there are different gases with different properties. They tend to believe that air, gas and oxygen are synonyms of the same concept. Moreover, they don't understand the material nature of gases. These ideas function as cognitive constraints to their understanding of phenomena that relate with gases and influence the activity sequence. For this reason, during the development of the webquest we embedded activities for teaching the material nature and the properties of gases. These activities precede the teaching of the phenomenon of condensation.