The water cycle in the form of a story (fable) to children with marginal intellectual hysteresis

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Abstract

The understanding of the water cycle is very difficult in the stage of specific fermentation, in which two important concepts are being developed: conservation and classification. Students have to successively comprehend the concepts of evaporation, condensation, liquefaction and gravity. In this paper, we will try to find the theoretic framework in which we will ground our teaching of the water cycle, with the assistance of the story (fable) of Anastasia Peristeraki - Psichogiou. "The story of water".

PRESENTATION – THEORETICAL APPROACHES

This paper can be addressed to children with marginal intellectual hysteresis (trainable). What we should bear in mind is that: the elder intellectual age that these children can reach is the age of children between the classes b-d of the elementary school and their intellectual development is, according to the Piaget theory, at the stage of the specific fermentation.

In this stage, children have a clear perception of place and time; they start thinking in ways that can also be found in the developed logic of an adult, but their thought remains adherent to objects. During that period, children can only have limited hypotheses, however they find that procedure easier when there is only one variable. They can solve problems only when they act upon objects. It is very hard for them to keep the problem in their mind while at the same time they try to solve it.

During this stage, two important abilities are being developed: conservation and classification. In its general sense, conservation is a process of the mind that leads to the verification that many aspects of a variable situation are unalterable despite the occurring changes.

If we count on the Piaget theory, it is possible that the presentation of the specific activity will be based on what the educator wants to teach and not what children will understand.

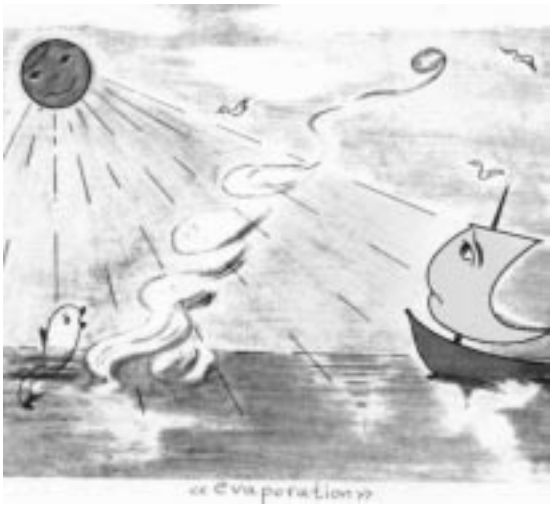
Children may have developed the concept of conservation, but the fact that the water cycle occurs in successive phases may induce difficulties in the understanding of the natural phenomenon. Also, if we rely upon Piaget Genetic Epistemology, according to which an individual interacting with the objects of its environment during the learning procedures plays an active role in building its intelligence (K. Ravanis, 2004) and thus being encountered as a developed organism– here we have the Piaget's innovation who resisted empiricism of the idea of the prime meaning of a direct experience- who do not just absorb irritants from the environment with his senses but acts upon objects with the possibility of transformation of sensory data, the understanding of water cycle in the specific stage of the specific fermentation seems to be difficult because students have to understand successively the concepts of evaporation, condensation, liquefaction and gravity, which are vital concepts for the understanding of water cycle.

The instructive activity that we examine in this paper, can be placed on the socio-cognitive theoretical streams for learning, whose basic hypotheses is, on the one hand, that knowledge cannot be transferred but is in the mind of every person and, on the other hand, that the building process of knowledge is accomplished with the systematic mediation of the social and educational environment. We are talking about streams of psycho-educational thought, which developed the basic theoretical aspects of Piaget, Vygotsky and Bruner and tried to organize educational frameworks of social interaction, in which, with the use of particular instructive strategies, children's cognitive progress is being accomplished (K. Ravanis – Ch. Voutsina, OMEP).

The socio-cognitive perspective for learning is based on an attempt to trace children's intellectual representation for a given topic and on an instructive procedure of destabilization of these intellectual representations and their reorganization towards an overstepping in the pedagogic thought.

Within the framework of Teaching of Physical Sciences, the study and development of children's intellectual representation has lead to the composition of the theoretical stream of constructiveness, whose searches have yielded interesting results for the development of alternative learning approaches and analytical programs (K. Ravanis – Ch. Voutsina, OMEP).

According to constructiveness, children develop alternative ideas and spontaneous interpretations for many things and phenomena that exist or happen around them, even from their first sensory experiences with the natural and social environment. These pre-existing ideas accompany children in the classroom and they usually differ from the scientific aspects. The meaning of the pre-existing ideas is very important for further learning activities because what directly affects learning is what is already known by the student (D. Spiropoulou – Katsani, 2002).



In the constructive procedure, the mistake is not only implicated but constitutes a directive procedure as well. The metacenter of a mental exercise is transposed to the location of the student's pre-existing ideas and to the cognitive conflict in an attempt to modify the student's ideas.

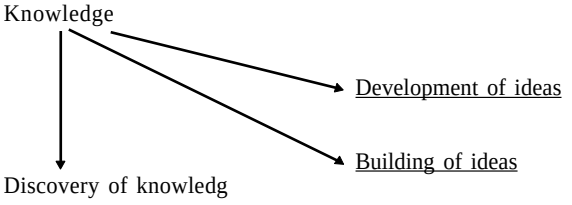
Therefore, learning is a product of semantic change that befalls students due to the cognitive conflict that they experience, which means that knowledge can be altered and obtained from each one. Knowledge cannot be conveyed or be passively accepted, but is build actively from the subjects within the framework of their social group.

At this point, we could view the learning problem as a communication problem. The children's pre-existing ideas give us the opportunity to identify the impact of everyday language. Everyday language, according to Vygotsky, expresses the spontaneous knowledge resulting from the individual's interaction with the environment, which abstains from the scientific knowledge. Within the framework of instructive procedures, the interpretation of different meanings in words, which in Physical Sciences are used in a specific content, can lead to confusion not only at the level of intellectual composition of meanings, but at the level of communication too.

METHODOLOGY

A characteristic teaching pattern is the one suggested by Cosgrove and Osborne (1985) in combination with the corresponding one by Driver and Oldham (1986), which includes five phases:

1. Orientation/ presentation of ideas
2. Testing student's ideas
3. Introduction of scientific knowledge
4. Application of the new knowledge
5. Comparison of student's ideas to the scientific knowledge/ metaknowledge (D. Spiropoulou – Katsani, 2002).



According to this model, in the phase of student's orientation/ presentation of ideas in order to stimulate their interest, we can present them the specific story of water cycle. Our intention is to make them understand the successive phases of water cycle, to comprehend the concept of evaporation, condensation and gravity. With the appropriate questions we can trace children's views.

1. What happens when the sun heats water?
2. Where do you think this water goes?
3. How are clouds created?
4. How do clouds move?
5. What happens when they encounter cool draughts?
6. How does the cloud change again to water?
7. Why drops fall to the ground?
8. Where does the rain go?

The difficulties that may arise have to do with the transition from the simple question about the clouds' origin to the conclusion of their creation due to the evaporation of sea because it requires deep reasoning, while here the intellectual building of descriptive shapes in their thinking is essential for the concept of the evaporation of water and the condensation of vapor and we know that it is difficult for children to comprehend the phenomena of the material's changing situation. Our fears are reinforced taking into account the attempt made by researchers to classify the students' ideas, according to which the common characteristics of children's ideas are the anthropocentric aspect (people breath because oxygen exists), the animistic aspect (clouds produce water), the invisible ones do not exist (water vapors in the atmosphere) (D. Spiropoulou- Katsani, 2002).

ACTIVITIES

We could pose a hypothetical experiment: what will happen if we leave a plate with a small quantity of water in the sun, in order children to apprehend evaporation which is an important concept for understanding condensation.

Then, we will move to the phase of scientific knowledge where children can see the results of the experiment and compare their initial answers to what really happens.

As far as condensation and liquefaction are concerned, we could ask students to describe what happens when we have a shower with hot water and the place is full of vapors and what becomes of vapors when they come in contact with the cold tiles of the bathroom, so as to orientate them towards the application phase of the new knowledge.

CONCLUSIONS

Undoubtedly, the specific instructive approach has many weaknesses. The most important of which, in our opinion, is that the water cycle occurs in successive phases (evaporation- condensation- gravity). Children should comprehend each one of them. So, both the cohesion of concepts and the fact that it is about concepts that are not subject to the students' sensory apprehension, as well as the inability of laboratorial intervention, render the instructive approach of the water cycle difficult. Besides, we assume that, with this specific instructive approach, we cannot probably help children to comprehend that vapor and water are the same.

Due to these weaknesses, we open the way for further thoughts, questioning and suggestions and this might be the best we could get from this non-extensive paper.

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