A CONTROLLED MAPPING EXPERIMENT ON TEACHING EARTH SCIENCE CONCEPTS

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Abstract: *A short pilot unit for teaching physical map skills to Grade 6 disabled students in Israeli elementary school has been developed, implemented and evaluated. The design of the unit was based on the findings of the authors' previous studies about teaching map skills in Grade 4 classes (Livni & Bar, 1998, 2001). The pilot unit was evaluated by studying the participant students developing external representations.*

INTRODUCTION

Learning disabled class teachers report about difficulties when instructing mapping skills of physical maps. As a result of investigating these difficulties it has been made clear that understanding physical maps is connected with mastering Earth-Science concepts of the large scale physical landscape which are described very similarly in such maps.

Key concepts: Earth-Science concepts, starting abilities, topological concepts, representation

EARTH-SCIENCE CONCEPTS THAT ARE DESCRIBED SIMILARLY IN PHYSICAL MAPS AND THE STARTING COGNITIVE ABILITIES NEEDED TO COMPREHEND THEM

The pilot unit deals with the following pairs of Earth-Science Concepts: Ocean - Continent, Lake – Island and Bay – Peninsula. Those concepts were defined accordingly to the Dictionary of Geography, by Moore (1962). The starting abilities for comprehending these large-scale landforms (Mark, 1993) are connected with the inner representation of the topological space (Piaget, 1967) and its relevant concepts as closed and open curves, continuity, estimated distance, area and space.

INTERNAL, SOCIAL AND EXTERNAL REPRESENTATION

Luitel (2005) studied three stages in the developing progress of the learners' cognitive representation: the Internal Representation [as defined by (Piaget, 1967; Hart & Moore, (1973) and Driver & Oldham, 1986)], the Social Representation which was constructed and carried out by social interchange (see Gergen, 1995) and the External Representation as it could be expressed by the learner and assessed in the pilot study.

EVALUATING EXTERNAL EXPRESSIONS

This paper deals with a pilot study which was implemented in a regular teaching process. Livni & Bar (1998: 53) emphasized the importance of evaluating the observed external expressions of the students, before and after learning any unit. These external expressions should be divided into two types: motoric expressions, as described by Feuerstein (1989), Livni & Bar (2001: 152), and symbolic (graphical and verbal) expressions as reported by Morita (1996) and Livni & Bar (1998: 53).

AIMS

The experiment' aims were as follows:
a) To identify cognitive starting abilities which are required to comprehend the pairs of Earth-Science concepts as ocean-continent, lake-island and bay-peninsula.

b) To evaluate the mastery of the learning disabled student concerning the above mentioned starting abilities.
c) To plan a teaching unit based on the findings of par. a) and b) and to assess the unit in a controlled framework.

During the year 2004, a controlled mapping experiment in instructing Earth-Science concepts to a class of learning disabled children was performed in Beer-Sheba, Israel.

THE TEACHING UNIT

The unit was based on the method of the constructivist approach to teaching science concepts (Driver & Oldham, 1986) in schools. This approach suggests to the pupils a learning situation that considers their previous conceptions and the level of developing relevant starting abilities. For learning each pair of concepts (ocean-continent, lake-island and bay-peninsula) the students performed hand on activities. Those activities were: behavioral demonstration of the internally represented topologic concepts, using plasticine models of the large-scale landforms, identifying and studying those landforms on satellite imageries and air photos, reading end decoding physical maps.

POPULATION AND METHOD

A class of 14 learning disabled students was the experiment's population. The experiment took place as a "quasi-experimental design" (Cook & Campbell, 1979) without control group. Starting abilities and understanding physical landscape concepts were evaluated before and after the instruction of the unit. The unit was implemented by the expert class teacher and a preservice teacher coordinated by author [1].

MAIN FINDINGS

Students who master the relevant concepts of the Topologic Space (identified as starting abilities) before learning, achieved a satisfactory level of comprehending the three pairs of landscape concepts – after learning the unit as demonstrated by there motoric, graphic and verbal external expressions.

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