

MAOF - Interdomain Organization of Knowledge: Design, Implementation and Evaluation of Instructional Units for High School

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Abstract

The various domains of physics are usually taught in sequence, very much as separate topics. This often causes the formation of a fragmented knowledge structure in the minds of students, and affects their ability to recall the knowledge or to use it for more complex problem-solving tasks.

The project described here consisted of the development, implementation and evaluation of seven interdomain organizational units "MAOF" : ("Overview" in Hebrew). The units focus on the general concepts of "vector fields" and "potentials". The examples of these general concepts, discussed in the MAOF units, are the electrostatic field, the gravitational field, the induced electric field and the magnetic field.

The instructional approach is aimed at the formation of interdomain organization of concepts learnt in different domains of physics. In this approach students' acquisition of useful knowledge structures is driven by problem-solving activities augmented with treatment of specific conceptual difficulties. The relationships acquired are represented by concept maps at different levels of detail. After constructing the maps students use them for further problem-solving activities.

The teachers in this study are related to as "learners". A sequence of "Maof lessons", in which they modify their own knowledge structures through the use of the MAOF, is offered to the teachers, similar to that being offered by them to their students.

The units were tried out in 22, 12th grade classes, during a period of four academic years (1990 – 1993).

The treatment was evaluated, using a variety of measurements, both questionnaires and interviews. The results of the evaluation reveal:

- a) The treatment constructs an interdomain knowledge structure in which there is a clear identification of the critical attributes of the general concepts and discrimination between the examples' critical and non-critical attributes.

- b) The treatment improves the understanding of central topics which are explained by interdomain relationships. (e.g. the conservation of mechanical energy)
- c) Students and teachers evaluated the treatment as useful and important.

In view of the great importance of organization of knowledge; the research findings and the interest in the subject, we suggest to integrate the ideas represented in the MAOF units, more fully into the curriculum and not only as summary units of what has been learnt.