Learning Science Using Qualitative Modeling Interactive Environment (Poster)

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Abstract

Science education nowadays faces manifold challenges. Adequate scientific knowledge is crucial for understanding the complex environment and reality within which we live; however, there is an alarming decline in number of students choosing science subjects. Motivational aspects are key factors for this decline, resulting from both inadequate pedagogical approaches to science teaching (Novak, 1998) and from students' perception of contents as uninteresting and tedious (Osborne & Hennessy, 2003). ICT is broadly used in science education for handling numerical data, however constructing conceptual interpretations of system's behavior (e.g. White & Frederiksen, 1998) requires ICT software supporting learners in actively dealing with the theoretical concepts such as visualization and diagrammatic techniques, creation of models and concept prediction and explanation (Niedderer et al., 2002). However, such techniques are unavailable or too complex to use, and therefore are seldom part of prescribed science activities (Osborne & Hennessy, 2003). The DynaLearn project aims to develop and implement effective educational tools for learning about complex systems using a qualitative modeling approach (Bredeweg et al., 2006; Bredeweg & Struss, 2003). This approach regards a model as an abstraction that captures ordinal knowledge and predicts the set of qualitatively possible behaviors of the system, given a qualitative description of its structure and initial state. Dynalearn project is funded by the European Union's 7th framework programme and carried by a consortium of eight participant partners. The main components of the DynaLearn Environment are Conceptual Modeling (CM), Semantic Technology (ST) and Virtual Characters (VC). The CM component is used for learners to articulate, analyze and communicate ideas, and thereby construct their conceptual knowledge (Figure 1). The VC component is used to generate meaningful feedback of various types, and make the interaction engaging and motivating. The ST component is used to deliver semantically appropriate feedback. The research was conducted during 2009/2010 academic semester, as part of the Marine Biology course at the Faculty of Life Sciences in Tel Aviv University. A group of 10 undergraduate students attended a 7 weeks seminar using DynaLearn environment with the purpose of constructing a model related to the course syllabus. In the evaluation process we analyzed the students' active construction of their models, their ability to interpret given states of a model,

Proceedings of the Chais conference on instructional technologies research 2010: Learning in the technological era
Y. Eshet-Alkalai, A. Caspi, S. Eden, N. Geri, Y. Yair (Eds.), Raanana: The Open University of Israel

their abilities to adapt a model to given data and scenarios in accordance with a given environmental phenomena or text.

Keywords: Qualitative modeling, Qualitative Reasoning, Science Education, Interactive environment, ICT.

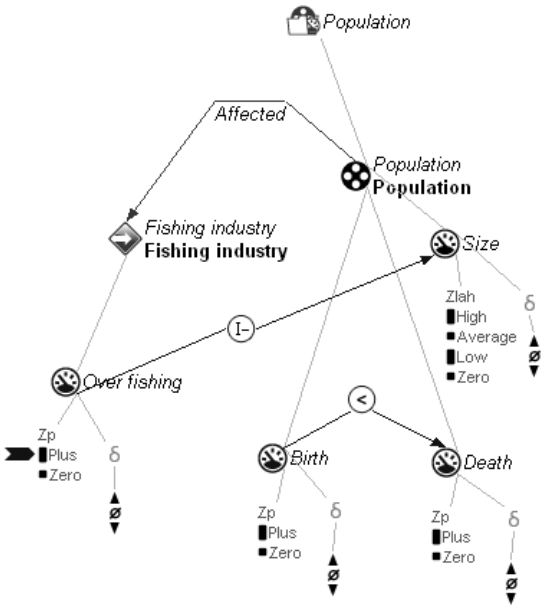

Figure 1. Fish Population's Model Fragment in Garp3

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