# YOUNG CHILDREN CONSTRUCTING AN UNDERSTANDING OF NUMBER SEQUENCES THROUGH MODELING BASED LEARNING

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## *Abstract*

*Despite the consensus in literature about the usefulness of modeling based learning, it is not commonly incorporated into educational practice, especially in early ages. In this poster, we provide a description of the implementation of specific task sequences which lasted 5 weeks, by using data collected from videotaped incidences, the teacher's personal filed notes and photos. The task sequences were implemented in public school classes of 25 children age 3½ to 6 years old. Through the description of the implementation of two activity sequences, we present the process through which the children used aspects of modeling based learning in order to construct conceptual understanding of number sequences. This study reveal insights with respect to a) the way the phases of the modelling process interplay and b) the conditions under which modeling based learning can be activated.*

***Keywords*** modeling based learning, number sequences, early childhood education

In this poster we aim to present how modeling based learning might look like in authentic early childhood education settings. In modeling based learning, learning takes place via students' construction of models as analogical representations of mathematical phenomena. Relating literature describes the modelling process as a cyclical process involving the following four steps: (a) making systematic observations and/or collecting experiences about the phenomenon under study, (b) constructing a model based on observations and experiences, (c) evaluating the model against, predictive power, and/or explanatory adequacy, and (d) revising the model and applying it in new situations [Louca, Zacharia & Constantinou, 2011; Constantinou, 1999]. The data that will be presented in the poster help us to better understand these steps but also to study in depth the way these steps interplay with one other.

The two activity sequences that will be described were designed and implemented as part of, and in support of, a three year research project[1] which aims to develop, implement, evaluate and scientifically justify a joint mathematics and science literacy curriculum for early childhood education in Cyprus. The curriculum is developed by a mixed group of researchers, content-knowledge specialists and educators. The procedure that was followed was based on the belief

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that the development of a scientifically justified curriculum requires (a) iterative procedures of designing and implementing activities and collecting and analyzing data from authentic early childhood settings and (b) participation of educators in action research-based teacher training courses. We will provide a description of the implementation of specific task sequences which lasted 5 weeks, by using data collected from videotaped incidences, the teacher's personal filed notes and photos. The task sequences were implemented in public school classes of 25 children age 3½ to 6 years old.

Through the description of the implementation of these task sequences, we present the process through which the two groups of children used aspects of modeling based learning in order to construct conceptual understanding of number sequences. We define conceptual understanding as the understanding of the principles that govern a domain and of the interrelations between pieces of knowledge in a domain (although this knowledge does not need to be explicit). The first group of children studied an 8X8 square constructed by milk bottle lids and through observations, constructions and representations which focused on how to make the shape bigger and smaller constructed an understanding of squared numbers. The second group of children constructed an understanding of triangular numbers through an investigation of bowling.

Findings from this study reveal insights with respect to a) the way the phases of the modelling process interplay and b) the conditions under which modeling based learning can be activated. The analysis of the data collected allows us to support that the phases of the modeling process are not as distinct and the process is not as linear and cyclical as presented in the literature. The interplay between the phases is much too interactive when the procedure is meaningful for the children. In an attempt to collect data, observations and experiences about a phenomenon under study, the children often use representations to do so, and conversely when they represent a model/phenomenon, they simultaneously collect additional data, observations and experiences. This is where it appears that there is common ground between modeling based learning and learning as promoted by constructionism and Papert's powerful idea of providing children "objects-to-think-with" [Ackermann, 2001; Papert, 1980]. Lastly, these data support the idea that modeling process could be activated only when it is meaningful for the children and begins with problem solving or the in-depth study of a phenomenon (investigation)

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