Models and modelling have become an influential approach to science education — especially in physics. One reason for this is that models are seen as a way towards authenticity in science education. Another reason is that modelling based learning can lead to better learning outcomes with regard to conceptual knowledge as well as facilitate conceptual change. In this paper I will first look at the roles of models and modelling in science education arising from the literature. Specifically, I will argue that there are three main roles: 1) using models to convey an idea or concept, 2) constructing and revising models and 3) using models in theory development. However, despite ample research there are surprisingly few that look at the cognitive processes underlying model-based learning. However, it has been suggested that viewing models as relational categories could provide insight with regard to the learning processes. I will follow this suggestion and contrast it with the roles 2 and 3 of modelling. Most importantly, I will argue that this comparison highlights the learning of generic relational knowledge, which has been somewhat neglected in science education literature. I will also discuss the specific processes associated with learning of such knowledge. Lastly, I will discuss the implications for research.

A longitudinal study of the development of science knowledge among 4th to 8th grade students
Keywords: Cognitive development, Conceptual change, Quantitative methods, Science education
Presenting Author: Erzsébet Korom, University of Szeged, MTA-SZTE Science Education Research Group, Hungary; **Co-Author:**Erzsébet Antal, University of Szeged, Hungary; **Co-Author:**Zsófia Gabriella Szabó, University of Szeged, Hungary; **Co-Author:**Gyongyver Molnar, University of Szeged, Hungary; **Co-Author:**Benö Csapó, University of Szeged, Hungary

In this paper, we examined the development of a set of basic science concepts (e.g., matter, life forms, characteristics, classification and conditions of life, the properties of matter) among 10 to 14 year-old students. The objective of the study is to examine (1) the differences in students' science knowledge over the years; (2) the predicting power of the starting abilities on later achievement and (3) to compare developmental changes regarding the different subject areas. The sample was drawn from 4th, 6th and 8th grade students. Different versions with different item difficulty of science tests were used, which varied by grade. Versions contained anchor items, so achievement scores could be represented on a single scale. The contents of the tests were adjusted to the school curriculum. Rasch-model was used for scaling the data. Plausible values and weighted likelihood estimation were computed to compare the achievements of the age groups and to obtain individual level point estimates. The internal consistency of the instrument was high (a_grade4=.93; a_grade6=.913; a_grade8=.925). Across all grades, development of science knowledge is obvious. The fastest development happened from grade 4 to 6. Initial abilities had a lasting effect: relative abilities did not change significantly over time. The mean probability of correct solution of items belonging to the different subject areas increased with age. The differences at student level in the same grade were getting larger and varied by subject areas. Findings of the present paper identify factors having predicting power on the developmental level of students' scientific knowledge.

Session G 10

31 August 2017 08:30 - 10:00
Main Building A - A4
Single Paper
Motivational, Social and Affective Processes

Motivation and Emotion - L

Keywords: Educational Psychology, Emotion and affect, Goal orientation, Higher education, Informal learning, Mathematics, Motivation, Motivation and emotion, Neuroscience, Out-of-school learning, Quantitative methods, Quasi-experimental research
Interest group: SIG 08 - Motivation and Emotion
Chairperson: Irina Lokhtina, University of Central Lancashire, Cyprus

Diurnal Cortisol Patterns, Motivational and Socio-Emotional Regulation in University Students
Keywords: Emotion and affect, Higher education, Neuroscience, Motivation and emotion
Presenting Author: Katherine Cheng, University of Nebraska, Lincoln, United States; **Presenting Author:**Jenefer Husman, University of Oregon, United States; **Co-Author:**Reinhard Pekrun, Ludwig-Maximilians-Universität (LMU), Germany

Building upon Control Value Theory (CVT), the current study examines socio-emotional and motivation factors and their associations with diurnal cortisol patterns in post-secondary university students. University students provided survey and salivary cortisol data at the beginning of the semester, mid-semester during a stressful academic event, and near the end of the semester to gauge recovery. Diurnal cortisol slope near the end of the semester was found to be related to negative emotions earlier on in the semester, and social support throughout mid-semester the end of semester. Diurnal cortisol slope was also found to be predicted by an interaction between students' future time perspective (value subscale) and their emotion regulation (reappraisal). Results support the physiological aspect as an academic emotional facet as described in CVT; findings also call for the inclusion of future-oriented motivation to be incorporated into CVT.

Beneficial for all? Differential effects of an autonomy-supportive intervention in the classroom
Keywords: Motivation, Quantitative methods, Quasi-experimental research, Motivation and emotion
Presenting Author: Barbara Flunger, Utrecht University, Netherlands; **Co-Author:**Axel Mayer, RWTH Aachen University,