

## **Abstract**

The goal of this Master thesis was development of teaching materials that are focusing on mastering the fundamentals of mathematical modelling on the examples of photosynthetic processes and influence of selected environmental factors on these processes. Developed models of photosynthetic response to select environmental factors, worksheets, methodical manuals and other supporting materials belong to the teaching materials for secondary schools and serve as a basis of work with models. This teaching materials are aimed to introduce modelling and its significance not only in science but also in education. The present thesis was accomplished on the basis of participation of the Department of Experimental Plant Biology of Faculty of Science of Charles University in Prague in international project NSF within programme GLOBE – The Carbon Cycle.

The present thesis is divided into two parts – theoretical part and practical part. The theoretical part includes a literary review and an introduction to the mathematical modelling (in software Stella) that are elaborated considering the teaching purposes and serve as a theoretical background for practical part of present thesis. The chapters that deal with increasing interest in mplementing of modelling in education and with philosophical background of software Stella and of programme GLOBE (abbreviation for „Global Learning and Observation to Benefit the Environment“) are placed at the end of section about modelling and models.

The programmes used for model building are described in the first chapter of practical part of diploma thesis. The next chapter is dedicated to presentation of newly developed models that were built. The following chapter includes findings obtained from evaluation of questionnaire research in pilot schools that participated in testing of teaching materials – models, worksheets, methodical manuals and another supporting materials. The final part contains discussion and conclusion.

In order to build the models of photosynthetic response to elected environmental factors it was necessary to introduce several topics of plant biology that are beyond the curricular borders and the teaching goals of secondary school. The Stella software was chosen as an modelling environment. This software support better understanding of complex dynamic systems and it is convenient especially for the students with limited mathematical skills. The Stella software supports various learning styles and therefore enables satisfactory approaches to wide range of individuals. Further, it was necessary to create materials that prepare eachers

and students for fundamental work in software Stella and that introduce the main ideas of „Systems Thinking“ and „Systems Dynamics (see chapter **Chyba! Nenalezen zdroj odkazů.**). Systems Thinking and Systems Dynamic are the philosophical background of the software Stella.

The models and supporting materials were presented and passed to pilote schools in workshop GLOBE. The workshops GLOBE were held on 4. – 5.4. 2008 and 11.-12.6.2010. The verification of the teaching materials was run in two pilote secondary schools in cooperation with association TEREZA. In order to increase utility of teaching materials in classwork there were suggested alternations of the these materials on the basis of feedback which was obtained by questionnaire research.