

# LEARNING CONTRACT, CO-OPERATIVE AND FLIPPED LEARNING AS USEFUL TOOLS FOR STUDYING METABOLISM

**Beatriz Martínez-Poveda<sup>1</sup>, Ángel Luis García-Ponce<sup>2</sup>, Ángel Blanco-López<sup>2</sup>, Ana Rodríguez Quesada<sup>1</sup>, Fernanda Suárez<sup>1</sup>, Francisco José Alonso Carrión<sup>1</sup>, Miguel Ángel Medina Torres<sup>1</sup>**

<sup>1</sup>*Universidad de Málaga, Andalucía Tech, Departamento de Biología Molecular y Bioquímica, Facultad de Ciencias, Málaga (Spain).*

<sup>2</sup>*Universidad de Málaga, Andalucía Tech, Departamento de Didáctica de la Matemática, de las Ciencias Sociales y de las Ciencias Experimentales, Facultad de Ciencias de la Educación, Málaga (Spain).*

## Abstract

Undergraduate students in Biology identify *Metabolic Biochemistry* as a particularly difficult subject. This is due to the fact that students need to interconnect properly all the contents of its syllabus throughout their study of the subject in order to get a global insight of the complex regulatory features controlling metabolic pathways within the metabolic network under different physiologic and pathologic conditions, as well as metabolism as a whole. Due to these objective difficulties, a high percentage of our students face the study of this subject as a very hard task beyond their forces and capacities. This perception leads to high rates of premature dropout. In previous years, less than 40% of all the registered students attended the examinations of *Metabolic Biochemistry* (a subject in the second year of the Degree of Biology at our University). Even worse, less than 25% of our students passed the exams.

From the academic year 2015/16 on, we are developing innovative teaching projects (PIE15-163 and PIE17-145, funded by University of Malaga) aimed to increase our student loyalty to the subject (and hence to increase their attendance to exams) and to help them to learn more effectively metabolism and its regulation. These innovative teaching projects are based on the use of several powerful tools: a learning contract and problem-based learning within the framework of group tasks promoting an actual collaborative learning in a flipped classroom.

The present communication will show the implementation of the PIE15-163 and PIE17-145 projects and some results obtained from them.

[This work was supported by Malaga University funds granted to the educational innovation project PIE17-145. The attendance to the END2018 International Conference on Education and New Developments (June 2018, Budapest, Hungary) has received a grant from "I Plan Propio Integral de Docencia. Universidad de Málaga"].

**Keywords:** *learning contract, co-operative learning, flipped learning, problem-based learning, metabolism..*

---