

**BUILDING COMMUNICATION BRIDGES BETWEEN MATH EDUCATION AND  
ENGINEERING EDUCATION COMMUNITIES: A DIALOGUE THROUGH MODELLING AND  
SIMULATION**

**RUTH RODRIGUEZ**

Tecnologico de Monterrey

The main goal of this talk is to show the importance of building communication bridges between two apparently disjoint academic communities: the mathematicians' and the engineers'. The starting point is an overview of an approach to teach mathematics through modeling (Blum et al., 2007) and simulation of real phenomena at a private university in the northeastern of Mexico, which mainly focuses on the training of future engineers (Rodríguez, 2015, Rodríguez & Quiroz, 2015). The intention in this conference is to first show some background about the teaching and learning of mathematics through an overview of modeling, followed by an example of a specific case of a study done with high school students and developed under an anthropological point of view. Later on, some reflections and limitations of studies conducted from a particular theoretical perspective are presented to undertake more comprehensive studies on engineering education for the 21<sup>st</sup> century. Several generic skills are required for math colleagues to expand their vision of the first approach on modeling and simulation of complex phenomena and social nature (Rodríguez & Bourguet, 2015). In particular, the above is exemplified by the introduction of holistic and / or systemic thinking in the training of engineers in a specific course of Differential Equations (sophomore year). Through the introduction of a new language and vision of the phenomena, qualitative studies can give feedback that allow the introduction of a new vision, a new approach and a new language for modeling (Fisher, 2011). The need for building communication bridges between the mathematics and engineering education communities seem to be fundamental in order to rethink the goals of mathematics education to be prepared to face the challenges posed by today's changing situations. The results and experience of mathematics professors that teach engineering students allow to see some advantages of incorporating new ways of visualizing and understanding phenomena. Furthermore, these allow students to have a new vision of mathematics and deeper understanding of several math concepts.

**References**

- Blum, W., Galbraith, P. L., Henn, H.-W. & Niss, M. (2007) Introduction. In Blum, W., Galbraith, P. L., Henn, H.-W. & Niss, M (Eds.), *Modelling and applications in mathematics education*, pp. 45-56. The 14 Springer-Verlag.
- Fisher, D. M. (2011). "Everybody thinking differently": K-12 is a leverage point. *System Dynamics Review*, 27, 394-411. DOI: 10.1002/sdr.473
- Rodríguez, R., y Bourguet, R. (2015). Building bridges between Mathematics and Engineering: Modeling practices identified through Differential Equations and Simulation. *American Society of Engineering Education (ASEE) Annual Conference and Exposition, Conference Proceedings*. Atlanta, Estados Unidos. <https://www.asee.org/public/conferences/56/papers/13153/view>
- Rodríguez, R. y Quiroz, S. (2015). El papel de la tecnología en el proceso de educación matemática para la enseñanza de las Ecuaciones Diferenciales. *Revista Latinoamericana de Investigación en Matemática Educativa*, 19(1). DOI: 10.12802/relime.13.1914 ISSN: 2007-6819
- Rodríguez, R. (2015). A Differential Equations Course for Engineers through Modelling and Technology. In G. Stillman, W. Blum & M. S. Biembengut (Eds), *Mathematical Modelling in Education, Research and Practice. Cultural, Social and Cognitive Influences* (pp. 545-555). New York: Springer. Print ISBN: 978-3-319-18271-1 Electronic ISBN: 978-3-319-18272-8 <http://www.springer.com/us/book/9783319182711>