

# EXPLORING THE CRITICAL-REFLEXIVE DIMENSION OF MATHEMATICAL MODELLING

**Daniel Clark Orey – Milton Rosa**

*Centro de Educação Aberta e a Distância - Universidade Federal de Ouro Preto – Minas Gerais - Brasil*

According to the Brazilian National Curriculum for Mathematics (Brazil, 1998), students need to develop their ability to solve problems, make decisions, work collaboratively, and communicate effectively. This approach is based on emancipatory powers, which help students face challenges posed by society by turning them into flexible, adaptive, reflexive, critical, and creative citizens.

This perspective is also related to the sociocultural dimensions of mathematics, which are closely associated with an ethnomathematics program (D'Ambrosio, 1990). This aspect emphasizes the role of mathematics in society by highlighting the necessity to analyze the role of critical and reflexive thinking about the nature of mathematical models as well as the role of the modelling process to solve everyday challenges present in the contemporary society.

Mathematical modelling provides real and concrete opportunities for students to discuss the role of mathematics as well as the nature of mathematical models (Shiraman & Kaiser, 2006). It could be understood as a language to study, understand, and comprehend problems faced daily by society. For example, mathematical modelling is used to analyze, simplify, and solve daily phenomena in order to predict results or modify the characteristics of these phenomena.

In this process, the purpose of mathematical modelling is to develop students' critical and reflexive skills that enable them to analyze and interpret data, to formulate and test hypotheses, and to develop and verify the effectiveness of the mathematical models. In so doing, the reflection on reality becomes a transformative action, which seeks to reduce the degree of complexity of reality through the choice of a system that it represents. This isolated system allows students to make representations of this reality by developing strategies that enable them to explain, understand, manage, analyze, and reflect on all parts of this system.

This process aims to optimize pedagogical conditions for teaching so that students are better able to understand a particular phenomenon in order to act effectively transform it according to the needs the community. The application of critically-reflexive dimensions of mathematical modelling makes mathematics to be seen as a dynamic and humanized subject. This process fosters abstraction, the creation of new mathematical tools, and the formulation of new concepts and theories.

## **Reference**

Rosa, M.; Reis, F. S.; & Orey, D. C. (2012). A modelagem matemática crítica nos cursos de formação de professores de matemática [Critical mathematical modelling in the mathematics teacher education program]. *Acta Scientiae*, 14(2), 159-184.