







# An Assessment of the Weight of the Experimental Component in Physics and Chemistry Classes

Margarida Figueiredo<sup>1</sup> , M. Lurdes Esteves<sup>2</sup>, Humberto Chaves<sup>3</sup> ,  
José Neves<sup>4,5</sup> , and Henrique Vicente<sup>4,6</sup> 

<sup>1</sup> Departamento de Química, Escola de Ciências e Tecnologia, Centro de Investigação em Educação e Psicologia, Universidade de Évora, Évora, Portugal

mtf@uevora.pt

<sup>2</sup> Agrupamento de Escolas D. José I, Vila Real de Santo António, Portugal

lurdes.esteves@aedji.pt

<sup>3</sup> Escola Superior Agrária de Beja, Instituto Politécnico de Beja, Beja, Portugal

hc@ipbeja.pt

<sup>4</sup> Centro Algoritmi, Universidade do Minho, Braga, Portugal

jneves@di.uminho.pt

<sup>5</sup> Instituto Politécnico de Saúde Do Norte, Famalicão, Portugal

<sup>6</sup> Departamento de Química, Escola de Ciências e Tecnologia, REQUIMTE/LAQV, Universidade de Évora, Évora, Portugal

hvicente@uevora.pt

**Abstract.** Experimental work plays a central role in Physics and Chemistry teaching. However, the use of experimental work depends on the perception that teacher has about the gains in terms of the students' motivation and learning. Thus, this study aims to evaluate the weight of the experimental component in the chemistry teaching focusing on four topics, i.e., material resources, teaching methodologies, learning achievements, and teacher engagement. For this purpose, a questionnaire was developed and applied to a cohort comprising 129 Physics and Chemistry teachers of both genders, aged between 26 and 60 years old. The questionnaire consists of two sections, the first of which contains general questions, whereas the second contains information on the topics mentioned above. Mathematical-logical programs are presented, considering the teachers' opinions in terms of Best and Worst-case Scenarios, complemented with a computer approach based on artificial neural networks. The model was trained and tested with real data exhibiting an overall accuracy of 91.5%.

**Keywords:** Experimental work · Chemistry teaching · Thermodynamics · Entropy · Knowledge Representation and Reasoning · Logic Programming · Artificial neural networks · Decision Support System