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Addressing Misconceptions about the Particulate Nature of Matter among Secondary-School and High-School Students in the Republic of Macedonia

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ABSTRACT

A study was conducted to identify concepts about the particulate nature of matter among secondary- and high-school students (N = 187) and to address some misconceptions regarding this topic, especially the misunderstandings related to the vague ideas of the relationship between the macro and micro world. Data were collected using both quantitative (six-item multiple-choice instrument in a pre-test-post-test design) and qualitative (semi-structured focus group interviews) methods. Paired-samples t-test analysis showed that students experienced significantly higher results in the post-test when compared to the pre-test, thus confirming the efficiency of the intervention program in facilitating the understanding of some basic elements of the theory and practice concerning the particulate nature of matter (widely known as particle theory concepts, a term which will be used in this paper as well) among students of different levels of study. The findings revealed seven misconceptions prevalent by more than 20% of students and some additional ones emerged from the in-depth focus group discussions. The analysis of the content of textbooks indicated that some erroneous chemical concepts might have been formed as a result of the teaching of chemistry and that of physics, as well. The use of animations and molecular models had a positive effect on students and pointed to the need of introducing, in the chemistry teaching, the new material more visually.

KEYWORDS

Focus Group Interviews; Intervention Program; Misconceptions; Particulate Nature of Matter; Particle Theory Concepts; Secondary- and High-School Chemistry Education

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