**Difficulties in learning the concept of chemical concentration in moroccan secondary school students**

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**Abstract:**

The concentration of chemical solutions is one of the most important concepts in solution chemistry and at the same time one of the most difficult topics in chemistry. The aim of the study was to determine the sources of difficulty that students face in solution of problems related to the concept of chemical concentration. 72 Moroccan students [17-18 years old] participated in this study, who are following their study program in Moroccan high schools in Tangier-Tetouan-Al Hoceïma region. Students were asked to answer eighteen open-ended questions about the concept of chemical concentration. Analysis of the students' responses leads to the identification of common errors, in the conceptual understanding of the topics. We found 76% of students answered incorrectly or incompletely to the open-ended question "What is the chemical concentration? " It was revealed that one of the contributing factors to the poor success rate in solving problems related to the concentration was the superficial understanding of the mole concept. 71% of students were not able to connect the mole concept with mass and number of particles. They also had difficulty answering questions about chemical concentration and dilution. Based on this first study, we are going to develop a new didactic tool, using graphic animations, to identify students' errors when using the concept of chemical concentration and to improve their learning of this concept.

***Keywords: High schools, Learning, Secondary students, Chemical concentration***

**Références**

1. S.H. Chong "Wither the Concepts of Mole and Concentration: Conceptual Confusion in Applying M 1 v 1= M 2 v2. " Universal Journal of Educational Research 4.5 (2016): 1158-1162.
2. S.H. Chong,N. Goolamally and K. Eu Leong. "Post-secondary Science Students' Understanding on Mole Concept and Solution Concentration." Universal Journal of Educational Research 7.4 (2019) : 986-1000.
3. B. Kevin. "A study of first-year chemistry students' understanding of solution concentration at the tertiary level." *Chemistry Education Research and Practice* 13.1 (2012) : 8-16.
4. W. Bénédicte and P. Snauwaert. "Les difficultés rencontrées dans l’apprentissage du concept de concentration en chimie. Construction d’un outil didactique permettant de mettre en évidence les erreurs d’élèves lors de l’utilisation du concept de concentration chimique." Spirale-Revue de recherches en éducation 55.1 (2015) : 177-205.