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Analysis of Student Conceptions and Conceptional Changes about Chemical Equilibrium Materials in Concentration Factors

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ABSTRACT

Objective: This study aims to determine the conception and changes in the conception of the concentration factor in chemical equilibrium material. **Method:** The method used in this study is a mixed method, which is a combination of qualitative and quantitative methods, namely the Concurrent Embedded Strategy, which is a combination of qualitative methods and quantitative methods carried out at the same time. **Results:** The test instruments provided can reduce the misconceptions that exist in students when viewed from a comparison of the number of students who experience misconceptions from 13.33% in the first stage to 7.00% in the last stage. Students understand enough about chemical equilibrium shifts but still need clarification, especially in writing down changes in reaction equations when chemical equilibrium is disturbed and analyzing phenomena using metacognitive examples of a concept in their surroundings. **Novelty:** This research reveals that students' misconceptions can be reduced using worksheets with five processing stages. This novelty can provide (1) solutions related to identifying students' misconceptions and (2) reducing students' misconceptions regarding chemical equilibrium concentration factors.

INTRODUCTION

Chemistry is one of the fields of science that is taught to students. Chemistry is the study of reactions to changes in matter in natural processes as well as in planned experiments (Landa, 2020), which are related to natural phenomena that contain the composition, properties, structure, reactions, dynamics, and energetics of a material (Juniar, 2022). Chemistry is often discussed and taught primarily regarding non-observable theoretical entities, such as molecules, electrons, and orbitals, which seem familiar and natural to a chemistry teacher (Taber, 2019).

Mastery of concepts in learning chemistry is significant (Avargil, 2019) as the concept is connected tightly to one another (Irawati, 2019). Therefore, science education must develop students' abilities, understand, and expand their ability to use theoretical knowledge and skills obtained resourcefully and originally. Chemistry is the science that studies the composition, structure, and behavior of substances or matter from the atomic (microscopic) to molecular scale, as well as their changes or transformations and interactions to form matter found in everyday life (Helsy & Andriyani, 2017). Chemistry has three levels, namely macroscopic, submicroscopic, and symbolic. Macroscopic levels can be obtained from direct observation (Ahmar et al., 2020; Gkitzia et al., 2020; Rizqiyyah & Novita, 2022; Sinaga, 2022). Examples of chemicals that can be seen directly are NaOH solution, magnesium ribbon, and rusty iron. At the same time, the submicroscopic level is a chemical level that cannot be observed directly. An example is the chemical reaction between ethanol and acetic acid. An example is a chemical reaction (Kusumaningrum, 2018). To help students understand these basic concepts,

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