



## The Effectiveness of The Six Tier Diagnostic Test (STDT) Instrument in Viewed from Empirical Validity to Identify Student's Misconceptions in Chemical Equilibrium Materials

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### ABSTRACT

**Objective:** Students are said to understand the concept comprehensively if they master the concepts from dimensions of ontology, epistemology, and axiology. One of the topics that still needs to be clarified is chemical equilibrium. Therefore, it is necessary to develop instruments to diagnose conceptions about the chemical concepts taught. The STDT is one of the instruments that will be developed by researchers, which contains three scientific questions to identify misconceptions in chemical equilibrium. **Method:** This development research used the ADDIE model. The instrument's effectiveness refers to the empirical validity after applying the STDT instrument. The effectiveness of the STDT instrument was obtained through the correlation of misconceptions experienced by students with the level of difficulty of the items. The STDT instrument was applied to 86 students. **Results:** The percentage of students who experienced the highest misconceptions occurred in the chemical equilibrium section of the equilibrium shift due to the influence of a catalyst. In each item of questions, most students need more knowledge or knowledge. The composition of the difficulty of these items should be considered from the start of the instrument's preparation. In the developed STDT instrument, the item difficulty obtained from empirical trials on students did not meet the ideal conditions for the composition of the item difficulty level. **Novelty:** The resulting instrument for detecting misconceptions. It is a tier diagnostic test that is integrated with three scientific questions.

## INTRODUCTION

Teaching chemistry as a branch of science to students should refer to a philosophical foundation in the development of science, which includes three scientific components: scientific product, scientific method, and scientific attitude. The chemical content taught is a scientific product that includes facts, concepts, principles, laws, and theories. In addition to paying attention to scientific products, planning and implementing chemistry lessons must include the scientific method and a scientific attitude (Istikhomah & Wachid, 2021). Students are stated to be able to master the concept comprehensively if they can answer three scientific questions related to the concept being studied. The three scientific questions are ontology, epistemology, and axiology. Ontology, epistemology, and axiology questions are marked with the keywords what, how, and what are the benefits, respectively.

The concept is defined as a generalization of facts with the same characteristics. The concept is abstract because it does not have its existence other than in the individual's mental representation. The results of generalizing (abstraction) facts that have been accommodated in one's schema are called conceptions (Wahyuni, 2018). Conception is a person's perspective on a concept. Suppose the results of an individual's abstraction of a concept are not by the scientific understanding or understanding received by scientists

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