



Validity of Student Worksheets Based on Model Argument Driven Inquiry Integrated by STEM to Train Students' Argumentation Ability and Self-Efficacy in Chemical Equilibrium Material

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ABSTRACT

Objective: One of the teaching materials that can increase students' interest and learning motivation is student worksheet with an interesting learning model. This study aims to: (1) train students' argumentation abilities when they want to express their opinions regarding chemical equilibrium material and (2) train students' self-efficacy by bringing opinions related to equilibrium material. **Method:** The research method refers to the 4D model, namely definition, design, development, and deployment. However, it is only limited to the third stage. The data collection technique used the validation method by three validators, namely two chemistry lecturers and one high school chemistry teacher. The instruments used to assess the validity of the student worksheet are content validity sheets and construct validity sheets. The data obtained is then processed using the agreement percentage formula. **Results:** student worksheet 1, student worksheet 2, and student worksheet 3 are feasible in terms of content and construction validity with very valid categories. This is evidenced by the agreement percentage value on each student worksheet which is above 75%. **Novelty:** student worksheet modeled on STEM-integrated ADI will be developed to train students' argumentation skills and self-efficacy. This novelty can be assessed as being able to provide: (1) solutions related to students' interest in ideas on chemical equilibrium material, especially the sub-factors of shifting factors towards chemical equilibrium and (2) being able to increase students' confidence when conveying their ideas or other actions.

INTRODUCTION

Chemistry is part of learning science which plays an important role in life. With chemistry, the public can obtain information related to a substance, including other ingredients in it, its properties, changes that can occur, and its benefits for them (Kadek & Nyoman, 2020). All of that can be learned through the world of schooling. One of the chemicals at the high school level is chemical equilibrium (Adawiyah *et al.*, 2021). In this material there is a sub-material, namely the factors of shifting the direction of the equilibrium listed in Basic Competency (BC) 3.9 namely analyzing the factors that influence the shift in the direction of the equilibrium and its application in industry and BC. 4.9 designing, conducting, and concluding and presenting the results of experiments on factors that influence shifts in the direction of equilibrium. Many students think that the sub-material is difficult because students apply Le Chatelier's principles without understanding it (Permatasari *et al.*, 2022). Le Chatelier's principle is the basis for answering questions related to shifts in equilibrium (Fitri *et al.*, 2022). Students often have misconceptions in drawing conclusions on each factor (Laksono, 2020; Pujianto *et al.*, 2018; Suparwati, 2022). This problem is also experienced by some high school students. Based on the results of a survey conducted at SMA Cendekia

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