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Development of Guided Inquiry Lesson Based on Ethnoscience E-Modules to Improve Students' Problem-solving Ability in Chemistry Class

Syahmani[1*], Jahidah Rahmatilah[1], Atiek Winarti[1], Muhammad Kusasi[1], Rilia Iriani[1], Yogo Dwi Prasetyo[1]

[1]*Universitas Lambung Mangkurat, Indonesia*

***Correspondence to**: *syahmani_kimia@ulm.ac.id*

Abstract: The limitations of teaching materials in the implementation of distance learning coupled with students' low problem-solving ability led to the need to develop teaching materials in the form of guided inquiry to improve students' ability to solve problems. This development research aims to determine the validity, practicality, and effectiveness of the Guided Inquiry Lesson Based on Ethnoscience (GILBE) e-module. This development research employs the Research and Development (R&D) approach with a 4D development model, meaning define, design, develop, and disseminate. GILBE e-module on colloid material was piloted on 16 students SMA at Central Kalimantan in the limited trial and 30 students SMA at South Kalimantan in the broad trial. The validity test was measured using a validation sheet. The practicality test was measured using a readability questionnaire, student and teacher responses, and the effectiveness test was measured using a problem-solving ability test instrument in the form of ten essay questions. Descriptive and inferential statistical analysis was used to analyze the data. The findings revealed that the designed e-module matched valid, practical, and effective. The effectiveness is based on the p-value <0.05 in the limited and broad trial of the N-gain of students' problem-solving abilities in the high category and can be used in the chemistry learning process. Further research will develop teaching materials for higher-order thinking that apply the GILBE model, which is of higher quality.

Keywords: e-module GILBE; colloid; problem-solving ability; chemistry learning

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INTRODUCTION

Humans need 21st-century life skills to make decisions in solving problems related to everyday life. Students are expected to be able to provide solutions to various problems that occur in learning at school and in the world of work. It is essential to instill problem-solving abilities (PSA), so students can easily solve problems based on their knowledge and experience in the world of education. The inquiry learning model is one of the science learning models suitable for twenty-first-century learning (Scott, 2015), involving thinking processes and activities (Kidman & Casinader, 2017). Inquiry-based learning can increase student engagement, academic achievement, and scientific process skills (Abdi, 2014; Kaya & Yilmaz, 2016; Murphy, Smith & Broderick, 2019) and improve environmental attitude and higher order thinking skills such as PSA (Cabalang & Cabalang, 2022; Şimşek & Kabapinar, 2010).

Along with the times, the world of education in the era of the Industrial Revolution 4.0 is required to be able to equip students with developing skills needed in the 21st century (Becker & Park, 2011; Oktavia, 2019) such as technology, communication, and problem-solving ability (Bell, 2010; Kholifah et al., 2018). An effort done is using teaching materials (Haspen & Festiyed, 2019). Teaching materials that can be used according to the Industrial Revolution 4.0 era and during the COVID-19 period Zhang et al. (2020) are online teaching materials to help students learn online using virtual classes from anywhere in the world (Tsegay et al., 2022).

The phenomenon occurred at SMA in South and Center Kalimantan, where chemistry teachers have not trained students in solving problems related to local wisdom. Hence, students find it difficult to apply chemical concepts in everyday life, especially in the culture around them. Teaching materials are difficult to learn independently by students. They need help from various sources such as material summaries or solutions to these problems on the internet or YouTube. Based on that, innovation is required that combines culture, and local potential as a source of contextual science/chemistry learning (Betaubun, 2019; Hermino, 2016; Mayasari, 2017), to practice problem-solving ability.

Teaching materials are designed to support educators and students in the learning activity, making learning more effective (Asrizal et al., 2018). These teaching materials can be meaningful during distance