

Implementation of Small-Scale Chemistry Lab to Improve Student Cognitive Abilities on the Subtopic of Colloid Properties

Rika Siti Syaadah^{1,*} HAM. Mulyono² Hokeu Suhandi³

¹ Master of Chemistry Education Program, Faculty of Mathematics and Sciences, Universitas Pendidikan Indonesia, Indonesia

^{2,3} Department of Chemistry Education, Faculty of Mathematics and Sciences, Universitas Pendidikan Indonesia, Indonesia

*Corresponding author. Email: rikas0909@student.upi.edu

ABSTRACT

This study aims to investigate the effect of the Small-Scale Chemistry Lab to improving the cognitive abilities of students who are studying colloid properties. Cognitive abilities studied are according to Bloom's taxonomy. The research conducted was pre-experiment with one group pre-test post-test design. Participants involved in this study were 40 students of class XI high school in Bandung Regency. The instruments used in the study included a written test and questionnaires. The instruments in this study used the content validity test by supervisors who are experienced in small-scale chemistry lab. Beside that, a reliability test was also carried out with value 0.79. The increased cognitive abilities calculated based on the difference pre-test and post-test scores using the N-gain formula, the data has been processed are then analyzed descriptively. The results showed that most of the students' cognitive abilities had increased as indicated by the N-gain value 0.63. Based on these findings, it is recommended that small-scale chemistry lab can be applied to the learning process of other chemistry topics that have a characteristic compatibility between the learning material and small-scale chemistry lab for the development of students' cognitive abilities.

Keywords: *Small scale chemistry lab, Cognitive ability, Colloid, Sustainable environment, Green chemistry*

1. INTRODUCTION

Chemistry is a core science which is often considered difficult because some of its concepts are abstract [1]. Student perspectives on chemistry need to be addressed with a correct concept of knowledge, so that student can provide predictions or explanations about chemistry correctly [2]. Student-centered teaching approaches has a lot of advantages for teaching of chemistry topics [3]. [4] said that meaningful learning is possible in the laboratory because student is given the opportunities to manipulate equipment and materials in an environment suitable for them to construct their knowledge of phenomena and related scientific concept. [5] provide an opinion that practicum has an important role in science education and he suggested that there are a lot of benefits in learning derived from that activity.

In any levels of chemistry learning practicum activities are important because chemistry is an experimental science [6]. According to [7] said that chemistry laboratory activities should gained understanding because that activities help students to define something about chemistry by their experience. Although practicum has a lot of advantages, in fact practicum is still rarely implemented on chemistry learning activities for several reasons.

In general, practicum activities carried out in schools today are practicum using macro-scale. Because the practicum uses materials on a macro scale, the waste that will be produced is in large quantities and it caused environmental pollution. Small-scale chemical lab has the advantage of reducing the use of chemicals substances so the amount of waste produced is reduced [8]. The reduced

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Small-scale Chemistry Laboratory Manual Edward L. Waterman, Stephen Thompson, 1993 *Addison-Wesley Small-scale Chemistry* Dennis D. Staley, Edward L. Waterman, 1995 *Modern Methods of Teaching Chemistry*, Chemtek Stephen Thompson, 1990 This laboratory manual for general chemistry presents experiments especially designed for use with smallscale quantities instrumentation and techniques and are not scaled down versions of classical experiments *Prentice Hall Chemistry*, 2005 **The 9th Annual International Seminar on Trends in Science and Science Education (AISTSSE) 2022**, 2023-10-04

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problems **Small-scale Chemistry Laboratory Manual** ,2004 **Conference proceedings. New perspectives in science education** Pixel,2014 **Illustrated Guide to Home Chemistry Experiments** Robert Bruce Thompson,2012-02-17 For students DIY hobbyists and science buffs who can no longer get real chemistry sets this one of a kind guide explains how to set up and use a home chemistry lab with step by step instructions for conducting experiments in basic chemistry not just to make pretty colors and stinky smells but to learn how to do real lab work Purify alcohol by distillation Produce hydrogen and oxygen gas by electrolysis Smelt metallic copper from copper ore you make yourself Analyze the makeup of seawater bone and other common substances Synthesize oil of wintergreen from aspirin and rayon fiber from paper Perform forensics tests for fingerprints blood drugs and poisons and much more From the 1930s through the 1970s chemistry sets were among the most popular Christmas gifts selling in the millions But two decades ago real chemistry sets began to disappear as manufacturers and retailers became concerned about liability em The Illustrated Guide to Home Chemistry Experiments steps up to the plate with lessons on how to equip your home chemistry lab master laboratory skills and work safely in your lab The bulk of this book consists of 17 hands on chapters that include multiple laboratory sessions on the following topics Separating Mixtures Solubility and Solutions Colligative Properties of Solutions Introduction to Chemical Reactions Stoichiometry Reduction Oxidation Redox Reactions Acid Base Chemistry Chemical Kinetics Chemical Equilibrium and Le Chatelier s Principle Gas Chemistry Thermochemistry and Calorimetry Electrochemistry Photochemistry Colloids and Suspensions Qualitative Analysis Quantitative Analysis Synthesis of Useful Compounds Forensic Chemistry With plenty of full color illustrations and photos Illustrated Guide to Home Chemistry Experiments offers introductory level sessions suitable for a middle school or first year high school chemistry laboratory course and more advanced sessions suitable for students who intend to take the College Board Advanced Placement AP Chemistry exam A student who completes all of the laboratories in this book will have done the equivalent of two full years of high school chemistry lab work or a first year college general chemistry laboratory course This hands on introduction to real chemistry using real equipment real chemicals and real quantitative experiments is ideal for the many thousands of young people and adults who want to experience the magic of chemistry **Laboratory Techniques in Organic Chemistry** V. K. Ahluwalia,2013-12-30 This book deals with general information about work in Organic Chemistry Laboratory viz safety first aid different types of apparatus and their assemblies used for various types of reactions stirring arrangements heating techniques and low temperature experiments Various methods used for purification of organic compounds have been described Besides the normal technique the book includes write up about molecular distillation chromatography and electrophoresis Special emphasis has been given to the methods which can be used for working up of organic reactions Various methods which can be used successfully for isolation of products from natural sources have been incorporated Emphasis has also been given on the isolation of products from oily mixture using the technique of Liquid Liquid extraction

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