

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

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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

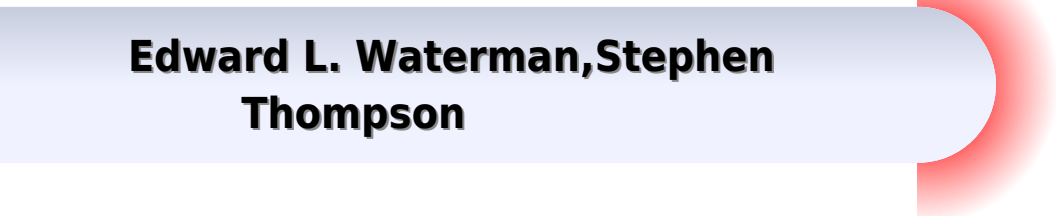
Chemistry is a core science which is often considered difficult because some of its concepts are abstract [1]. Student perspectives on chemistry need to be addressed with a correct concept of knowledge, so that student can provide predictions or explanations about chemistry correctly [2]. Student-centered 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

Small Scale Chemistry

**Edward L. Waterman, Stephen
Thompson**



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Small-scale Chemistry Laboratory Manual Edward L. Waterman, Stephen Thompson, 1993 *Microscale General Chemistry Laboratory* Zvi Szafran, Ronald M. Pike, Judith C. Foster, 2012-04-13 In the past two decades microscale techniques have soared in popularity because these techniques minimize exposure to potentially dangerous chemicals in the lab drastically cut the amount of chemical waste lower costs and reduce risks of chemical fires and explosions The result is a safer and healthier laboratory environment Now with Microscale General Chemistry Laboratory with Selected Macroscale Experiments Second Edition you can bring these techniques into your own chemistry lab Thoroughly revised with updated experiments the new Second Edition continues to offer a large variety of well designed easy to follow experiments as well as thorough background information and an outstanding selection of questions and problems **Addison-Wesley Small-scale Chemistry** Dennis D. Staley, Edward L. Waterman, 1995 *Chemtrek* 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 **Modern Methods of Teaching Chemistry** , *Prentice Hall Chemistry* , 2005 **The 9th Annual International Seminar on Trends in Science and Science Education (AISTSSE) 2022** , 2023-10-04 This is the ninth time we are hosting this seminar and we are proud to inform you that this seminar is an annual event in our calendar and has been held every year since 2014 This year for the third year we are holding it via Zoom meeting online meeting due to Covid 19 pandemic We are inviting internationally recognized speakers from several countries to share their latest discoveries in the fields of Biology Chemistry Physics Mathematics and Science Education Well known researchers in science and science education will share their experiences and knowledge so that we can stay up to date with the latest information This is one of the goals of this seminar As science researchers we realize the importance of information exchange among us The new information enlightens our minds and gives us ideas on what to do next in our research and how to do it This new information often becomes the foundation for our next project in particular and sets the research trends for the upcoming year in general Information exchange also keeps us updated allowing us to give and receive suggestions and critiques that will lead to better results Therefore we need a forum where we can share and exchange information Seminars conferences and other scientific gatherings are the media through which we can do this Organizer Faculty of Mathematics and Natural Sciences of Universitas Negeri Medan Where Web Seminar via Zoom Meeting When Tuesday 8th November 2022 Theme The development of industrial based research in science and science education to improve research innovation strategy Topics AISTSSE 2020 included following topics 1 Mathematics Science 2 Mathematics Education 3 Physics Science 4 Physics Education 5 Biology Science 6 Biology Education 7 Chemistry Science 8 Chemistry Education 9 Computer Science 10 Science Education Scientific Committee 1 Prof Dr Syawal Gultom M Pd Universitas Negeri Medan Indonesia 2 Prof Dr Marleen Kamperman University of Groningen Netherland 3 Prof Manihar

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