World Academy of Science, Engineering and Technology
International Journal of Educational and Pedagogical Sciences
Vol:11, No:07, 2017

Development of Instructional Material Using Scientific Approach to Make the Nature of Science (NOS) and Critical Thinking Explicit on Chemical Bonding and Intermolecular Forces Topics

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Abstract : Chemistry education tends to change from triplet representation among macroscopic, microscopic, and symbolic to tetrahedron shape. This change set the aspect of human element on the top of learning. Meaning that students are expected to solve the problems involving the ethic, morality, and humanity through the class. Ability to solve the problems connecting either theories or applications is called scientific literacy which have been implemented in curriculum 2013 implicitly. Scientific literacy has an aspect of nature science and critical thinking. Both can be integrated to learning using scientific approach and scientific inquiry. Unfortunately, students' ability of scientific literacy in Indonesia is far from expectation. A survey from PISA had proven it. Scientific literacy of Indonesian students is always at bottom five position from 2002 till 2012. Improving a scientific literacy needs many efforts against them. Developing an instructional material based on scientific approach is one kind of that efforts. Instructional material contains both aspect of nature of science and critical thinking which is instructed explicitly to improve the students' understanding about science. Developing goal is to produce a prototype and an instructional material using scientific approach whose chapter is chemical bonding and intermolecular forces for high school students grade ten. As usual, the material is subjected to get either quantitative mark or suggestion through validation process using validation sheet instrument. Development model is adapted from 4D model containing four steps. They are define, design, develop, and disseminate. Nevertheless, development of instructional material had only done until third step. The final step wasn't done because of time, cost, and energy limitations. Developed instructional material had been validated by four validators. They are coming from chemistry lecture and high school's teacher which two at each. The result of this development research shown the average of quantitative mark of students' book is 92.75% with very proper in criteria. Given at same validation process, teacher's guiding book got the average mark by 96.98%, similar criteria with students' book. Qualitative mark including both comments and suggestions resulted from validation process were used as consideration for the revision. The result concluded us how the instructional materials using scientific approach to explicit nature of science and critical thinking on the topic of chemical bonding and intermolecular forces are very proper if they are used at learning activity.

Keywords : critical thinking, instructional material, nature of science, scientific literacy
Conference Title : ICEEE 2017 : International Conference on Education and Educational Engineering
Conference Location : Paris, France
Conference Dates : July 20-21, 2017