

Nattharit Kuathan 2014: The Development of Secondary School Students' Mental Models of Chemical Bonding by Model-Based Learning. Master of Education (Science Education), Major Field: Science Education, Department of Education. Thesis Advisor: Assistant Professor Chatree Faikhamta, Ph.D. 194 pages.

The objectives of this study were to investigate and develop grade 10 students' mental models of chemical bonding through model-based learning. The research was divided into two phases. In the first phase, a survey research method was used in order to investigate secondary student's mental models of chemical bonding. The subjects were 211 secondary students, selected by purposive sampling from five public secondary schools under Amnatcharoen Educational Service Area and Ubonratchathani Educational Service Area 2. The research was conducted during the second semester of 2008 academic year. Students' mental models of chemical bonding were elicited by using a chemical bonding mental models questionnaire (CBMMQ). The CBMMQ consisted of 10 items covering three main concepts of chemical bonding: the ionic bonding, the covalent bonding and the metallic bonding, in which the items included open-ended questions with drawing and explanations. The research findings in the first phase could be framework and guideline for developing of learning activities. In the second phase, development secondary students' mental models of chemical bonding through model-based learning were investigated. The subjects were 39 secondary students in the first semester of 2009 academic year, selected by purposive sampling from a secondary school under Amnatcharoen Educational Service Area. The CBMMQ, classroom observation and documentary data were used to assess the development students' mental models of chemical bonding during implementing the intervention. The content analysis was used to describe students' mental models of chemical bonding.

The findings in the first phase indicated that majority of students held complete flawed mental models of chemical bonding. The concepts that most of students' mental models were flawed mental models were conductivity of ionic compounds, intermolecular forces and metallic bond formation. The students used their everyday-life experiences to explain chemical bonding and their properties. The research findings suggested that teachers should provide learning activities which help students to construct, test and evaluate their mental models. The findings in the second phase revealed that, prior to learning activities the majority of student held flawed mental models, particularly in conductivity of ionic compounds, polarity of molecules, ionic bond formation and intermolecular forces. During students were learning through model-based learning (MBL), the were encouraged to construct mental models, evaluate their mental models to hands-on and activities and the animation have linked the chemical changes in the three-level, revise model and elaborate model. It was found that MBL could promote students' correct mental models, especially structure of ionic compounds, conductivity of ionic compounds, covalent bond formation and conductivity of metals.

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Student's signature

Thesis Advisor's signature