

Title : Developing Learning Activities for Enhancing Students' Level of Chemical Representation on Chemical Bond Issue for Secondary Students at the 10th Grade Level

Author : Miss. Sakuna Khamya

Degree : Master of Education (Master of Science Education)
Rajabhat MahaSarakham University

Advisors : Assistant Professor Dr.Panwilai Dokmai
Dr.Thanawat Somtua

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ABSTRACT

The aims of this research were 1) to develop students' learning activities to enhance the representation of chemical thinking on Chemical bonding for the 10th grade students, 2) to investigate the measuring level of students' responses of chemical thinking on chemical bonding, and 3) to assess students' perception of science attitudes on learning activities. The samples consisted of 32 of the 10th grade students at Kamalasai School under the Secondary Educational Service Area Office 24. The mixed research methodology was employed in this research. The research instruments were 10 lesson plans which organized learning activities to enhance the chemical thinking, 2) a chemical thinking on chemical bonding test, and an attitude towards science. The data collection was administered with learning activity management, work sheets, unstructured interview, and the post learning activities for enhancing their level of chemical representation. The data were analyzed and grouped according to the level of chemical representations.

The results of this research were as follows: 1) students' responses revealed that the learning activities to enhance the representation of chemical thinking understood and described what they had understood such as explanation, model drawing, molecular formula writing, chemical equation, and element structure in order to link the relationship with various concepts in three levels: the macroscopic, microscopic and symbolic level. 2) The representation of chemical thinking on chemical bonding revealed that 79.68% of the samples were thought to be at the macroscopic level, 77.18% at the microscopic level, and 75.62% at the symbolic level. Most students have the ability to present their own insights into the concepts through three chemical thought agents. 3) Students' perceptions of their

science related to attitude in the level of chemical representations on chemical bonding for the 10th grade students were positive attitude, and the opinion of chemical representation were at a high level ($\bar{X} = 4.52$, S.D. = 0.69). The students showed the better concepts of science, or better feeling and scientists.

Keywords: Learning activity management, Level of chemical representations,
Attitude towards science