

Panwilai Chomchid 2008: Using Visuospatial Models to Enhance Teaching and Learning of Atomic Structure and the Periodic Table in High School Chemistry. Doctor of Philosophy (Science Education), Major Field: Science Education, Department of Education Thesis Advisor: Associate Professor Sunan Sung-Ong, Ph.D. 266 pages.

Atomic structure and the periodic table are very important topics for teaching and learning chemistry. Understanding the concepts of Atomic structure and the Periodic table will help students to understand advanced chemistry topics. Complementary research studies suggest that models and understanding modeling provide essential perspectives on conceptual development for students learning in chemistry. And, more recently, visualization and visuospatial thinking are adding another dimension for understanding learning in chemistry. In this study, the atomic structure and the periodic table instructional units (ASPTUs) using constructivist visuospatial models, VAST-models and video animations were developed to enhance students' conceptual understanding and visuospatial thinking in atomic structure and the periodic table.

The ASPTUs were implemented by three volunteer chemistry teachers in three Grade 10 chemistry classrooms (44, 42, and 43 students) representing three different schools. The study provides a model for using constructivist visuospatial models for atomic structure and the periodic table instruction. Besides, the data of how do teacher implement, and students learn the ASPTUs as well as how can the instructional units promote students' understanding of concepts in atomic structure and the periodic table were explored. The teachers' teaching and students' learning were answered through classroom practice. Whereas the promotion of the instructional units was answered in term of students' conceptual understanding, students' visuospatial thinking of concepts, and students' perception of using the visuospatial models in their learning concepts of atomic structure and the periodic table.

The finding indicated that the visual representations VAST-models and video animations were mostly used for classroom discussions, detailing the experimental results, and used as a tool for inquiry. These visuospatial models facilitated students' conceptual learning and, by using multiple visual representations, students could achieve a deeper understanding of phenomena and concepts. Students' visuospatial abilities were significantly correlated with their performance in chemistry learning. Students with high spatial ability did better on chemistry tasks required problem solving skills rather than rote memory or the simple algorithms such as atomic structure and chemical periodicity of elements. Moreover, the preference is given to the dynamic VAST-models and video animations because they allowed for active inquiry and exchange of ideas. However, when visuospatial models are used in chemistry instruction, teachers should encourage students to focus on the visualization process and assist them to make cognitive connections between the models, their representations, and their chemistry concepts. Also, knowing students' existing understanding and concepts of atomic structure and the periodic, along with the students' visuospatial experiences and abilities prior to instruction should, enable teachers to adapt activities for addressing and enhancing students' performance.

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Thesis Advisor's Signature

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