# Student-generated animations and the teaching and learning of chemistry

Zeynep Yaseen

MS Science, BS and MS Teaching Chemistry

Faculty of Arts and Social Sciences

University of Technology Sydney

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# CERTIFICATE OF ORIGINAL AUTHORSHIP

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signature: Date:

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# Publications and papers produced from this research

Polat-Yaseen, Z. 2015, 'Interactions among Students and with Teacher after Student- Generated Animation: Influences on Students' Science Learning', 11th Conference of the European Science Education Research Association (ESERA), Helsinki, Finland, August 31-September 4, 2015.

Polat-Yaseen, Z. 2014, 'The Influence of Follow-up Class Discussions to High School Students' Science Learning after Creating Animations', 2014 FASS Higher Degree Research Conference, University of Technology Sydney, Australia, November 7-8, 2014.

Polat-Yaseen, Z. 2012, 'The Effects of Student-Oriented Chemistry Animations on Conceptual Learning Processes', 2012 FASS Postgraduate Research Student Conference, University of Technology Sydney, Australia, November 2-3, 2012.

# Dedication

This thesis is dedicated to:

My supportive husband, Muhammad Yaseen, who has provided me with love and endless support, and to my son Arqam. Without my husband's support this research would not have been possible.

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# Abstract

This study investigates the use of student-generated animations in the teaching and learning of chemistry. Previous research has identified the potential for animations to contribute to student learning in science. In particular, animations have the capacity to represent the dynamic processes and motions that may be inherent in some chemical concepts. This study focuses on animations that students produced with the support of their teacher and their fellow students. The literature review brings ideas together from social constructivism, representational pedagogy and analogical reasoning to highlight the implications of this research.

The research investigated a teaching intervention that was designed to investigate the following conjecture: That students working in groups to create their own animations to represent their conceptions, when supported by their teacher to analyse the animations in group discussions, develop their understanding of science concepts.

The participants in the study were 28 Year 11 Science students and their science teacher. The concept the students were learning was states of matter. The teaching intervention included training the students in the use of animation software, followed by the students working in pairs or groups of three to create animations representing their conceptions of solid, liquid and gaseous states of matter. Students were supported by their teacher and encouraged to discuss ideas as they constructed their animations. After completion of the animations, the teacher facilitated the students to analyse and discuss their own animations as well as animations that had been produced by experts. Data collection included pre- and post-tests, classroom observation, videorecording of lessons, collection of artefacts (the students' animations) and interviews with the teacher and students.

Use of the student-generated animations created an opportunity to represent and discuss conceptions of the states of matters, including dynamic elements of their conceptualisations. The teacher's scaffolding of the groups during their animating, helped them to accurately represent their conceptions. The teacher became aware of her students' misconceptions and otherwise hidden understandings as they created their animations. In their analysis of the various animations, students identified differences and similarities among their animations. As well, by comparing attributes of their conceptions of states of matter with attributes shown in their animations, they identified

those that were matching and mismatching. They also critiqued expert animations of states of matter. Data from pre/post-tests, observations and interviews indicate that the students improved their understanding of states of matter through the teaching/learning process that occurred during the intervention.