Professor Dr.Prasert Na Nagara Thesis Awards, Academic Year 2025

60th Anniversary The Graduate School Kasetsart University

Outstanding Thesis Awards

Social Sciences and Humanities Section | Doctoral Degree Program

Dr. Anupong Praisri | Major in Science Education

Developing Science Teachers' Epistemology of Models and Teaching Modeling Practice through Lesson Study

Supervisor: Assoc. Prof. Chatree Faikhamta[1], Assoc. Prof. Akarat Tanak[2] and Prof. Samia Khan[3]

[1,2]Department of Education, Kasetsart University, Bangkok, Thailand

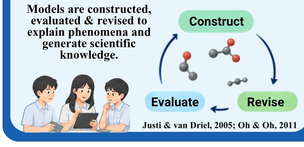
[3]Department of Curriculum & Pedagogy, University of British Columbia, Vancouver, Canada

1 Why this research?

A Shift in Scientific Modeling
From representing to constructing knowledge

Scientific models are not simply representations of reality.

Models are constructed, evaluated & revised to explain phenomena and generate scientific knowledge.



Justi & van Driel, 2005; Oh & Oh, 2011

THE THEORETICAL LENS
What teachers believe shapes what they teach

Epistemology of Models (EoM)

What teachers believe models are and how model-based knowledge develops

SHAPES

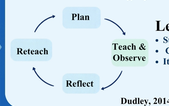
Modeling-specific PCK

Representations & ↔ Students' Learning Strategies

Magnusson et al., 1999; Friedrichsen et al., 2011

The Research Gap
Developing both thinking and teaching

How can teachers develop both their EoM and modeling-specific PCK?



Lesson Study(LS)
- Student evidence
- Collaborative reflection
- Iterative improvement

Dudley, 2014 and Lewis et al., 2019

Can LS reshape both how teachers THINK about models and how they TEACH modeling?

2 Research Question

1. How do science teachers' epistemologies of models influence their pedagogical content knowledge (PCK) for teaching modeling practices through LS?
2. In what ways does LS enhance science teachers' epistemologies of models and modeling teaching practices?

3 Research Design

RQ1 A case study and cross-case analysis



Andrew, Chemistry teacher | Rachel, Physic teacher | Olivia, Biology teacher

▶ Data Collection: Semi-structured interviews + observations

▶ Analysis: Within-case → Cross-case (Khan & VanWynsberghe, 2008)

3 teachers × 5 months × 2 LS cycles

RQ2 Qualitative case study



Andrew | Jennie, Chemistry teacher | Rachel | Rachel, Chemistry teacher | Olivia

▶ Data Collection: Observations + post-lesson discussions + interviews

▶ Inductive Analysis: Concrete data → shared patterns → themes

5 teachers × 5 months × 2 LS cycles

4 Findings

RQ1 Teachers' EoM Shape What Students Do with Models

Published in Journal of Science Teacher Education (Q1)

Teachers' EoM shaped what counted as a "good model," and therefore how they taught modeling.

Andrew

Models are evidence-based and revisable.

Students constructed and evaluated models from evidence.

Rachel

Multiple models can be legitimate

Students compared, negotiated, and revised models collaboratively.

Olivia

A model represents the correct answer

Students' modeling converged toward the textbook model.

What teachers believe a model IS shapes what students are allowed to DO with models.

RQ2 How LS Changed EoM and Modeling-specific PCK

Published in Pedagogies: An International Journal (Q3)

LS changed teaching when reflection was grounded in student evidence and followed by self-reteaching.

① **SEE — Student Evidence**
Made limitations in existing teaching visible.

② **REFLECT — Critical Dialogue**
Required teachers to explain and justify their instructional decisions.

③ **CHALLENGE — Expert Support**
Knowledgeable others and master teachers challenged existing thinking.

④ **ACT — Self-Reteaching**
Turned reflection into enacted change.

Changes in EoM ↔ Changes in Modeling-Specific PCK

Reflection alone was not enough; change became visible when teachers taught the revised lesson themselves.

5 What is new?



Reteach = See-Feel-Change | Buddy teach | Expert teacher | Knowledgeable other

Key Contribution

Lesson Study co-develops teachers' EoM and modeling-specific PCK through reflection and self-reteaching.

Value & Impact

Teacher Development → Studnt Modeling → Scientific Thinking → Scientific Citizenship

Thesis Book File