How Infrastructures of Lesson Studies Impact on Teachers' Learning

Jacob Bahn, *University of Copenhagen*

The better we understand how teachers learn from lesson studies, the better we can support this learning. The research presented here, illustrates how specific conditions and constraints ' referred to as infrastructure 'impact on teachers' learning.

The results of the case study provide substance to nurture the discussion and further investigations of how ' i.e. in which way ' specific infrastructures condition and constrain what and how teachers learn from a lesson study.   Specific examples will be presented,   including:

* iteration (multiple cycles, including revision of lesson plan),
* facilitation (guidance and external inputs),
* goal-setting (teaching problem),
* kyouzai kenkyuu (study of knowledge to be taught, and related resources)

The analysis takes advantage of models and notions of teaching and learning that have proven powerful in analysing the dynamical and complex connections between teaching and learning. These are derived from the Theory of Didactical Situations (TDS), which shares essential affordances with lesson studies (e.g. Clivaz, 2015; Miyakawa & Winsløw, 2009).

In TDS learning is modelled as taking place through adapting to a milieu: the problem and available resources to approach it. This is known as the student-milieu interplay and unfolds in different types of situations: situation of action (immediate attempts), situation of formulation (hypothesising coherences) and situation of validation (refuting or confirming hypotheses).

The overall situation in which these types of student-milieu interplays unfold is named the didactical situation. The didactical situation imposes conditions and constraints for the function of the student-milieu interplay. One strength of using TDS is the possibility to analyse the impact these infrastructures have on the student-milieu interplay, and hence on students' learning.

In a similar fashion, teachers' learning in lesson studies can be modelled as emerging from them adapting to a problem (of teaching) through situations comparable to those of action, formulation and validation. Since the problem of the teachers is how to teach, their milieu is the didactical situation (in which students learn by interplaying with their milieu).

Similarly to how the didactical situation imposes conditions and constrains on the student-milieu interplay, the paradidactical situation imposes equivalent conditions and constraints on the teachers' interplay with the didactical situation.

In an earlier study (Bahn, 2017), these models were used to analyse what and how teachers learn from lesson studies. Based on this, the research in question here elevates one step, using the models to analyse further how specific paradidactical infrastructures impacted on that learning.

(The mentioned earlier study, Teachers' learning from a lesson study - analysed by the Theory of Didactical Situations (Bahn, 2017) is to be discussed at a symposium here at WALS 2017, organised by Akihiko TAKAHASHI and Stephane CLIVAZ: Mathematics lesson study around the world, Theoretical and

methodological issues).

Bahn, J. (2017). Teachers' learning from a lesson study - analysed by the Theory of Didactical Situations. Manuscript.

Clivaz, S. (2015). French Didactique des Mathematiques and Lesson Study: a profitable dialogue? International Journal for Lesson and Learning Studies, 4(3), 245' 60.

Miyakawa, T., & Winsløw, C. (2009). Didactical designs for students' proportional reasoning: An "open approach" lesson and a "fundamental situation". Educational Studies in Mathematics, 72(2), 199' 18.

Development of Lesson Plan and the Teaching Ability of Biology Pre-service Teacher through Microteaching-Lesson Study

Marheny Lukitasari Heny, *Universitas PGRI Madiun*

The objectives of this research are 1) developing of learning tools for high school biology subjects from microteaching students in university, 2) describing the ability to teach biology teacher candidates through microteaching-lesson study activities. The combination of microteaching-lesson study activities is conducted with the aim of preparing real learning conditions for prospective teachers who will practice field experience in the actual classroom. Implementation is done during the even semester of the academic year 2016-2017. Students who participated in the activity as many as eight people from Biological Education Department of UNIPMA. Data were obtained from observation sheets, interviews and microteaching scores that demonstrated students' teaching ability. Data analysis was done descriptively. The results of the study showed that 1) each student produced three good and excellent learning plans, 2) the increased ability of teaching and class management can be seen from the mean of first practice value (55,77), second (71,88) and third (84, 38). It was also found that students experienced difficulties in the early stages of implementation, preparation and execution that took a lot of time and there were concerns that LS would be constrained when introduced at school if they later became teachers.

Programming and Ethics - Developing Ethical and Reasoning Ability

Johan Kellen, *Municipality of Linkoping*

Markus Tangring, *Municipality of Motala*

During the course of two semesters we conducted a Learning Study based on applying Variation Theory to teaching Programming, more specifically the concept of ethics in web development.

Our Learning Object, LO, for the study was for the students to be able to reason about and reflect on ethics and integrity on the web and to be able to present arguments in discussions regarding the subject.

We will present the study and the lesson plan that we developed, which can be adapted to many subjects under Computer Science and perhaps be of interest to other subjects where ethics is involved. This was important to us as ethics is a minor part of the Swedish curriculum of programming and web development and our goal is that others find use for this lesson plan, as well as the critical aspects we found.

The most prominent Critical Aspects we found were to be able to distinguish what is illegal and what is considered right and wrong according to societies informal laws, focusing on the web. This CA enables discussion of another CA, namely to be able to understand the complex concept of integrity and how varied the concept of integrity can be for different people.

During the presentation we will present experiences and lessons learned. One of the challenges we faced was to be able to determine to what extent students actually understood the LO. We will also present thoughts on pre- and post-assessment tests, which were quite a challenge. We will present how we used contrast according to Variation Theory by juxtaposing law and norm as well as levels of breach of integrity.