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Meta-theoretical aspects of the two case studies of networking theoretical perspectives: Focusing on the treatments of theoretical terms in different networking strategies

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Keywords: Networking strategies, combining and coordinating, integrating, theoretical terms.

Networking strategies and the present study

In the past decade, strategies for connecting theories have been intensively discussed (e.g., Prediger et al., 2008). According to Prediger et al. (2008), the networking strategies are structured as follows: *understanding* and *making understandable*; *comparing* and *contrasting*; *combining* and *coordinating*; and *integrating locally* and *synthesizing*. The purpose of this study is to show my/our two case studies related to the networking theories in order to consider some meta-theoretical aspects of these studies. I will briefly introduce the two case studies, which have been developed by myself (Shinno, 2016) and by a Japanese research group (Shinno et al., 2015). The first study is concerned with combining and coordinating, and the second study is concerned with locally integrating.

By reflecting the researchers' practice on the two case studies at meta-theoretical aspects, I attempt to reconsider different treatments of theoretical terms in different strategies. This may allow us to analyse transition between pre/post statuses of the networking, although different strategies can be utilized for different purposes. Comparing the two studies, by focusing on the treatments of terms, I discuss how the elaboration of the original terms may influence the degree of integration.

The two case studies: Overview

Case study 1: *Combining and coordinating*

Shinno (2016) aims to characterize the development of mathematical discourses in a series of lessons in terms of the model of semiotic chaining by Norma Presmeg and the *commognitive* framework (Sfard, 2008). One of the research questions of this study is as follows: In what ways can the model of semiotic chaining be combined with the *commognitive* framework in the analysis of reification in the learning of square roots? For gaining multi-faceted insight of the reification phenomenon, Shinno (2016) attempts to coordinate the *commognitive* terms (such as *keywords*, *visual mediators*, *endorsed narratives*, and *routines*) with the semiotic terms (such as *signifier*, *signified*, and *interpretant*). By doing so, Shinno (2016) intends that the implicit meta-discursive rule (*routine*) may become explicitly identified as the semiotic component (*interpretant*).

Case study 2: *Integrating locally*

Shinno et al. (2015) aims to construct a theoretical framework for curriculum development for teaching proof by means of integrating different theoretical constructs related to proof. In developing a framework, the notion of Mathematical Theorem comprised of the three elements – *statement*, *proof*, and *theory* – is used as the foreground of the framework. Some other theoretical constructs, such as *mathematical proof* by Nicolas Balacheff and *local organization* by Hans Freudenthal, are locally integrated into the framework in order to consider the wide range of contents and levels of

statement, proof, and theory in curriculum. As a result, Shinno et al. (2015) elaborate some additional categories by introducing new terms, for example, *real world logic*, *local theory*, and *quasi-axiomatic theory*, which are included in a category of ‘nature of system’ based on the concepts of *local organization*.

Discussion: Meta-theoretical aspects

In the first study, when coordinating the semiotic and discursive terms, it seems that a theoretical term is interchangeable with another term (e.g., “an interpretant” with “a routine”). Therefore, even after the coordinating, it seems that the treatments of the terms can be preserved in both theoretical contexts. In other words, the results of the empirical studies can feedback to the original theories. In the case of Shinno (2016), it allows to analyse the reification phenomenon from the two different perspectives and to gain a deeper understanding of the phenomenon. In the second study, it seems that the basic constructs to be networked are ‘concepts’ rather than ‘theories’. Some original concepts such as *local organization* can be elaborated and integrated locally into new terminologies or categorizations in the constructed theoretical framework. Since elaborated terms have a consistency within the new framework and these can create new meanings, such terms cannot preserve their original senses. Thus, this networking strategy may contribute to establish a new theoretical discourse rather than to understand a certain empirical phenomenon. It seems that this strategy also can be utilized for developing or elaborating a new theoretical model.

References

- Mariotti, M. A., Bartolini, M., Boero, P., Ferri, F., & Garuti, R. (1997). Approaching geometry theorems in contexts: from history and epistemology to cognition. In E. Pehkonen (Ed.), *Proceedings of the 21st Conference of the International Group for the Psychology of Mathematics Education*, (Vol. 1, pp. 180–195). Lahti, Finland: PME.
- Prediger, S., Bikner-Ahsbals, A., & Arzarello, F. (2008). Networking strategies and methods for connecting theoretical approaches: first steps towards a conceptual framework. *ZDM Mathematics Education*, 40(2), 165–178.
- Sfard, A. (2008). *Thinking as communicating: Human development, the growth of discourse, and mathematizing*. New York, USA: Cambridge University.
- Shinno, Y. (2016). Reification in the learning of square roots in a ninth grade classroom: combining semiotic and discursive approaches. *International Journal of Science and Mathematics Education*. doi:10.1007/s10763-016-9765-3
- Shinno, Y., Miyakawa, T., Iwasaki, H., Kunimune, S., Mizoguchi, T., Ishii, T., & Abe, Y. (2015). A theoretical framework for curriculum development in the teaching of mathematical proof at the secondary school level. In K. Beswick, T. Muir & J. Wells (Eds.). *Proceedings of the 39th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 4, pp. 169–176), Hobart, Australia: PME.

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<http://www.osaka-kyoiku.ac.jp/~shinno/shinno/poster.html>