

Teaching mathematics as contribution to interaction

Andreas Eckert
Linnaeus University

Teaching could be many things, but this presentation focus on the portion of the work that involves interacting with students about mathematics in the classroom. Its purpose is to open up for a discussion about teaching in terms of contribution to that interaction. The corresponding theoretical discourse about students learning has reached a state of maturity over the years whereas the theoretical discourse about teaching has fallen behind (Boaler, 2003; Jaworski, 2006). As a part of my thesis work I would like to add to that discourse about teaching to better understand teachers' interactional strategies in the classroom (c.f Eckert & Nilsson, 2015). Symbolic interactionism forms the base of the theoretical discussion and learning is operationalized through the learning metaphor of contribution. Following is a brief outline of the theoretical frame, which is then exemplified and open for discussion during the presentation through transcripts from a teaching experiment.

Symbolic interaction has its roots in sociology and has been used in mathematics education research to focus the analysis on interaction in the classroom (Yackel, 2001). Voigt (1996) argues that symbolic interactionism take both individual and social aspects of interaction into account without giving neither process primacy, making it ideal to study learning processes in the classroom. Symbolic interactionism relies on three premises (Blumer, 1986). According to the first and second premise participants of an interaction act towards objects depending on how they interpret the meaning of that object, which in its turn is dependent on how others have acted upon that object in prior interactions. As for example in the case with the addition symbol, participants of the mathematical community proceed to do the mathematical operation of adding for example integers when encountering this symbol as they have experienced others doing in the past. Objects are anything that could be referred to in social interaction, i.e., the objects can be physical, social or abstract. The meaning of an object is not viewed as inherited, or even fixed, but continuously negotiated through a string of ongoing interactions in line with Blumer's third premise.

Learning as contribution is based on a transformative activist stance from Vygotsky's work (Stetsenko, 2008). The idea is that collaborative purposeful transformation is at the core of human nature. It is a social process by which

individuals come to know themselves as well as their world by being active agents and contributors to social interaction. Individuals play the active role since their purposeful actions transform their world just as the world transforms them (Stetsenko, 2008). So, by engaging in social interaction and the negotiation of meaning, you actively contribute to the negotiation as well as you transform your own understanding of prior events. By connecting a metaphor of learning to Blumer's 2nd and 3rd premise we are one step closer to operationalize teaching within the theoretical frame. As meanings are derived from and handled in social interaction, it allows us to define the role of the teacher as an active contributor to students' development.

Collaborative purposeful transformation becomes a way to operationalize what Blumer (1986) calls the joint action. Joint action is a societal organization where the combined acts of different, diverse, participants become something else compared to the individual acts or their aggregation. A lesson constitutes a joint action, enabling us to study the collective that engage in learning without having to identify each separate act that comprises it (Blumer, 1986). Therefore we can study teachers' roles in contributing to collaborative purposeful transformation as participants of joint action meanwhile regarding the class as a collective also engaged in that same collaborative purposeful transformation.

References

- Blumer, H. (1986). *Symbolic interactionism : perspective and method*. Berkeley: University of California Press.
- Boaler, J. (2003). *Studying and capturing the complexity of practice - the case of the 'dance of agency'*. Paper presented at the 27th Conference of the IG-PME, Hawaii.
- Eckert, A., & Nilsson, P. (2015). Introducing a symbolic interactionist approach on teaching mathematics: the case of revoicing as an interactional strategy in the teaching of probability. *Journal of Mathematics Teacher Education*, 1-18. doi: 10.1007/s10857-015-9313-z
- Jaworski, B. (2006). Theory and Practice in Mathematics Teaching Development: Critical Inquiry as a Mode of Learning in Teaching. *Journal of Mathematics Teacher Education*, 9(2), 187.
- Stetsenko, A. (2008). From Relational Ontology to Transformative Activist Stance on Development and Learning: Expanding Vygotsky's (CHAT) Project. *Cultural Studies of Science Education*, 3(2), 471-491.
- Voigt, J. (1996). Negotiation of Mathematical Meaning in Classroom Processes: Social Interaction and Learning Mathematics. In L. P. Steffe, P. Nesher, P. Cobb, G. A. Goldin & B. Greer (Eds.), *Theories of Mathematical Learning*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Yackel, E. (2001). *Explanation, Justification and Argumentation in Mathematics Classrooms*. Paper presented at the Proceedings of the Conference of the IG-PME, Utrecht, The Netherlands.

