A Complex Systems Perspective on Knowledge Transformation During Strategy Change

What does it mean to “understand” a problem solving strategy? When learners construct new strategies, how do we characterize what it is that they have “learned?” From one perspective, it could be argued that learners only have constructed a new means for solving problems that they recognize as similar. However, I will argue that in order to understand how and why strategy shifts during problem solving occur, it is instrumental to have a means of characterizing the projection of learners’ conceptual knowledge that has been invoked and refined through their acts of problem solving.

In this talk, I will present a characterization of both students’ strategies and their emerging conceptual knowledge as complex knowledge systems. The moment-by-moment dynamics and co-development of particular strategic and conceptual systems are explored in a case of strategy construction in algebra problem solving. Complex systems perspectives on knowledge and learning, while relatively new in mathematics education circles (e.g., Wagner, 2006; 2010), have led to significant insights into the nature and development of learners’ scientific knowledge and reasoning (e.g., diSessa, 1993; diSessa, Gillespie & Esterly, 2004; Kapon & diSessa, 2012; Sherin, 2001; Parnafes, 2007; 2012). In addition to providing a novel viewpoint for characterizing mathematical knowledge and learning, the viewpoint on strategy and conceptual systems that is elaborated in this talk also provides an alternative characterization of strategies and strategy change to that in the educational psychology literature (e.g., Siegler, 2006).

Biography

Mariana Levin is currently a postdoctoral scholar in the Program in Mathematics Education (PRIME) at Michigan State University. Mari is interested in how learners across a wide range of topics and levels of experience make sense of mathematics. She is especially interested in developing theoretical and analytical tools to capture the contextuality of learners’ knowledge use in mathematics and the dynamics of real-time sense-making processes. Her dissertation research was at the nexus between problem solving and learning research and concerned the nature of knowledge transformation during strategy change. Her postdoctoral work builds on and extends this work. Mari holds a Ph.D. in Mathematics and Science Education (2011) from University of California, Berkeley and an M.A. in pure mathematics by research, also from Berkeley. Her graduate studies and research have been supported by fellowships funded by the National Science Foundation (NSF), Institute of Education Sciences (IES), and Bell Laboratories.