

**Enacting enactivism: Exploring the potential for a theory of mathematical cognition to enhance classroom practice (11w2177)**

*2 Day Workshop*  
4<sup>th</sup> – 6<sup>th</sup> November, 2011

**Organizers and Participants**

Lynn McGarvey, Associate Professor (University of Alberta)  
Lyndon Martin, Associate Professor (York University)  
Jo Towers, Professor (University of Calgary)

**Invited Participants:**

Paulino Babb, Post-Doctoral Fellow (University of Calgary)  
Brent Davis, Professor (University of Calgary)  
Tom Kieren, Professor Emeritus (University of Alberta)  
Joyce Mgombele, Associate Professor (Brock University)  
Jérôme Proulx, Professeur (Université du Québec à Montréal)  
Tina Rapke, Ph.D. Candidate (University of Calgary)  
Elaine Simmt, Professor, (University of Alberta)

**Overview**

Constructivism has undoubtedly become a major theoretical influence in contemporary mathematics education. Although constructivism began as a theory of learning, it has progressively expanded its influence, in particular becoming what might be seen as a theory of teaching. However, in recent years new (and renewed) theoretical ways of thinking about knowing have emerged. In particular, the broadly defined term 'enactivism' provides an alternative to constructivism which includes among other ideas, a reorientation to the collective body, both in terms of what is known and of who is doing the knowing.

In 2009, at the 33rd annual meeting of the International Group for the Psychology of Mathematics Education (PME) in Thessaloniki, Greece, a Research Forum entitled "The enactivist theory of cognition and mathematics education research: Issues of the past, current questions and future directions" was held and through a series of linked papers participants considered both the current place of enactivism as a theory within the domain of mathematics education and also what its future potential might be (Proulx, Simmt, & Towers, 2009). The BIRS workshop was a follow-up to the international research forum with the aim of taking certain identified issues to the next level.

The workshop included Canadian academics that contributed to the PME forum and have strong backgrounds in the conceptual roots and ongoing theorizations of enactivism. In addition, two graduate students were invited who were less familiar with the theoretical ideas but would at the same time, question taken-for-granted assumptions about the theory and provide diversity to the perspectives offered. The workshop provided a highly interactive and focused opportunity to address the following objectives:

1. To review the common ground of the participants and establishing common foci and clearly defined points of intersection within our individual research,
2. To identify the current limitations of enactivism as a theory of cognition as well and how these might be addressed,
3. To consider the key areas in which enactivism might make a greater contribution, especially in the nature of learning and the theory and practice of mathematics teaching, and
4. To articulate a set of explicit, focused research questions around (2) and (3) and develop a number of potentially fundable research projects to answer these.

**Highlights of the Workshop:**

The first evening and part of the next day were spent in exploring the ontological and epistemological roots and affordances of enactivism as a theory of cognition. This work enabled each participant to lay bare their own understandings of the frame and discuss the ways in which enactivism had shaped their life and work.

A major focus of the next part of the meeting was to explicate the similarities and differences between enactivism and other frames of knowing (radical constructivism and complexity thinking, in particular.) Given the overwhelming prevalence of constructivism in the current educational discourse, participants felt it important to dwell in this space in order to begin to formulate a potential sphere of influence for enactivist thinking in the discourse and practices of K-12 education. A number of distinctions (representative but not exhaustive) emerged, and coalesced within the following nested schematic:

<b>Radical Constructivism</b>	<b>Enactivism</b>	<b>Complexity Thinking</b>
Viability	Bringing forth a world of significance	Emergence
Adaptation—assimilation and accommodation	Co-dependent arising	Scale
Subjectivity	Problem-posing	Interaction
Reality/existence	Structural coupling	Conditions
World of experience	Structure	Learning system
	Being (together)	Collectivity
		Existence

There was fruitful discussion, and even disagreement, about whether radical constructivism and enactivism are ‘embedded’ within complexity thinking, or whether complexity thinking is a set of tools that allows us to look at these different levels of focus on the same phenomena. The discussion enabled us to draw on our experiences in classrooms that ranged from pre-school to graduate school and bring examples of how these different discourses allow for varied interpretations of the phenomena in which we are all interested—students, teachers, learning, teaching, being, doing, and knowing.

Ideas such as the tacit domain of teaching knowledge, collectives and individuals, and subject matters and interactions all emerged here and enabled us to probe more deeply. Sometimes we needed to talk about specific educational practices, such as lesson planning. Often, we needed to talk at length about what a particular theoretical construct meant, such as structural coupling. At regular intervals we drew on seminal thinkers in the field—Varela, Maturana, and so on. We quoted from their texts, tried to unpack their well-condensed ideas and aphorisms, and revelled in their enduring insights.

The teacher's role was often a critical touchstone for our conversations. We recognised many obligations that are central to understanding teaching from within the discourse of enactivism—including the teacher's role as one who helps students to notice something (mathematical) and the teacher's role as an expanded consciousness for the classroom. We recognised the question, "Does this make your world bigger?" as a touchstone for determining whether to intervene in students' learning.

As we drew the meeting to a close on the last morning, we began to conceptualize possibilities for further research, beginning with creating a web of questions or potential research foci to which every participant contributed. Moving around the room and using the entire blackboard space, we created clusters of potential issues, questions, and problems. Possible joint research projects were discussed, including enactivist interpretations of the teaching role, collaborative re-interpretations of our existing data sets, as well as re-conceptualizing of particular teaching tasks (such as lesson planning) and obligations (such as attending to errors). At this point in time, approximately one month post-workshop, small teams of participants are already actively working on this research agenda. The first manuscript resulting from the workshop, co-authored by Jerome Proulx and Jo Towers and entitled "Teaching Mathematics—Reconceptualizing and Expanding the Vocabulary" is in final draft stage and will be submitted to a peer-reviewed journal by 31<sup>st</sup> December 2011.

### **References:**

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