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**Collaborative activities for improving the quality of science teaching and learning and learning to teach science**

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I have been involved in research on collaborative activities for improving the quality of teaching and learning high school science. Initially the collaborative activities we researched involved the uses of coteaching and cogenerative dialogue in urban middle and high schools in Philadelphia and New York (currently I have active research sites in New York and Brisbane, Australia). The research not only transformed practices but also produced theories that informed the development of additional collaborative activities and served as interventions for research and creation of heuristics for professional development programs and teacher certification courses. The presentation describes a collage of collaborative approaches to teaching and learning science, including coteaching, cogenerative dialogue, radical listening, critical reflection, and mindful action. For each activity in the collage I provide theoretical frameworks and empirical support, ongoing research, and priorities for the road ahead. I also address methodologies used in the research, illustrating how teachers and students collaborated as researchers in multilevel investigations of teaching and learning and learning to teach that included ethnography, video analysis, and sophisticated analyses of the voice, facial expression of emotion, eye gaze, and movement of the body during classroom interactions. I trace the evolution of studies of face-to-face interactions in science classes to the current focus on emotions and physiological aspects of teaching and learning (e.g., pulse rate, pulse strength, breathing patterns) that relate to science participation and achievement.