

# Insights Into the Complexity of Designing for Professional Development Networks in Educational Technologies: Tensions Between Structure and Agency

Susan Yoon, Eric Klopfer, Ginger Richardson & James Taylor  
Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA, 02139  
Tel: (617) 452-4977, Fax: (501) 642-7378  
syoon@mit.edu

## Background and Objectives

The preliminary results reported here are part of a larger research program aimed at identifying ways in which a specific educational computer application called StarLogo improves both student understanding of complex dynamic systems and more broadly, technology use and skills. The intent of the smaller study was to identify successes and barriers in the design and delivery of professional development activities with the explicit goal of building network capacity. Drawing on three major bodies of literature: professional development in education (cf. Howe & Stubbs), social network theory (cf. Rogers, 1995), and design research (Collins, 1999), we implemented a professional development model with the following four design features: *flexibility*--addressing the dynamic nature of teaching environments and individual goals; *adaptiveness*--attending to the situatedness of individual teaching contexts and responding to system-wide needs; building social *network capacity*--providing avenues for communication, collaboration and peer facilitation; and *self-organization*--encouraging self-reflexive metacognitive behavior with a view to enhancing teacher autonomy and empowerment.

## Conceptual Framework and Methodology

Computer-based tools that enable students to work effectively with conceptual artifacts, deal with complex decision-making, manage emergent and often disparate information and coordinate efforts to collaboratively construct knowledge have increasingly gained momentum in educational research. While the potential for technology to revolutionize educational practice looms high on the horizon, a critical factor in achieving substantial, large-scale, enduring and self-regulated change is how to appropriately in-service teachers. The dominant in-service model of presenting "teacher proof" materials that are unconnected to classroom life has largely failed in transforming teaching practices. To address this dilemma, we employed an iterative, mixed methods design approach with the following organizational components: (a) A ten-day teacher workshop; (b) Access to local expert facilitators; (c) Bi-monthly whole-group meetings; (d) Communication on a shared on-line bulletin board; (e) Construction, articulation and on-going revision of participant goals and timelines.

## Results, Discussion and Implications

The results reported here are based on data generated from 24 teacher participants recruited from school districts in a mixed urban-rural area in the southwestern part of the U.S. 18 public middle and high schools were represented, three of which were private and one charter. While further analyses are forthcoming, we found that the successes and barriers in the design and implementation of our professional development model in this first phase hinged on a meta theme focusing on the tensions between *structure* and *agency*. Using multiple data sources the following six critical developments emerged throughout the intervention: (a) Centralization of resources: Innovators vs. status quo; (b) Organizing for self-organization; (c) Harnessing individual network capacities; (d) Authentic use of communication tools; (e) Transforming self-efficacy beliefs; and (f) Working within pre-existing systems. Each of these developments were subsequently used as starting points for revision of future design efforts. With an emphasis on constructing a robust social network understanding, through our design partnership with investigators, facilitators and participants, we intend to continually modify our own professional development practices and hope that this insight will also inform those doing similar research in the diffusion of innovative educational technologies.

## References

- Collins, A. (1999). The changing infrastructure of education research. In E. C. Lagemann & L.S. Shulman (Eds.) *Issues in Education Research: Problems and Possibilities*. San Francisco: Jossey-Bass Inc., Publishers.
- Howe, A. & Stubbs, H. (1996). Empowering science teachers: A model for professional development. *Journal of Science Teacher Education*, 8(3), 167-182.
- Rogers, E. (1995). *Diffusion of Innovations*. New York: The Free Press.