Synergizing the Epistemic Roles of Scaffolds for Supporting Epistemic Practices

Feng Lin, Singapore University of Social Sciences, linfeng@suss.edu.sg

Abstract: Previous studies have suggested that when scaffolds are embedded and distributed across different agents, tools, and activities, it might better support students' learning. However, little is known about how they could interact and complement each other to support students' epistemic practices. In this paper, I build on Tabak's synergistic scaffolds framework and propose to synergize the epistemic roles of different scaffolds to support students' epistemic practices and learning.

Previous studies have suggested that in complex learning environment, designing *distributed scaffolding* (supports distributed across different agents, tools, and activities) could support students' different learning needs (Martin, et al., 2018; Puntambekar & Kolodner, 2005). They also suggested that *synergistic scaffolding* (supports that complement and interact with each) is a promising way to maximize students' learning (Tabak, 2004). However, little is known about what properties of their interaction make the synergies work (Pea, 2004). In this paper, I build on Tabak's (2004) work and propose to synergize different scaffolds based on their complementary epistemic roles. By *epistemic role*, I mean the role the scaffold plays in supporting students' knowledge construction process. I propose that when scaffolds with complementary epistemic roles interact, they might work synergistically to model and support students' epistemic practices and learning.

Distributed scaffolding

Scaffolding has been widely used in educational research to describe the assistance that enables a learner to accomplish a task which would be impossible without that assistance (Tharp & Gallimore, 1988). It was first introduced by Wood's et al. (1976) and was used to describe how children, with the help of more knowledgeable other, perform task that would be beyond his/her competence to perform if unassisted (Pea, 2004). Scaffolding is often associated with the Zone of Proximal Development (ZPD), which describes the difference between what a learner can do by him/herself and what he or she can do with help (Vygotsky, 1978).

In the recent decades, the notion of scaffolding has evolved. It expanded from the traditional metaphor of describing temporary assistance provided by a more knowledgeable other (Stone, 1998) to other various types of supports, including the ones provided by digital tools, prompts, curricula, and resources (Pea, 2004; Puntambekar & Kolodner, 2005). In complex learning environments where there are multiple ZPDs, scaffolding is often *distributed* among agents, tools, and activities, which together support student's learning. Puntambekar and Kolodner (1998, 2005) introduced the notion of *distributed scaffolding* to describe how students benefits from multiple sources of support when solving complex problems. Tabak (2004) further identified three patterns of distributed scaffolding: differentiated scaffolding, redundant scaffolding, and synergistic scaffolding. Differentiated scaffolding refers to the way of using separate supports to address different needs. Redundant scaffolding refers to the way of using multiple forms of support to address the same need. Synergistic scaffolding refers to the way of using co-occurring multiple forms of support to address the same need and these supports are complementary in addressing the need. Tabak suggested that synergistic scaffolding is an important conceptual tool to understand how the interaction among the scaffolds can produce greater support than the sum of separate scaffolds. In this paper, I am going to further build on Tabak's notion of synergistic scaffolds and propose to synergize the epistemic roles of scaffolds to design distributed scaffolding for supporting students' epistemic practices and learning.

Synergizing the epistemic role of scaffolds

There are different ways multiple forms of supports could interact and complement each other to form synergy. For example, they could complement each other based on their different and individual functions (e.g., navigating inquiry, structuring a task, supporting communication, and fostering reflection) (Hsu, Lai, & Hsu, 2014); they could also complement each other based on their flexibility (hard and soft scaffolds) (Brush & Saye, 2002) and sociality (social and material scaffolds) (Martin et al., 2018). So far, little attention has been paid on the epistemic aspects of scaffolding (e.g., Lin, 2019). In this paper, I propose that scaffolds could also interact and complement each other based on their epistemic roles. When scaffolds with complementary epistemic roles interact, they may work synergistically to model and support students' epistemic practices and learning. In the following, I will use

an example to illustrate how we may orchestrate the epistemic roles of scaffolds to design distributed scaffolding for supporting students' epistemic practice of progressive inquiry.

Science is about building ever deeper explanations of the natural world (Carey, et al., 1989), and scientific inquiry is a progressive process (Hakkarainen, 2002) that involves generating questions, developing explanations, using evidentiary or authoritative new information to refine explanations, and developing deeper questions for further inquiry. Such epistemic practices have led to progress in the scientific community (Bereiter, 1994). I propose that it is also possible to foster such epistemic practices in a classroom community by synergizing the epistemic roles of different scaffolds. For example, as figure 1 illustrate, if we position technological tools as epistemic tools to provide *new information* (e.g., providing new data and evidences through simulation; providing new textual information through e-textbook), and teachers model the process of connecting the new information to their inquiry and *asking progressively deeper questions*, such synergy could immerse students in the process of progressive inquiry. When teacher's scaffolds fade, students might gradually take the agency to incorporate new information in their inquiry and asking progressively deeper questions to sustain their inquiry.

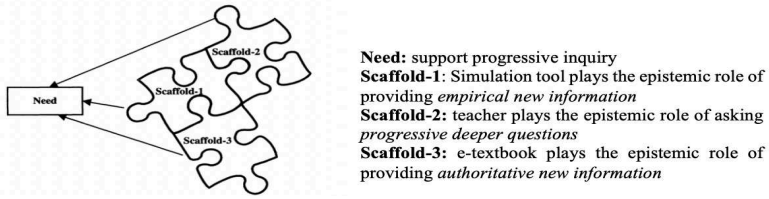

Figure 1. An example of synergizing the epistemic roles of different scaffolds to support progressive inquiry (graph is derived from Tabak 2004).

This approach could be also be applied in supporting other epistemic practices. For example, to support argumentation, we may design some scaffolds to play the epistemic role of questioning and problematizing (they may come from teacher or materials), and design some other scaffolds to play the epistemic role of providing evidences (they may come from experimentation or text). Such synergy could allow students to experience different aspects of argumentation, and thus empower them to engage in similar epistemic practices while some scaffolds fade.

Conclusion

In this paper, I propose to consider the epistemic roles of different scaffolds while designing distributed scaffolding. When scaffolds with complementary epistemic roles interact, they may better support students' epistemic practices and learning. I acknowledge that this is a preliminary proposal, more empirical studies are needed to test this assumption. More work is also needed to outline how this idea is related to other existing theories (e.g., modelling). At this stage, I hope that this proposal could bring the epistemic perspective into the discourse of scaffolding research.

References (selected)

Martin, N. D., Dornfeld Tissenbaum, C., Gnesdilow, D., & Puntambekar, S. (2018). Fading distributed scaffolds: the importance of complementarity between teacher and material scaffolds. *Instructional Science, 47*(1), 69-98.

Lin, F., & Puntambekar, S. (2019). *Design epistemic scaffolding in CSCL.* Paper presented at the International Conference on Computer Supported Collaborative Learning, Lyon.

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity *Journal of the Learning Sciences, 13*(3), 423-451.

Puntambekar, S., & Kolodner, J. L. (2005). Toward implementing distributed scaffolding: Helping students learn science from design. *Journal of Research in Science Teaching, 42*(2), 185-217. doi:10.1002/tea.20048

Stone, C. A. (1998). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal of Learning Disabilities, 31*(4), 344-364.

Tabak, I. (2004). Synergy: A complement to emerging patterns of distributed scaffolding. *Journal of the Learning Sciences, 13*(3), 305-335. .

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry and Allied Disciplines*(17), 89-100.

Acknowledgments

The current work is inspired by the author's prior research conducted at University of Wisconsin-Madison.