Chapter 14
Scaffolding Ambitious Instruction:
Teaching and Re-Teaching in a Methods Practicum

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ABSTRACT

Pre-service teachers (PSTs) often have to plan and teach a lesson in a practicum setting as part of their methods class. This assignment is designed to give PSTs a chance to enact ambitious instruction; however, they often encounter obstacles that prevent them from engaging students in core disciplinary practices. A structure, based on lesson study, provides opportunities for PSTs to experience and identify these obstacles, revise their plans to address them, and engage in ambitious instruction while re-teaching the revised lesson. This structure also recasts initial lessons as opportunities to learn and improve through collaborative reflection. Examples of this structure are described, including features that contribute to PST learning and lesson improvements. Obstacles to ambitious instruction as well as strategies to overcome those obstacles are identified and discussed. Parallels are drawn between ambitious mathematics teaching and ambitious teacher education.

INTRODUCTION

This chapter is about a common assignment in a mathematics teaching methods course in which pre-service teachers (PSTs) plan and teach a single lesson in a practicum classroom. The author clarifies goals for that assignment, identifies common obstacles that PSTs experience, and describes an innovation that transforms those obstacles into valuable learning opportunities. The immediate goal of the innovation is to produce more effective opportunities for PSTs to develop and practice skills needed for ambitious teaching. Although the cases in this chapter occur in secondary mathematics, teacher educators can apply the innovation across grade levels and content domains. (For the sake of clarity throughout the chapter, "students" refers to students in K-12 classrooms. Teacher candidates will be referred to as pre-service teachers, or PSTs.)

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Like any change in a complex system, this small innovation could have significant consequences. It is part of a growing movement within education to facilitate reform by utilizing design thinking and improvement science (Jenkins, 1997). In improvement science practitioners plan and enact small changes, collect data on their effectiveness and then make revisions to those changes based on analysis of that data. Through a gradual process of revision and refinement, these innovations are improved and adopted by a wider range of practitioners, who in turn revise and refine them for use in their particular contexts. Such small changes gradually result in overall systemic change that is created by, and responsive to those enacting the change (Bryk, Gomez, Grunow, & LeMahieu, 2015; Lewis, 2015). In addition, these changes provide an opportunity to build and sustain professional knowledge that is grounded in practice, with the potential to bridge the gap between the craft-based knowledge of practitioners and the more theoretical, scientific knowledge of researchers (Hiebert, Gallimore, & Stigler, 2002; Kennedy, 1999).

BACKGROUND

For decades, a wide variety of stakeholders have called for more rigorous and ambitious learning goals for students. In particular, they have advocated that students develop conceptual understanding of ideas and discipline-specific methods of inquiry, and that they use those ideas and methods to solve a range of problems inside and outside of school settings (Gardner, 1983; National Commission on Mathematics and Science Teaching for the 21st Century, 2000; National Council of Teachers of Mathematics, 2000, 2014). In response to these more ambitious learning goals, teacher educators expect PSTs to learn and practice *ambitious instruction*, instruction that supports students in making sense of fundamental ideas through enacting core disciplinary practices (Lampert, Franke, Kazemi, Ghousseini, Turrou, Beasley, . . . Crowe, 2013; Smith, Lee, & Newmann, 2001).

Ambitious mathematics teaching requires designing lessons that provide opportunities for students to solve difficult problems, reason about mathematical ideas, test conjectures, and make connections between different solution methods and representations. It aligns well with more rigorous content goals for school mathematics, and with instruction that requires students to engage in essential mathematical practices. For instance, the Common Core State Standards include "standards for mathematical practice." These include:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning.

The authors of the Common Core standards for mathematical practice explicitly state hat these practices are not just important goals for students, but that students should consistently engage in these practices as a way to learn more specific content (CCSSI, 2010). As they write: