UNIVERSITY OF CALIFORNIA,
IRVINE

A Model of Professional Development for Field-Based Teacher Educators: Addressing Historical Problems through Local Collaboration

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Education

by

Jessica Williams Tunney

Dissertation Committee:
Associate Professor Elizabeth van Es, Chair
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2016

DEDICATION

To Dad

for inspiring my lifelong interest in the human condition,

and for convincing me that I can make a difference in the world.

and

To the classroom teachers

who do what it takes every day

to educate our children with commitment and care.

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I would like to thank the UC Irvine credential program staff, especially Virginia Panish and Susan Toma-Berge. You have both gone well above and beyond to make this study happen, and you have generously entertained my endless requests and ideas over the last several years. Your confidence in this research and trust in my abilities has made all the difference, and it means so much to me that you made it possible for these voices be heard.

Finally, I must thank my family and friends for all of your support and help over these last months and years. First, I thank my mother, Harriet Williams, for her tireless commitment to helping her children. In this case, that involved reading lots and lots of pages of copy.
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I thank my San Clemente neighbors and community of friends for keeping my family happy and fed in my absence. It has made all the difference for me to know that Peter and the kids are among friends who care for us like family. I am quite confident the universe smiled upon us the day we found our way to T-Street.

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EDUCATION

University of California, Irvine
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Bank Sreet College of Education
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Cornell University
B.A., Anthropology **1994**
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PROFESSIONAL EXPERIENCE

UNIVERSITY EXPERIENCE

Student Teaching Supervisor, School of Education, Multiple Subject Program
University of California, Irvine, 2013- Present

The multiple subject credential program emphasizes learning from teaching through close observation of student thinking and reflection on practice to prepare beginning teachers. The field component of the program includes six months of student teaching in which pre-service teacher candidates have opportunities to design, teach, and reflect on teaching with classroom mentor teachers and university supervisors. Pre-service teacher candidates are placed in elementary schools throughout Orange County.

Teaching Assistant, ED 305: Learning to Learn from Teaching
University of California, Irvine, Fall 2014

This course focused on pedagogical practices for responsive teaching with a particular emphasis on noticing student thinking and learning to understand how teachers can maintain an ambitious instructional approach in classroom practice. Pre-service teacher candidates in the course were guided to design opportunities for students to make thinking visible, and learned to notice connections between instruction approaches and practices and learning.

Faculty Instructor, Online Certificate of Advanced Professional Development: A Neurodevelopmental Strength-Based Approach to Teaching and Learning
Tseng College, California State University, Northridge, 2014-2015

This year-long professional development course for practicing teachers was developed through a grant-funded initiative that aimed to help teachers draw upon students' unique strengths and interests

to support classroom teaching and learning. Over six six-week learning modules throughout the school year, participants in the course were introduced to the All Kinds of Minds neurodevelopmental framework for learning and were guided to connect content of the online courses to their direct work with students in the classroom through the design, modification, and implementation of lessons, learning activities, and individualized supports.

Teaching Assistant, ED 173: Cognition and Learning in Educational Settings
University of California, Irvine. Fall 2012, Fall 2013

This introductory course for multiple subject and single subject credential students presented theories of cognition and learning foundational for classroom teaching, including stage theories of development, situated learning, and behaviorist traditions. In addition, the course focused heavily on theories of student motivation rooted in educational psychology, such as attribution theory and studies of student self-efficacy.

Faculty Instructor, SPED 504: Teaching Diverse Learners
California State University, Northridge. 2008

This graduate special education course focused on understanding and addressing the needs of diverse learners in special and general education classrooms. The design of the course drew on the All Kinds of Minds neurodevelopmental framework to help students learn to observe children closely to identify their unique strengths, challenges, and interests. The course also focused on helping credential students learn to modify lesson plans and activities to meet the diverse learning needs in classrooms, and to accommodate the strengths and interests of students.

PROFESSIONAL DEVELOPMENT LEADERSHIP EXPERIENCE

Online Professional Development Course Designer and Instructor
Online Certificate of Advanced Professional Development: A Neurodevelopmental Strength-Based Approach to Teaching and Learning, CHIME Institute. 2012 – present

Professional Development Leader, Social Studies Mentor Teacher Team
Spurgeon Intermediate School, Santa Ana, California. 2015 – present

Faculty Mentor, Secondary Math and Science Departments
Westmark School, Center for Teaching and Learning (CTL), California State University, Northridge. 2013 – present

Professional Development Leader, Mentor Teacher Workgroup
Davis Magnet School, Costa Mesa, California. 2014-2015

Professional Development Leader, Project Connect
Center for Teaching and Learning (CTL), California State University, Northridge. 2010 – 2011

Faculty Mentor and Professional Development Leader
CHIME Charter Schools, Woodland Hills, California. 2006 - 2009

Professional Development Facilitator, Schools Attuned
All Kinds of Minds. New York, New York; Los Angeles, California. 2004 - 2007

CLASSROOM TEACHING

Teacher: 4th Grade Inclusion

CHIME Charter Elementary School, Los Angeles, California. 2006 - 2009

Literacy Support Specialist: 1st Grade, 2nd Grade
P.S. 321, Brooklyn, New York. 2003 - 2005

Teacher: Kindergarten, 1st Grade, 5th Grade
P.S. 321, Brooklyn, New York. 1999 - 2002

PUBLICATIONS

Tunney, J. & van Es, E.A. (2016). Using video for teacher educator professional development. *The New Educator, 12*(1), 105-127.

van Es, E.A., **Tunney, J**., Goldsmith, L.T., Seago, N. (2014). A framework for the facilitation of teachers' analysis of video. *Journal of Teacher Education. 65*(4), 340-356.

van Es, E. A., **Tunney, J.,** & Seago, N., & Goldsmith, L. (2014). Facilitation practices for supporting teacher learning with video. In B. Calandra & P. Rich (Eds.). *Digital Video for Teacher Education*: *Research and Practice*. Routledge: New York.

RESEARCH EXPERIENCE

Project Researcher: Engineering and Education Collaborative: Teacher Professional Development
University of California, Irvine. 2014 - Present

Faculty: Dr. Tesha Sengupta-Irving

Research focus: teacher learning in professional development presenting instructional approaches that incorporate designing, building, and testing frameworks to teach engineering and science content to under-represented minority students.

Research activities: reviewing video recordings and transcripts professional development; working with Dr. Sengupta-Irving to analyze teachers' participation in learning activities and understanding of instructional approaches as related to students; contributing ideas for development of manuscript to be submitted for publication.

Project Researcher: Cross-cultural Teacher Noticing
University of California, Irvine. 2011 - 2015

Faculty: Dr. Rossella Santagata

Research focus: cross-cultural examination and comparison of teachers' professional noticing in Hong Kong, Japan, the Netherlands, and the United States.

Research activities: reviewed video recordings and transcripts of teacher commentaries on 8th grade mathematics lessons using data gathered in the 1999 TIMSS study; analyzed teacher commentaries using established frameworks for professional noticing and mathematical knowledge for teaching; developed categories to characterize and describe teacher noticing by country; compared teacher noticing in the United States with teacher noticing in the higher-performing comparison studies; co-created manuscript submitted for conference presentation and publication.

Graduate Student Researcher: Facilitating Video-Based Discussions in Professional Development
University of California, Irvine. 2010 - 2014

Faculty: Dr. Elizabeth van Es

Research focus: examining facilitation of video-based discussions for teacher learning in professional development settings.

Research activities: reviewed video recordings and coding facilitation moves using transcripts from two video-based professional development programs; worked with Dr. van Es to develop framework of facilitation moves; conducting quantitative and qualitative analysis to compare facilitation across professional development settings; contributed to manuscripts submitted for conference presentation and publication.

Graduate Student Researcher: TASEL-M2 project
University of California, Irvine. 2011 - 2012
Faculty: Dr. AnneMarie Conley

Research focus: teacher motivation within a district-led, multi-year professional development initiative intended to improve mathematics instruction and the development of professional learning communities.

Research activities: developed data collection instruments, created project-related materials to present to teachers, conducted focus groups with teachers, working with district professional development leaders to review materials collected by the district, analyzed teacher and student motivation variables, supervision of undergraduate research associates.

School-Based Research Liaison: CHIME Charter Schools
California State University, Northridge. 2007 - 2009
Faculty: Dr. Wendy Murawski

Research focus: examining the integration of the principles and instructional strategies of Schools Attuned at CHIME.

Research activities: collected, synthesized, and presented classroom artifacts to members of the university research team; worked with research team to analyze teachers' enactment of Schools Attuned and explore areas for future professional learning.

CONFERENCE PRESENTATIONS

Tunney, J. (2016). *Teacher educator collaboration: Constructing local solutions to historical problems of learning in field experience.* Paper presented at American Educational Research Association conference. Washington, D.C.

Santagata, R., Sun, J., **Tunney, J.,** van Es, E.A., Yeh, C. (2016). *Developing a professional vision of mathematics instruction by learning to learn from teaching.* Presentation at annual conference of the Association of Mathematics Teacher Educators. Irvine, CA.

Tunney, J., Madero, T. & Lopez, D. (2015). *Developing shared goals for mentoring student teachers.* Presentation at UC Irvine School of Education Teacher Education Forum: Collaborating to Support the Trajectory of Teacher Learning. Irvine, CA.

Tunney, J. & van Es, E. (2015). *Video as a central artifact in professional development for teacher educators: Negotiating a shared approach to working with pre-service teachers in clinical experience*. Poster presented at American Educational Research Association conference. Chicago, IL.

Tunney, J. & Santagata, R. (2015). *The cultural nature of mathematics teacher noticing: What can we learn from comparison?* Paper presented at American Educational Research Association conference. Chicago, IL.

Lafferty, K. & **Tunney, J.** (2015). *Drawing on practitioner knowledge to enrich and inform: Education doctoral students with backgrounds in teaching.* Paper presented at American Educational Research Association conference. Chicago, IL.

Tunney, J. (2015). *Formative intervention for teacher educators: Negotiating a shared approach to supporting pre-service teacher learning in practice*. Research presented at California Council on Teacher Education conference. San Jose, CA.

Tunney, J. (2015). *Formative intervention to support learning in practice*. Paper presented at Association for Teacher Educators conference. Phoenix, AZ.

Tunney, J. & van Es, E. (2013). *Facilitating productive teacher discussions in video-based professional development.* Poster presented at California Council on Teacher Education conference. San Jose, CA.

Tunney, J., Spielman, K., Pena, A. (2013). *The power of mindsets: Creating a positive climate in the classroom*. Workshop presentation at the What REALLY Works! Conference hosted by the Center for Teaching and Learning and California State University, Northridge. Northridge, CA.

van Es, E., **Tunney,** J., Seago, N. & Goldsmith, L. (2012) *A framework for the facilitation of teachers' analysis of video*. Paper presented at American Educational Research Association Annual Conference, Vancouver, BC.

Tunney, J. & van Es, E. (2011) *Facilitating productive teacher discussions in video-based professional development*. Poster presented at California Educational Research Conference, Anaheim, CA.

Tunney, J., Coleman, K., Ackerman, A., Kempf, G. & Andersen, A. (2008*) Mindsets and resilience: The work of Dr. Robert Brooks*. Workshop presentation at the California Association of Independent Schools Regional Conference, North Hollywood, CA.

FELLOWSHIPS AND AWARDS

Clinical Practice Fellow
Association of Teacher Educators (ATE). 2014-2015

Emerging Scholar
Association of Teacher Educators (ATE). 2014-2015

Quest Program Fellow
California Council on Teacher Education (CCTE). 2014-2015

PROFESSIONAL SERVICE

Reviewer
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Cohort Representative, Associated Doctoral Students of Education (ADSE)

School of Education, University of California, Irvine. 2012 - 2013

Professional Development Leaders Committee
Center for Teaching and Learning, California State University, Northridge. 2007 - 2013

ABSTRACT OF THE DISSERTATION

A Model of Professional Development for Field-Based Teacher Educators:
Addressing Historical Problems through Local Collaboration

By

Jessica Williams Tunney

Doctor of Philosophy in Education

University of California, Irvine, 2016

Associate Professor Elizabeth van Es, Chair

This dissertation takes on a key and persistent challenge within teacher education: pre-service teacher learning in field experience. I approach this historical problem through its local manifestations, and this study examines an intervention that brought together three university supervisors and six classroom mentor teachers from one university-school partnership for seven meetings over the six months of student teaching. Framed by Cultural-Historical Activity Theory, the emergent design of the Mentoring Study Group intervention aimed to provoke expansive learning (Engeström, 1987; 2001) to transform how practitioners understand their work and to support them in constructing new tools and concepts for practice for themselves. Qualitative methods were used to examine the key problems of practice participants identified, the new tools and concepts for practice they developed, and to interpret learning in terms of the expansive learning conceptual model to understand how features of the model design enabled the group to broaden their understanding and coordinate their work. Results demonstrate that through participation in the structured collaboration offered by the emergent professional

development approach, participants were able to uncover a fundamental contradiction embedded within teacher preparation, between goals of helping pre-service teachers develop ambitious instructional practice and preparing pre-service teachers to lead "formula lessons." In attempting to confront and resolve this contradiction, the Mentoring Study Group devised a shared tool to coordinate their work, The Five High-Leverage Math Practices +1 Protocol and field-based pedagogical practices to guide modeling, observations, and feedback on teaching. This model of structured collaboration for teacher education practitioners holds promise for university-school partnership efforts to come together to develop shared approaches to mentoring and a common language of practice for the purpose of preparing beginning teachers for ambitious practice in the field.

INTRODUCTION

> Teacher education students regard student teaching as the most valuable part of their preparation. Still, they cannot count on regular opportunities to observe, analyze, and practice reform-minded teaching. At the same time, cooperating teachers often feel the need to protect student teachers from "impractical" ideas promoted by education professors who are out of touch with classroom realities. When the people responsible for field experiences do not work closely with the people who teach academic and professional courses, there is no productive joining of forces around a common agenda and no sharing of expertise.
>
> Feiman-Nemser, 2001, p. 1020

Current research and work in teacher education marks a departure from focusing on the knowledge needed for teaching that prevailed in recent decades; the field is moving now towards making teaching practice central in teacher preparation and education (Ball & Forzani, 2009; Cochran-Smith & Lytle, 2009; Darling-Hammond, 2010; Grossman, 2011; McDonald, Kazemi & Kavanagh, 2013; Zeichner, 2012). Proponents argue that because teaching is most essentially relational work, beginning teachers must be prepared to enact key instructional practices, and also must be able to reflect meaningfully to learn in and from classroom experience (Feiman-Nemser, 2001; Lampert, 2010; Hiebert, et al. 2007). In recent years, teacher education programs that emphasize field experience over traditional coursework have proliferated, reflecting a broad interest in moving to a practice-based approach to educating teachers (Darling-Hammond, 2006; 2010; Noel & Nelson, 2010; Zeichner, 2012). Moreover, as teacher residency programs and alternative routes to certification have emerged as a powerful and growing trend in the United States (Darling-Hammond, 2010; Grossman & Loeb, 2008; NCATE, 2010; Solomon, 2009;), it seems likely that this shift towards learning teaching through teaching will continue.

An emphasis on practice in teacher preparation places new demands on the role of field experience. Although some practice-based learning activities are uniquely able to be offered in

the reduced complexity of university settings, such as opportunities to enact particular instructional practices and receive targeted feedback from peers and university educators in-the-moment (Ball & Forzani, 2009; McDonald et al., 2013), field sites have been and remain the primary spaces in which pre-service teachers can connect knowledge and skills presented in coursework with the messy realities of classroom teaching (Darling-Hammond, 2006; Feiman-Nemser, 2001; Zeichner, 2010). It is in field settings that tensions between theory and practice emerge and the unexpected regularly occurs, and where pre-service teachers have opportunities to develop expertise in adapting and responding to the particular needs of students or features of the classroom setting. These skills are crucial to the professional work of practicing teachers, but can be addressed only partially through coursework learning outside of field settings.

Unfortunately, the field component of teacher education has been widely criticized for a weak pedagogy of practice (e.g. Darling-Hammond, 2006; Kennedy, 1999; Lampert, 2010), discontinuity with the instructional approaches and practices advocated by university teacher education programs (Anderson & Stillman, 2013; Cook, Smagorinsky, Fry, Konopak & Moore, 2002; Grossman, Smagorinsky & Valencia, 1999), and gross variation in the learning opportunities made available for pre-service teachers across classroom settings (Zeichner, 1992; 2012). Research describes missed opportunities for learning throughout field experience (Levine, 2011; Valencia, Martin, Place & Grossman, 2009). Furthermore, university oversight of pre-service teachers in field placements most often is limited to a few observation visits over the course of a semester, and relationships between university teacher educators and classroom mentor teachers are notoriously fraught with tension and conflict (Cook, et al., 2002; Martin, Snow & Franklin Torrez, 2011). As a result, the work of supporting pre-service teachers to learn practice in practice is left mostly in the hands of classroom mentor teachers who receive little or

no support in how to provide guidance to pre-service teachers, and who may or may not model an approach to teaching that is consistent with the approaches advanced in teacher preparation programs (Levine, 2011; Martin, et al., 2011; Zeichner, 1992). In light of this history, it seems clear that simply providing more time for beginning teachers to be present in field sites will not guarantee that they will learn to enact high-level practices.

Many agree that essential to the success of practice-based teacher education is a coherent vision of teaching accompanied by a clear pedagogy for learning in practice that connects learning across university and field site settings (Ball & Forzani, 2009; Darling- Hammond, 2006; Feiman-Nemser, 2001; McDonald, et al., 2013). Bringing this vision to life demands attention to learning in the field, and a potential re-envisioning of the structure and form of field experience itself. For example, it may be important for university teacher educators to understand and consider the ways core instructional practices occur in field placements that are distinct from the ways they are presented in university courses to prepare pre-service teachers to recognize and enact those practices with students in classrooms. To do so, university-based teacher educators will need to access specifics that reside in the knowledge held by classroom mentor teachers, such as the unique learning needs of particular students, the demands of mandated curricula or lessons, and the cultural contexts of their schools. For classroom mentor teachers to connect their working knowledge of students and particular school contexts to the core practices emphasized in university coursework, they need to be familiar with the instructional practices presented to pre-service teachers in university programs, and it is the university-based teacher educators who hold (or have access to) this knowledge.

In this dissertation, I present and describe the Mentoring Study Group, a professional development intervention for teacher educators that aimed to take up recommendations for

developing a shared approach to supporting learning in field experience by bringing together supervisors of student teaching from a university teacher preparation program and classroom mentor teachers from a partner school site. Theoretically grounded in Cultural-Historical Activity Theory (CHAT) and the related traditions of interventionist and developmental work research, I designed and facilitated the Mentoring Study Group with the explicit goal of achieving transformational learning and developing new concepts and practices for understanding what it takes to prepare beginning teachers to enter the profession. Through an emergent design intended to provoke expansive learning and "open up the landscape toward the unknown and the unpredictable" (Engeström, 2011a, p. 34), the primary goal of the Mentoring Study Group was to create and maintain a collaborative space for the participants themselves to articulate the particular problems that challenged their work, then generate new ways of thinking and approaches to supporting pre-service teachers in the classroom. Thus, rather than seeking a predetermined outcome or externally defined solution, the Mentoring Study Group aimed to support practitioners in devising their own solutions that could account for the specifics of their contexts and the actual demands and requirements of their direct work supporting pre-service teacher learning in the field.

The professional development intervention took place during the 2013-2014 school year. Participants were nine teacher education practitioners (university supervisors and classroom mentor teachers) working directly with pre-service teacher candidates pursuing a Multiple Subject teaching credential for elementary teaching. In seven meetings over the six months of student teaching, participants collaboratively created, implemented, and reshaped a shared protocol tool to guide observations and feedback on mathematics instruction. Participants were encouraged to adapt and modify the shared protocol in practice according to their expertise and

direct use with pre-service teacher candidates, and were guided to share their knowledge and expert perspectives through collaborative conversations and learning activities presented in meetings.

This dissertation centers the process of identifying problems of practice and developing concrete and practical solutions within the Mentoring Study Group. I present findings that describe how participants came to expand their understanding of the challenges of supporting pre-service teacher learning in field experience, and how they constructed a shared tool – the "Five High-Leverage Math Practices +1 Protocol" – and field-based pedagogical practices to coordinate and guide their work. Broadly, this research is aimed at understanding: In what ways did a professional development model designed for expansive learning support teacher education practitioners in identifying and addressing key problems of pre-service teacher learning in field experience? To investigate this, I pose the following three research questions:

1. What key problems did the group identify?
2. What new tools and concepts did the group create and implement into practice?
3. How did the intervention design support the group in identifying and addressing problems in their work?

In the following nine chapters, I present and describe the Mentoring Study Group and the outcomes of my analysis. The first chapters provide background for the study and review relevant research literature. Chapter 1 provides the historical context for the professional development intervention through a review of literature on practice-based teacher education in general and learning in field experience in particular. In Chapter 2, I review the CHAT traditions of interventionist and developmental work research. These traditions have grounded my

approach, informed the professional development intervention design, and framed the analysis of findings.

In Chapter 3, I describe the context for this study and the design of the Mentoring Study Group. Consistent with a CHAT approach to research, this chapter includes an expanded description of context to account for the relevant specifics of the university program and school site; the details I present are important for data analysis and interpretation, and enable appreciation for and consideration of the complexity of mentoring to support learning in the field. In addition, I describe the three-phase design of the professional development intervention, highlighting connections to the theoretical foundation of CHAT and the related theory of expansive learning (Engeström, 1987; 2001). In this section, I also emphasize the features of the design intended to make room for dynamic and emerging ideas, unexpected outcomes, and personal agency for all participants. Chapter 4 presents the research plan for the study, including data sources and analytic methods.

Chapters 5 – 8 present findings for the three research questions I pursued in this study. Chapter 5 offers an overview of the three phases of intervention and describes learning outcomes for the Mentoring Study Group in terms of the CHAT triangular model. This chapter also offers a summary of findings for the three research questions to contextualize the results presented in Chapters 6 – 8. In Chapter 6, I present findings for Question 1 to illustrate how the group came to an expanded understanding of the challenges and contradictions that problematize the work of supporting pre-service teacher learning in field experience. Chapter 7 presents findings for Question 2, and thus follows the development of the concrete and conceptual solutions the group constructed and implemented into practice. To understand how the design of the intervention afforded the learning outcomes, in Chapter 8 I present an analysis of the group process in terms

of the expansive learning cycle conceptual model (Engeström, 1987; 2001), and I describe my choices in facilitating a model of professional development based upon an emergent design.

Finally, in Chapter 9 I present the theoretical and practical contributions of this study. I discuss how findings from this study can support CHAT theoretical developments through a new lens for understanding the process of expansive learning within groups. I also discuss how this model of intervention, rooted in CHAT research, can offer tools through which practitioners themselves can be guided to devise local solutions to the key challenges they face in their work. Finally, based on results of this study I argue for involving teacher education practitioners more closely in efforts to improve the field component of teacher education, as drawing upon field-based knowledge and expertise can support advancements in specifying a shared vision of practice-based teacher education and the ways such a vision can be taken up and cultivated in university settings, school site classrooms, and the intersecting spaces between.

CHAPTER 1

Field Experience in Teacher Education

In this chapter, I review prior research related to pre-service teacher learning in field experience to demonstrate the potential contributions of the current study and the practical goals of the professional development intervention. First, I present historical research findings describing the tensions that challenge pre-service teacher learning. This discussion includes the particular points of conflict that characterize the divide between universities and school sites. Next, I review literature on practice-based teacher education, highlighting the specific research-based recommendations that have implications for the field component of teacher preparation programs. To conclude this chapter, I describe how a consideration of these dual lines of research suggests that the practical challenges to teacher learning in the field are likely to persist without intentional disruption and a re-envisioning of traditional approaches to supporting pre-service teacher learning in practice.

Pre-service Teacher Learning in Field Placements: Navigating the "Divide"

Descriptions of the "divide" between universities and field sites include the separate physical locations of different institutions, but refer more broadly to the knowledge, goals, and routine activities that characterize these settings. Most typically, research presents the interests of universities and field school site settings in binary opposition: i.e. the theoretical focus of universities *vs.* practical concerns of schools (Martin, et al., 2011); reform practices advocated by universities *vs.* traditional practices modeled by mentor teachers in classrooms (Cook, et al., 2002); agendas for change advanced at the university *vs.* goals of survival in field settings (Valencia, et al., 2009); a focus on content knowledge and pedagogical skills promoted at the university *vs*. a focus on classroom management and student behavior in schools (Grossman, et

al., 1999). Within such a frame, university supervisors and classroom mentor teachers each represent their respective sides to pre-service teachers, who must navigate these divisions to make sense of and learn in field experience.

Unfortunately, rather than integrating the knowledge and perspectives represented by university and school-based teacher educators when facing (real or perceived) discontinuity, pre-service teachers instead are found to adopt a binary perspective themselves. In the face of apparent misalignment or connections because the approaches advocated and enacted across settings are not congruent, beginning teachers feel compelled to choose either the methods and approaches advocated at the university or the approaches modeled in field settings (Cook, et al., 2002). Moreover, because beginning teachers tend to be heavily concerned with the pragmatic aspects of teaching and classroom management during field experience, they are especially challenged to stay connected to the theoretical foundations that underlie instructional decision-making in the classroom (Zeichner, 2002).

Furthermore, in general, classroom mentor teachers and university supervisors receive little to no guidance regarding the essential features of their work (Hatch & Grossman, 2009; Zeichner, 2002). Research-based pedagogies of teacher education aimed at supporting pre-service teacher learning in field placement settings are remarkably underdeveloped and underspecified, and as a result teacher educators tend to offer individual, idiosyncratic, and inconsistent guidance (Darling-Hammond, 2006; Levine, 2011). Quite often the messages pre-service teachers receive from university supervisors and classroom mentor teachers are contradictory, and pre-service teachers are left to meet the associated tensions on their own. The result of this extends beyond missed opportunities for learning, as some field experiences for

pre-service teachers result in undermining university-endorsed instructional approaches (Valencia, et al., 2009).

For university supervisors and classroom mentor teachers seeking to bridge the divide and provide a more cohesive pedagogical approach in their work with pre-service teachers, multiple structural barriers constrain their efforts (Zeichner, 1992). First, teacher education programs rarely organize time for or require that university supervisors and mentor teachers meet and discuss individual pre-service teachers' progress (Darling- Hammond, 2006; Feiman-Nemser, 2001; Levine, 2011). Because supervisors typically make only limited visits (approximately 3 – 6 visits per semester) to the classrooms in which pre-service teachers are placed (NCATE, 2010), there are few (if any) program- sponsored opportunities supported by programs for mentor teachers and university supervisors to convene at all. Next, when university supervisors do visit field sites, in general they observe pre-service teachers and lead post-observation conferences without classroom mentor teachers' participation. These conferences generally are not mandatory for mentor teachers, and often mentor teachers are required to be with students when conferences occur. Classroom mentor teachers may not be aware of points emphasized in conferences if they do not attend them, and this compromises their ability to provide feedback that is consistent with the suggestions and guidance offered by supervisors. This disconnection opens the potential for classroom mentor teachers to offer guidance that contradicts supervisors' recommendations, contributing to additional conflict and tension for everyone involved.

Those holding university supervisor positions have a range of current or prior professional experiences, including methods course instructors, retired teachers or administrators, and graduate students (Levine, 2011; Zeichner, 2002). Research has documented

challenges universities face in offering coordinated learning experiences to pre-service teachers even within particular teacher preparation programs (Darling-Hammond, 2009; Levine, 2011), which adds an additional layer of complication in guiding pre-service teacher learning around a common understanding of specific practices. The inconsistency in the knowledge base and goals adopted by university supervisors works against the development of a pedagogical expertise specific to their work (Slick, 1998), as it challenges the development of a coherent understanding of the relationship between the content of pre-service teachers' coursework and the ways this content is reflected or made visible in field experience.

Within teacher education, there have been attempts to address these longstanding issues to improve the learning opportunities presented to beginning teachers in field placements. For example, "professional development schools" have partnered closely with universities to cultivate a shared vision of teaching through joint inquiry into practice and structured communication between teacher leaders at school sites and teacher educators in university settings (Loughran, 2007; Zeichner, 1992). Some teacher preparation programs have created hybrid positions for teacher educators, allowing them to move more fluidly between the settings (Zeichner, 2010), and others have modified the structure and location of university methods courses to root them more closely in the realities of school site settings (e.g. Kazemi, Franke & Lampert, 2009). However, these projects often are made possible only by temporary grants or outside research interests, and almost always involve far more time and effort than programs of teacher education generally require. Thus, it is unlikely that these approaches will be adopted broadly in teacher education. In addition, cited throughout research on these projects are persistent issues related to the dynamics of the "divide" that permeate interpersonal relationships and approaches to instruction (Alger & Kopcha, 2009; Martin, et al., 2011). For example,

university knowledge has been found to be "positioned" consistently as superior to knowledge developed through practice (Gutiérrez & Vossoughi, 2010), university educators have tended to ignore the social realities of teachers' work (Zeichner, 1992), and teacher educators taking on hybrid positions that span university and field settings experience multiple tensions within and across the spaces they inhabit (Zeichner, 2010). Taken together, it is clear that the field component of teacher education remains underutilized as a source for learning, even within efforts targeting practice.

The "New" Focus on Practice in Teacher Education

Although arguments that teacher education in the United States should be organized around practice are not new (Dewey, 1904; 1965), Ball and Cohen's (1999) call for the work of practitioners to be at the center of professional preparation has inspired much of the current interest in this topic (Grossman, 2011). Ball and Cohen (1999) argue that because teaching occurs in the particulars (of ideas, interactions, and individuals), learning teaching must include understanding how to learn from these particulars within the complex context of a real classroom (also see Ball & Forzani, 2009). Moreover, proponents assert that practice-based teacher education supports the reform-oriented vision of "ambitious teaching" that "deliberately aims to get all students…not only to acquire, but also to understand and use knowledge, and to use it to solve authentic problems" (Newmann & Associates, 1996 as cited in Lampert &Graziani, 2009). In working towards the broad goal of preparing teachers for ambitious instruction, the "new" generation of work focused on practice-based teacher education highlights four key challenges: 1) the lack of a shared language of practice in the field (Ball & Cohen, 1999); 2) the lack of a shared vision within teacher preparation programs around the "core instructional practices" that matter most for new teachers to develop skills in ambitious teaching (Grossman & McDonald,

2008; Grossman et al., 2009; Lampert, 2010) the need to provide multiple opportunities for enactment in which beginning teachers can develop skills in using and understanding these practices in action (McDonald, et al., 2013); and 4) the importance of rich and targeted feedback provided by expert coaches (Darling-Hammond, 2006).

To begin, Ball and Cohen (1999) assert that a shared vocabulary around teaching can help to connect the ways teaching practices are presented, examined, and developed in university coursework with the ways they emerge and are enacted in field settings. In response to the lack of a common language that is generally acknowledged within the field, Grossman and colleagues (2009) synthesize relevant literature to offer key characteristics of "core practices" that can be used to center pre-service teacher preparation programs adopting a practice-based, ambitious approach. It is important to note that these characteristics are not intended to prescribe specific instructional routines, but rather offer a guiding framework to be used for identifying the specific practices within particular content areas and across grade levels that will coordinate curricula and field experiences within individual programs. For example, characteristics of core practices such as "practices that allow novices to learn more about students and teaching" or "practices that novices can actually begin to master" (Grossman, et al., 2009) provide a research-based grounding for a curricular focus on particular practices such as eliciting student thinking, anticipating student responses, and orchestrating a productive discussion in mathematics within a specific teacher education program (Kazemi, Franke, & Lampert,, 2009; McDonald et al., 2013).

Offering pre-service teachers multiple opportunities to enact these core practices has been addressed in a variety of ways. Lampert (2010) describes "designed settings" in which teacher educators come into classrooms along with beginning teachers to provide live coaching or in-the-moment modeling with students. McDonald and colleagues (2013) offer a cycle of practice-

based learning that aims to develop expertise through a coordinated series of experiences including university coursework and microteaching assignments, analysis of video artifacts of practice, and opportunities to enact core practices with students and receive targeted feedback. Alger and Kopcha (2009) present a program that utilizes video artifacts of practice and a shared online environment in which teacher educators and pre-service teachers engage in analysis of teaching and reflection together throughout the field experience. Although each of these examples is unique in design and specific to a particular context, all share a common goal: to connect pre- service teacher learning of core practices across university and school settings so that beginning teachers can develop both a deep knowledge of the theoretical basis for core practices as well as expertise in enacting those practices with students in classrooms. Finally, for pre-service teachers to be able to learn in and from field experience, they need frequent, rich, and targeted feedback provided in the classroom setting (Darling-Hammond, 2006; Feiman-Nemser, 2001). Grossman, et al. (2009) argue that university-based teacher educators must improve their skills in coaching if they are to help pre-service teachers learn meaningfully in practice.

Beyond the limited preparation these mentors tend to receive for providing feedback (Darling-Hammond, 2010; Levine, 2011), prior research also has highlighted the tensions related to misaligned beliefs about teaching that challenge feedback (Wang & Odell, 2007). In addition, the limited time university-based teacher educators typically spend observing and conferencing with pre-service teachers makes it difficult for them to connect their comments to the specific contexts of the classrooms in which they observe, further challenging their ability to help pre-service teachers recognize the connections between coursework learning and classroom practice. Moreover, issues related to the "divide" discussed above, such as the historical lack of trust and communication between universities and schools, also may inhibit university educators from

attempting to gather the classroom-based knowledge they need to provide the most useful and targeted feedback that accounts for the specifics of individual classrooms and school settings.

In recent years, the field has made some progress in specifying how teacher educators can parse teaching to design curricula that enable teachers to learn in and from practice. There is now a growing foundation of work describing particular programs of teacher education that have organized learning around a common set of core practices, especially within the domain of mathematics teaching (e.g. Kazemi, et al., 2009; McDonald et al., 2013; Stein, Engle, Smith & Hughes, 2008). While this work is encouraging, it also has a serious limitation: it is focused primarily on the ways teacher education programs at universities can emphasize practice within university coursework and content, but has done far less to extend the practice-based approaches for learning in field settings. Although the existence of lab-like settings at universities offer valuable ways to "get inside" core practices and develop expertise (which is less available in school classrooms), by design they do not address fully the realities that complicate efforts to enact and learn from these practices within a complex classroom setting. Given the limited opportunities university supervisors have to spend time in the field placements with pre-service teachers and the typical lack of communication between supervisors and mentor teachers, their ability to provide meaningful and frequent feedback that accounts for the particulars of the classroom context is severely constrained.

Sharing Expertise: Accessing the Knowledge We Need to Make Progress in the Field

Taken together, the research presented in this chapter suggests that if teacher education practitioners share the knowledge and expertise they have developed in their separate settings using a common language to describe practice for the purpose of supporting pre-service teacher learning, they will be positioned to develop and offer the coordinated series of learning

opportunities called for by practice-based teacher education. This study conjectures that since the knowledge of particulars needed to connect theory to practice in field experience is distributed among teacher educators from both university programs and field site settings, connecting these teacher educators through opportunities for collaboration is crucial for the vision of practice-based teacher education advocated by researchers and experts in the field.

However, engaging in this kind of shared work requires teacher educators to participate in activities that currently are not structured into their professional roles: for example, ongoing collaboration, communication, and targeted discussions of relevant specifics related to the work conducted in each setting. Moreover, in light of the strained dynamics between universities and school site settings described above, it is imperative to consider what *new* actions developing this kind of coordinated vision would entail so that potential tensions, stresses, and barriers that may emerge can be recognized and addressed. By anticipating and responding to these challenges, teacher educators can build upon each other's efforts, utilizing the full resources of expertise inhered by the collective.

In Chapter 2, I present and describe the potential of Cultural-Historical Activity Theory (CHAT) and its tradition of interventionist research to support improvements in teacher education and research on learning in practice, as CHAT explicitly seeks to draw out, examine, and address the sources of tension that inhibit coordination and collaboration in practitioners' work. I describe the contributions to both theory and practice made possible through interventionist approaches to research, and I present the core features of CHAT interventions and accompanying studies that have grounded and informed the Mentoring Study Group and the analysis conducted for this study.

CHAPTER 2

CHAT and a Tradition of Interventionist Research

Within the field of education, Cultural-Historical Activity Theory (CHAT) has supported research that investigates teaching and learning as it occurs authentically within dynamic classroom settings, explicitly seeking to capture and account for the richness and complexity of the classroom by examining learning through studies of participatory actions, interactions, or the organization of the learning environment (e.g. Gutiérrez, 2008). A growing body of research within the field of teacher education draws upon the CHAT notion of interacting activity systems to examine pre-service teacher learning, as the work of preparing teachers is understood to be "situated in multiple hands across several contexts: schools, classrooms, and universities" (Martin et al., 2011, p. 13). Studies have examined topics such as the ways knowledge presented to pre-service teachers in university programs is taken up in or challenged by field experience (Grossman et al., 1999) or the tensions teacher educators experience in navigating the divide between universities and school sites (Martin et al., 2011; Zeichner, 2010).

In the sections below, I present the principles of CHAT I used to frame the questions under investigation for this study and the design of the Mentoring Study Group. First, I offer a brief account of CHAT history and the accompanying traditions of interventionist research that assert a fundamental, dialectic relationship between theory and practice. Following that, I describe two key contributions put forth by Engeström that grounded the Mentoring Study Group design and my approach to facilitation: the concept of expansive learning (1987), and the *Change Laboratory* model of formative intervention (2011a). Taken together, these descriptions highlight the unique potential of CHAT for making practical progress in resolving complex problems in work organizations, including in particular the field of teacher education.

Theoretical Framework

Three generations of CHAT. Since Vygotsky (1978) first introduced the notion that all human activity is object-oriented and artifact-mediated, activity theory has been developed to guide thinking and research aimed at understanding action in terms of the broader cultural-historical and societal systems in which it is situated (Roth & Lee, 2007). Engeström (1996) proposed three "generations" of CHAT development to describe a theoretical progression from an initial focus on individual psychological processes to an interest in understanding collective groups and the (multiple, overlapping) systems of activity they inhabit. According to Engeström (2001), "first generation" activity theory began with Vygotsky's (1978) foundational contribution of the concept of cultural mediation, represented in Figure 2.1. as the classic triad of *subject, object,* and *mediating artifact*. This notion of mediated action was revolutionary when introduced, as it upset prevailing perspectives rooted in behaviorist stimulus-response models, asserting instead that culture is at all times embedded in human action and thinking (Cole & Scribner, 1978; Sannino, 2011).

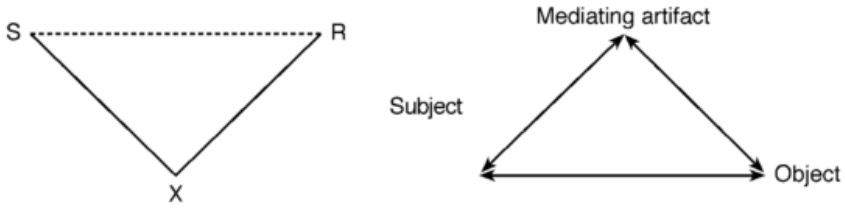


Figure 2.1 Common Reformulation of Vygotsky's Model of Mediated Action (Engeström, 2001).

Leont'ev brought about "second generation" activity theory through the notion of collective activity, which expanded the focus of research – and the unit of analysis – from the individual to the collective group (Engeström, 2001; Sannino, 2011). Describing this distinction,

Leont'ev (1978) theorized that actions are steps taken by individuals as they go about their work day to day, whereas activity refers to a collective endeavor (as cited in Heikkila & Seppänen, 2014). Importantly, in this conception the object of activity anchors and orients the activity system as a whole, as it offers a common motive or interest around which individual actions coalesce: it is the object that informs actions, understandings, and interpretation of meaning in systems (Sannino, 2011). Figure 2.2. shows the typical triangular representation of second generation activity theory, based on Il'enkov's (1977, 1982) explication (as cited in Engeström, 2001). In this depiction, the top section of the triangle (including subject, object, and tools and signs*)* is based on Vygotsky's original assertion of mediated action, and the bottom portions of the triangle (rules, community*,* division of labor) and the outcom*e* (labeled as another object in some representations – see Figure 2.3.) are intended to represent the expanded notion of collective activity introduced by Leont'ev.

Of note here is that for second generation activity theory, the introduction of collective activity as a concept also afforded attention to collective change and group learning. According to Sannino (2011), Il'enkov (1982) posited a dialectical relation between action and activity in which innovative, new actions may emerge and, once recognized and adopted by others within groups can "break through into new forms of activities" (Sannino, 2011; p. 573) that provoke changes along particular dimensions of activity systems and the orienting object itself. Engeström (2001) also points out the interest in group learning and change marked by second generation activity theory, asserting that with the introduction of collective activity, "the idea of internal contradictions as the driving force of change and development in activity systems…. began to gain its due status as a guiding principle of empirical research" (p. 135).

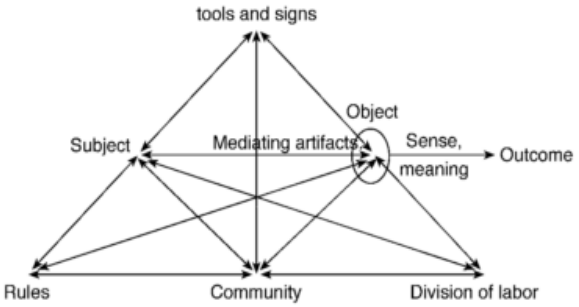


Figure 2.2 Structure of a Human Activity System (Engeström, 2001)

The "third generation" of activity theory, known as Cultural-Historical Activity Theory (CHAT), builds upon the expanded triangular representation (see Figure 2.2.), and aims to theoretically account for the complexity of networks of overlapping systems of activity and cultural diversity in the modern world (Engeström, 2001; Roth & Lee, 2007). Assuming all activity systems to be embedded within complicated networks of systems that are constantly shifting and undergoing change, third generation activity theory focuses on the spaces of intersection for overlapping systems (Engeström, 2001; Sannino, 2011). Third generation activity theory takes on the complexity of understanding activity as it spans multiple social spaces, along with the diverse (and potentially conflicting) perspectives, actions, and orienting objects individuals bring to interactions as a result. Table 2.3. presents the model Engeström introduced to describe the intersection of (at least) two systems of activity. Within this model, the overlapping ovals in the center represent a new, "potentially shared or jointly constructed object" (p. 136) that distinguishes third generation activity theory from earlier iterations. Education research examining these spaces of intersection often features the mediating conceptual or concrete *tools (instruments)* used to bridge systems of activity, such as the use of technology to mediate learning at school and at home (Akkerman & Bakker, 2011) or the development of "common knowledge" language to mediate communication among teachers,

social workers, and educational psychologists working collaboratively to support children's well-being (Edwards, 2011).

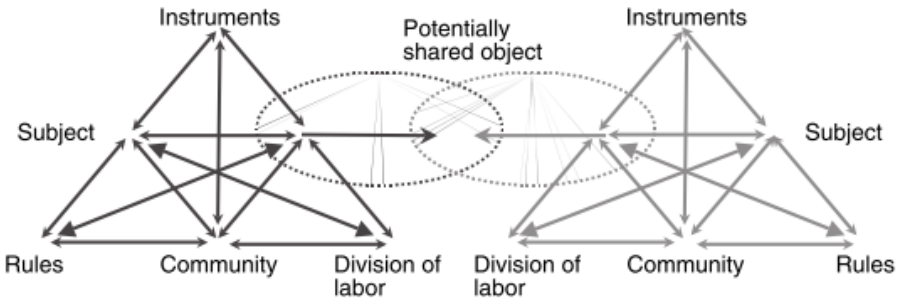


Figure 2.3. Interacting Activity Systems (Engeström, 2009).

Moreover, the theorized potential for learning in this space of intersection is enormous, as it is posited that the tensions and problems of practice that occur in these spaces make visible the underlying contradictions within or across systems that can be used to drive change (Engeström, 2001; Roth & Lee, 2007; Sannino, 2011). For example, research rooted in Third Space theory centers issues of power within and across systems of activity, often seeking to provoke change through multi-voiced discussions that confront historical dynamics of cultural and educational institutions to develop new knowledge that transcends embedded persistent constraints (Gutiérrez, 2008; Tsui & Wong, 2009; Zeichner, 2010). Third Space theory has been invoked to understand and conceive of new solutions for problems related to the "divide" between universities and schools in teacher education (Zeichner, 2010), and to argue that the inherently different funds of knowledge developed in separate settings can become resources for new knowledge and learning when groups are able to move beyond traditional hierarchies and traditions of power (Gutiérrez & Vossoughi, 2010).

The theory of expansive learning, introduced by Engeström (1987), aims to capture and describe the theorized transformative learning described above. Expansive learning is specifically about transformation, and is tied inextricably to practice and activity: expansive learning results in new and deepened understandings of the object of activity as well as new ways of coordinating and going about work day to day (Engestrom & Sannino, 2010). To put forth the theory, Engeström (1987) explicates the process of resolving contradictions to transform activity, describing group learning as the development of new routines, tools, and knowledge for activity within systems or across "non-traditional, hybrid multi-organizational and multi-cultural settings (Engeström, 2011b, p. 75). As a uniquely CHAT conception, expansive learning theory bears important distinctions from traditional cognitive, behaviorist, and situative theories prevalent in educational research, which more often focus on individual learning outcomes or testing discrete factors hypothesized to influence knowledge acquisition (Engeström, 1987; Engeström & Sannino, 2010; Greeno, Collins & Resnick, 1996). Because expansive learning theory presents such special features, and because I drew heavily upon it to guide the intervention design and data analysis for this dissertation study, below I discuss the theory in more detail and present the key components relevant to the questions under investigation here.

Expansive learning. Since its introduction in 1987, the theory of expansive learning has been applied, investigated, and theoretically enriched through CHAT interventionist studies of learning and practical change in complex work organizations ranging from health care, investment banking, and high-tech manufacturing to the field of education, including studies of teacher learning and teacher preparation (Engeström, 2001; 2007; Engeström, Pasanen, Toviainen, & Haavisto, 2005; Virkkunen & Newnham, 2013). This line of research hinges on a

close connection to practical experience, as the day-to-day work of practitioners and the problems they encounter are approached as key sources driving research investigations. To understand the process of group learning within complex organizations and systems of activity, expansive learning theory presents the following conceptual tools and assumptions:

A conceptual model of transformative learning. First, Engeström (2001; 2011a; 2011b) offers a cycle of strategic learning actions to describe an idealized progression towards expansive learning (Figure 2.4.). Using contradictions as a starting point for questioning, criticizing, or rejecting aspects of common practice (learning action 1), groups analyze the historical and cultural origins of these contradictions to develop a new model of activity as a potential resolution to the problem (learning actions 2 & 3). After examining the new model to identify its possible limitations and potential new problems that may arise in practice (learning action 4), members of the group implement the model into their work, reshaping and reforming the model as needed throughout the practical application (learning action 5). Finally (learning actions 6 & 7), the group reflects on implementation, evaluates the model, and consolidates its outcomes into a stable form of practice (Engeström, 2011a). It is important to note that this cycle is not intended to represent codification of a rigid stabilization of practice. Instead, as new practices are enacted and integrated into the work of practitioners, it is expected that change and growth will continue as practices and tools are adapted and modified to fit the needs of local contexts.

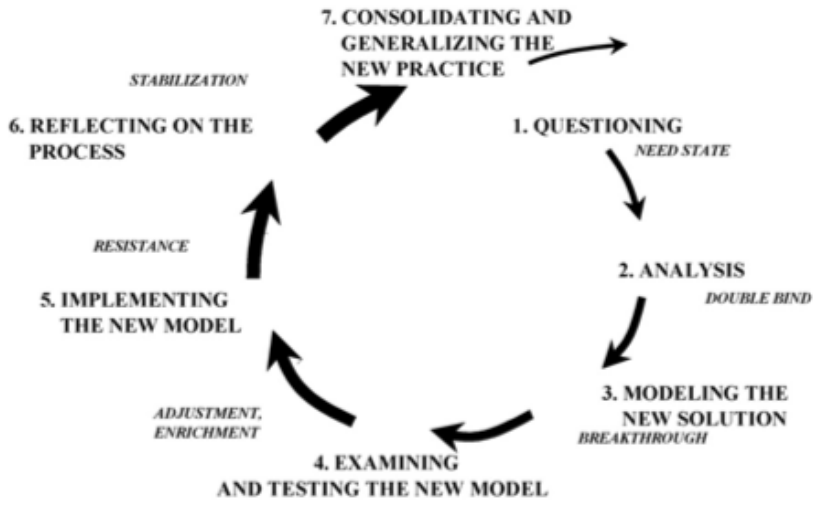


Figure 2.4. Expansive Learning Cycle Model (Engeström & Sannino, 2010).

A focus on group learning rather than individuals. Next, the theory of expansive learning seeks to understand and describe instead how groups learn, coordinate their activity, and develop new knowledge in the form of practical innovations and concepts related to a *shared object*. Expansive learning theory distinguishes itself from current "standard theories of learning" that most typically focus on how individuals "acquire some identifiable knowledge or skills" (Engeström, 2001, p. 138). Instead, expansive learning theory centers the collective new ways of thinking and innovating in practice necessary for bringing about change in complex work organizations. By focusing on the group rather than the individual, the theory of expansive learning is able to speak to the prevailing structure of teacher preparation programs in the United States, in which pre-service teachers are expected to learn the work of teaching through learning experiences across both universities and school sites, and through their interactions with teacher educators including classroom mentor teachers, university supervisors, and methods course instructors.

Learning the unknown. Expansive learning theory explicitly targets the unknown. According to Engeström (2001), "in important transformations of...organizational practices, we must learn new forms of activity *which are not yet there* [emphasis added]" (p. 138). In sharp contrast to theories of learning or knowledge acquisition that seek to understand how well-defined, previously specified knowledge is taken on, taken up, or integrated into existing ways of thinking or doing, the theory of expansive learning centers the process of developing new concepts, understanding, and practices. Learners themselves are expected to generate and develop unique ideas, tools, and concepts, which they integrate into practice and adapt according to their particular needs, goals, and work efforts. This feature of expansive learning is particularly important for practitioner-related research, as it acknowledges and honors the expertise of practitioners and allows for examination of the concepts they themselves construct or enrich.

Ascending to the concrete. Finally, expansive learning transformations are expected to include not only new ways of thinking and understanding related to an object, but also new patterns of activity and new tools integrated in practice. Expansive learning theory is based on the principle of "ascending from the abstract to the concrete," which derives from Davydov's depiction of the processes involved in student learning in schools and bears historical roots in an idea first introduced by Marx and further explicated by Il'enkov (as cited in Sannino, 2011). Ascending to the concrete refers to dialectical movement between the "real concrete," "abstraction," and the "thought concrete" (Engeström, Sannino, & Virkkunen, 2014). The principle asserts that concept development centers on a "germ cell" idea, i.e. the "smallest and simplest, genetically primary unit" of abstraction that captures the essence of a system -- including its internal contradictions – that can be traced to understand expansive learning

(Engeström, Nummijoki, & Sannino, 2012). In her discussion of this principal as a fundamental feature of CHAT interventionist traditions, Sannino (2011) presents four main characteristics of ascending from the abstract to the concrete: "(a) practical transformation, change, and experimentation with(in) a problematic situation; (b) identification and modeling of a germ cell behind the problematic situation; (c) testing the germ cell in its different material manifestations and possible variations; and (d) projecting a theoretically mastered solution to the initial problematic situation" (Sannino, 2011, p. 593). Thus, expanded learning concepts are *embedded within practice*, and therefore within the overlapping systems of activity practitioners inhabit. Moreover, direct application to real work situations and concrete action is inextricable from concept development.

CHAT interventions. According to Engeström and Sannino (2010), expansive learning is observable only rarely as a naturally occurring phenomenon, but work organizations can facilitate expansive learning through designed interventions. A focus on intervention in activity is not new for CHAT research, as CHAT has been described as historically and fundamentally interventionist, premised on the notion (attributed to Marx) that "theory is not only meant to analyze and explain the world but also to generate new practices and promote change" (Sannino, 2011; p. 580). Since activity systems are theorized to consist of *dynamic* relationships across the specified dimensions (see Figure. 2.3.), examination of the tensions, contradictions, and changes that continuously occur over time – including through intervention – affords deeper understanding of the processes through which activity systems operate. Descriptions of designed interventions are abundant throughout accounts of the development of activity theory, including within the foundational works of Vygostky, Luria, and Leont'ev (Sannino & Sutter, 2011; Vygotsky, 1978). Moreover, interventionist developmental work research studies have

contributed to CHAT theoretical advancements at every phase, offering both methods for transforming activity and analytic tools for understanding change as it develops (Clot, 2009; Engeström, 2001). Consistent with earlier lines of empirical research, modern CHAT interventions remain attentive to dual goals: 1) supporting groups in collectively addressing a shared object of activity to bring about concrete changes in practice; and 2) developing new knowledge and concepts for a theory of activity (Sannino, 2011).

In recent decades, CHAT research has focused increasingly on the specification of interventionist methodologies, including both the concrete and conceptual tools for promoting learning and change and the analytic methods used to understand these processes as they occur (Bødker, 2009; Engeström, Sannino & Virkkunen, 2014; Gutiérrez, 2008; Sannino & Sutter, 2011; Virkkunen & Newnham, 2013). Formative interventions, such as the well-known *Change Laboratory* model (Engeström, 2011a; Sannino, 2011; Virkkunen & Newnham, 2013), are part of the CHAT line of developmental work research interventions that target current problems of practice and are designed explicitly for practitioners to create new tools and models of action to resolve the pressing issues they themselves identify (Engeström, 2011a; Sannino, Daniels, & Gutiérrez, 2009; Virkkunen & Newnham, 2013). The *Change Laboratory* maintains a driving purpose of provoking and sustaining expansive learning (Engeström, 1987), and researchers design and present participants with a series of learning tasks that call for the strategic learning actions described by the cycle of expansive learning (see Figure 2.4). As groups are guided to confront the contradictions that challenge their work and devise unique solutions to persistent problems of practice, they are called upon to generate new learning through concept development that ascends to the concrete.

Because formative interventions are based in CHAT, they target learning from a CHAT perspective (i.e. expanded conceptions of the object of activity and concrete integration into practice), and are therefore tied directly to the particular organizational contexts and systems of activity in which participants go about their work. Formative interventions are thus local endeavors; efforts at generalization from formative interventions target theoretical advancements and a deeper understanding of interventionist methodology itself rather than seeking to generate blanket organizational solutions that can be applied broadly across contexts. This approach to intervention contrasts with many efforts in the field of education aimed at improving systems of teaching and learning, which often seek instead to test theories of learning or change through implementation of a previously determined, externally-derived tool or approach with the goal of wide adoption at scale. To understand the purpose and methods of formative interventions, Engeström (2011a) presents four key features that distinguish formative interventions (including the *Change Laboratory)* from more traditional "linear" interventions and controlled experiments (see Table 2.1 for a summary of these features).

Key features of formative interventions. First, the starting point for formative interventions is problems of practice identified by subjects themselves through the examination of key contradictions and tensions in their work. This starting point problem can be understood as a Vygotskian "first stimulus" that calls upon participants to question the object of activity in their work as they encounter persistent challenges in practice (Engeström, Sannino, & Virkkunen, 2014). The formative intervention approach of rooting the starting point in practitioners' direct experience contrasts with most "linear" interventions, wherein both the content and goals of the intervention are known and generated ahead of time by the researchers. Second, throughout the process of the intervention, participants are expected to negotiate both

the development and the use of new models, creating and reshaping tools and conceptual knowledge to suit the demands of their particular contexts. In this frame, tools and artifacts can be seen as "second stimuli" that "help[] subjects gain control of [their] action and construct a new understanding of the initial problem" (Engeström, Sannino, & Virkkunen, 2014, p. 121). In contrast, traditional interventions and experimental models more often seek to have subjects adhere closely to an existing model developed by outside agents for the purpose of examining its "application" to new settings.

Third, key outcomes of formative interventions include "locally appropriate new solutions" (Engeström, 2011a, p. 84) to problems of practice, which can occur through the development of "functional concepts" (Greeno, 2012) that "have meaning in a kind of activity…..and contribute[] to the way participants organize their understandings of what they're doing" (p. 311). This essential connection between concepts and their function in work organizations speaks to the practical commitment of CHAT interventionist research in general, and keeps centered the notion of concrete action even as concept development and learning are analyzed. In addition to new concepts, formative interventions explicitly target new forms of agency as outcomes for participants (Heikkila & Seppanen, 2014). Within the *Change Laboratory* model, participants are expected to take agentic actions to break away from established routines and patterns of activity. According to Engeström (2011a), these actions "need to be recorded and analyzed as important outcomes" (p. 12). Thus, formative interventions do not seek to achieve a "standardized solution module.... that will reliably generate the same desired outcomes when transferred and implemented in new settings" (Engeström & Sannino, 2010, p, 15) as is common in traditional interventions and experimental study designs.

Finally, the researcher's role in formative interventions is to provoke and sustain the process of transformation, then document and analyze the (expansive) learning that occurs. Unlike linear interventions or controlled experiments, the researcher does not seek to control variables or guide outcomes, but instead aims to cultivate and maintain a space in which practitioners themselves generate knowledge and solutions. Within the *Change Laboratory* model, researchers are called upon to design and introduce learning activities that call for strategic learning actions and expanded concept development, and are expected to gather rich contextual and historical data used to inform planning and discussion facilitation (Virkkunen & Newnham, 2013). In addition, researchers must ensure discussion include voices from participants presenting different (and perhaps conflicting) perspectives, as multi-voiced discussion is an essential driver of expansive learning and concept development (Engeström, 2001).

Table 2.1
Key Features of Formative Interventions (adapted from Engeström, 2011a)

Starting point	problematic or contradictory object embedded in routine work activity
Process	confronting contradictions to drive change and innovation negotiating content and course of intervention throughout
Outcomes	transformative agency expansive learning around the object of activity new concepts and tools implemented directly into practice
Researcher's role	provoke and sustain the process of transformation analyze and document the learning that occurs

Because of these distinctions, I conjecture that formative interventions are uniquely suited for developing innovations to address and resolve persistent challenges in practice- based teacher education related to field experience. Theoretically grounded in the theory of expansive learning, formative interventions encourage participants to remain oriented towards transformation and the development of new patterns of activity, and thus are able to "rise to the

concrete" (Engeström, 2011a; Gutiérrez, 2008) by developing and implementing coordinated pedagogies or tools in actual work with pre-service teachers. Furthermore, because the model offers a conceptual framework to guide both the design of learning activities and the analysis of the processes of learning and the new knowledge generated through participation (Virkunnen & Newnham, 2013), formative intervention models make it possible for related research to contribute to a growing empirical knowledge based focused on practice-based teacher education.

A CHAT Framework: Implications for Study Design

To summarize, a CHAT frame for this dissertation study bears several important distinctions that make CHAT ideally suited to address the complex problem of supporting pre-service teacher learning in practice. First, of primary interest in CHAT studies are the systems of activity (including particular tools, routines, and norms) in which changes in practice and group learning may occur. In particular, third generation activity theory (CHAT) encourages attention to the spaces of intersection between systems in which contradictions emerge as problems of practice and structural tensions are revealed. For teacher education, the importance of acknowledging and addressing learning in both university *and* classroom contexts cannot be overstated, as the structure of teacher preparation programs is in many ways based upon the assumption that pre-service teachers are able to draw these connections to make sense of theory in practice. As described in Chapter 1, the actual experience of field experience is far more problematic and learning cannot be assumed.

Next, CHAT affords insight into collective and organizational learning. Research typically focuses beyond the level of the individual, examining instead the relationships and processes within or across systems (Engeström, 2001; Roth & Lee, 2007). Although the actions or ideas brought forth by individuals are often included in research literature as illustrative

examples of theoretical advances, the driving goal of CHAT studies is typically system improvement or better understanding of systems of activities themselves (Sannino, 2011; Virkkunen & Newnham, 2013). Moreover, the concept of expansive learning (Engeström, 1987) provides a theoretical basis for efforts to support innovation and study the unknown, opening the potential for research to support improvements in practice and enrich theory. For teacher education, the persistent problems of practice described in Chapter 1 present both features in common (e.g. lack of communication between university-based and school-based teacher educators) and those that are local, specific, and particular (e.g. topics of focus in coursework and classroom-based curricula). Making meaningful improvements in a system of teacher education that has proven historically resistant to change (Zeichner, 2010; 2012), calls for new ways of thinking and doing and innovative solutions tied closely to actual practice.

Finally, CHAT offers an interventionist history and methodology to support efforts aimed at group learning and organizational change (Engeström, Sannino, & Virkkunen, 2014; Sannino, 2011; Virkunnen & Newnham, 2013). This methodology allows for educational research such as this dissertation study that seeks to bridge theory and practice by involving practitioners directly in the development of new knowledge for the field and acknowledging the reality of a complex and dynamic landscape of policies, institutional directives, and competing demands that complicate day to day work of teaching and – perhaps especially – learning in field experience.

CHAPTER 3

The Mentoring Study Group Context and Design

In Chapters 1 and 2, I reviewed the persistent challenges of practice-based teacher education and described the potential contributions of Cultural-Historical Activity Theory (CHAT) for encouraging innovation and examining change. With the content of these foundational chapters in mind, Figure 3.1 below presents the conceptual framing that guided the design and data analysis for the intervention presented in this dissertation study. Conceiving of school sites and university programs of teacher preparation as separate – and intersecting – systems of activity, this conceptual model asserts pre-service teacher learning in the field as a *shared object* that anchors and informs the day to day work activities of teacher education practitioners.

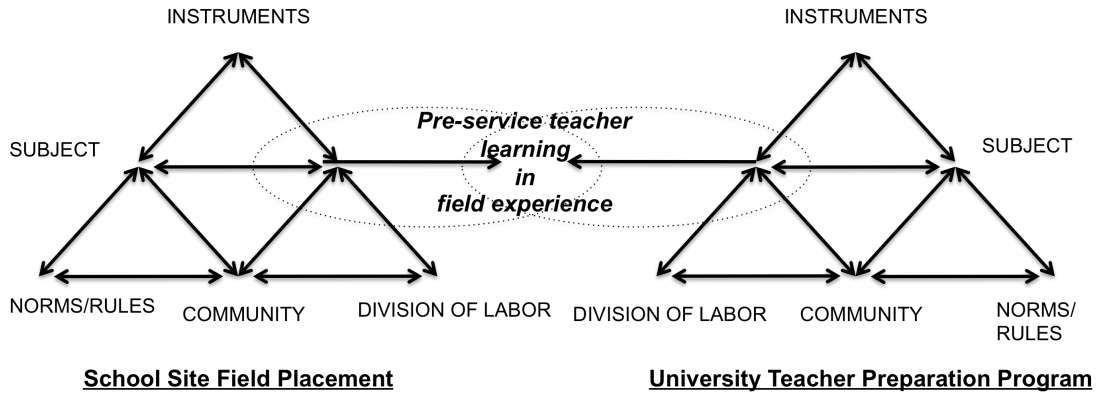


Figure 3.1. Pre-service Teacher Learning as a Space of Intersection

In this chapter, I describe how I initiated a CHAT intervention approach to support one group of teacher education practitioners working to address the particular problems of practice they encountered in their work. CHAT asserts an inextricable connection between research and context, and therefore the history and particulars of sites are crucial for analyzing study data and interpreting findings (Virkunnen & Newnham, 2013). Thus, in the section below I include

specific details of relevant classroom curricula and university coursework in the context description, and I provide supplemental information regarding teacher education policy in 2013-2014 to support examination of the research questions under investigation for this dissertation. In addition, in this section I draw attention to site-specific features and information that highlight the connections between settings as well as the points of potential tension, contradiction, and conflict. Following the description of context, I present the practical design for the Mentoring Study Group professional development intervention, including the central goals for three phases of meetings, design-based connections to the strategic actions of expansive learning, and the learning activities created to afford opportunities for participants to engage in structured collaboration around the shared object of mentoring pre-service teachers in the field.

Study Context

This study took place in the context of the University of California, Irvine (UC Irvine) elementary (Multiple Subject) teacher education program. Participants were UC Irvine student teaching supervisors and classroom mentor teachers from a partner school site that offers field placements to multiple UC Irvine pre-service teacher candidates each year. In this section, I first present a detailed overview of the UC Irvine program, highlighting the tools and programmatic emphases that informed supervisors' approaches to observation and feedback in the classroom. This section also includes a brief description of the teaching performance assessment (TPA) required by the state of California to earn a teaching credential in 2013-2014, which was a consistent topic of attention in professional development meetings and interviews with participants and is important for understanding data interpretation and the discussion of findings in chapters 5 - 7. Next, I describe the partner school site context, highlighting the specific school

and district mandates that impact the instructional practices they model and focus on in the classroom. Finally, I present and describe the participants in the group.

The university program. At the time this study was conducted, the UC Irvine Multiple Subject credential program enrolled approximately 75 pre-service teacher candidates each year, and offered both "credential-only" and "credential + masters' degree in education" options to pre-service teacher candidates. The vast majority of pre-service candidates in the program chose to pursue a masters' degree in education along with a California state teaching credential, so most pre-service teacher candidates enrolled in the program for two summers (coursework only) and a full school year in between (coursework and field experience). Table 3.1 presents an overview of the program structure in the 2013-2014 school year.

Table 3.1
UC Irvine Multiple Subject Credential Program Structure

Summer	Fall	Winter	Spring	Summer
	[----------Fieldwork----------]			
	-----(classroom 1)----------(classroom 2)--			
	Observation	*Student teaching*	*Student teaching*	
[---------- University Coursework ----------]				

Coursework overview. The university program was organized as a cohort model, offering a pre-determined trajectory of courses designed to prepare candidates to take on positions as classroom teachers immediately following completion of the program. Child development and courses on learning theories were offered at the beginning of the program (summer and fall) as foundations, followed by content area methods courses and additional required courses in winter and spring. The mathematics and English language arts methods courses spanned two quarters

(fall and winter), and all other methods courses were offered for one quarter either in fall, winter, or spring. The second summer session for candidates pursuing masters' degrees in education offered advanced coursework in theories of learning and student assessment.

Beginning in fall quarter and continuing throughout the school year, pre-service teacher candidates also attended fieldwork seminars led by the Multiple Subject field placement coordinator. This seminar met less regularly than the methods and foundations courses (for a total of five class meetings over the ten-week quarter), and focused on field experience and observation of teaching. Fieldwork seminar assignments included descriptions of field placement classroom contexts, students, classroom management, learning activities and lessons, and mentor teachers' instructional approaches, practices, and routines.

Math methods. The math methods course sequence required for all pre-service teacher candidates spanned two quarters during the 2013-2014 school year: fall and winter (see Appendix A for math methods winter syllabus). The math methods course sequence explicitly aimed to promote ambitious mathematical instruction, and was aligned with the portfolio assessment required by the state of California (described in detail below) and Common Core State Standards. Additionally, of note here is that the course was intentionally redesigned by university faculty four years prior to this study and was the focus of a multi-year research study examining pre-service teachers' "learning to learn from teaching" (Santagata & Guarino, 2011; Santagata & Yeh, 2014; Yeh & Santagata, 2015). Data collection for the research study concluded the year prior to this study, and in 2013-2014 the math methods instructors updated the course syllabi to include an emphasis on five "high-leverage" mathematical instructional practices drawn from research on ambitious mathematics teaching (V. Henry, personal communication, February 27, 2014). These five practices were introduced to pre-service teachers

through course activities and readings, and were emphasized through ongoing "Math Lesson Analysis Journal" weekly assignments. Figure 3.2 presents an excerpt from the math methods winter quarter syllabus describing the five high-leverage math practices and the accompanying journal assignments.

Math Lesson Analysis Journal – Weekly (30%)

In order to continuously focus on and refine high-leverage math teaching practices, you will analyze and reflect on your student teaching math lessons every week. You will upload your cumulative Journal to the appropriate eee dropbox each week no later than 8:45 a.m. on Friday mornings. You will be sharing your insights during class each week, so be sure to have a copy of your reflections for that week available either electronically or hard copy.

The five high-leverage math practices we would like you to focus on are:
1) Using rich tasks to engage students in constructing their own understanding of mathematical concepts, procedural knowledge, problem solving, and/or mathematical reasoning;
2) Using representations to deepen students' understanding of mathematical concepts and make connections to procedural knowledge/skills;
3) Using questioning to elicit and build on student responses to clarify/understand student thinking about mathematical understandings and to uncover misconceptions -- including academic language scaffolding/supports;
4) Providing opportunities for students to engage in mathematical discourse -- including academic language scaffolding/supports;
5) Making adjustments to your lesson and lesson sequence based on evidence of student learning, including differentiating for struggling and advanced students.

Journal Schedule:
Week 2 (Journal #1) -- one focus area, at least two lessons
Week 3 (Journal #2) -- two focus areas, at least three lessons
Week 4 (Journal #3) -- three focus areas, at least three lessons
Week 5 (Journal #4) -- four focus areas, at least two lessons
Week 6 (Journal #5) -- five focus areas, at least two lessons
Week 7 (Journal #6) -- five focus areas, at least two lessons
Week 8 (Journal #7) -- five focus areas, at least one lesson
Week 9 (Journal #8) -- five focus areas, at least one lesson
Week 10 (Journal #9) -- five focus areas, at least one lesson

Figure 3.2. The Five High-Leverage Math Practices from ED 322.

The Teaching Performance Assessment (TPA). Since July 2008, California law has required that all prospective teachers pass a teaching performance assessment (TPA) to earn a

teaching credential. According to California's Commission on Teacher Credentialing, TPAs are designed to measure candidates' "knowledge, skills and ability in relation to California's Teaching Performance Expectations (TPE's), including demonstrating his/her ability to appropriately instruct all K-12 students in the Student Academic Content Standards" (http://www.ctc.ca.gov/educator-prep/TPA.html). The TPE's referred to are the state-adopted standards for beginning teachers, which are assessed through the TPA portfolios. Further, according to the state credentialing website, "teacher preparation programs use the TPE's *as organizing concepts* [emphasis added] within preparation coursework, fieldwork, and assessments" (http://www.ctc.ca.gov/educator-prep/program-standards.html). In the 2013-2014 school year, there were three TPA models approved by the state, all of which were portfolio formats including components in which candidates were required to design and implement instruction with student assessment and present a culminating "teaching event."

The UC Irvine Multiple Subject program was designed to prepare pre-service teacher candidates to earn a California state teaching credential, and both the program structure and coursework emphasis reflected the goals and vision of the TPA's and the TPE's. In 2013-2014, the UC Irvine program required pre-service teacher candidates to complete and submit the edTPA (http://edtpa.aacte.org). Preparation for this assessment was embedded throughout both coursework and fieldwork materials. The university explicitly emphasized connections between the program design and the requirements of the edTPA, and the portfolio assessment heavily influenced both the structure and content of coursework, assignments, and field experience expectations. For example, course syllabi listed the particular TPE's addressed through each of the course goals presented to students. Assignments for courses guided students to complete reflections similar to those assessed in the edTPA, and edTPA grading rubrics were included in

the information packets distributed to all supervisors and mentor teachers (see Appendix A). In addition, the TPE's themselves were used as components on the evaluation forms both mentor teachers and university supervisors were required to complete for each candidate.

Field experience. UC Irvine pre-service teacher candidates were required to participate in field experience for the entire school year (see Table 3.1). Candidates remained in the same placement for Fall and Winter quarters, then were assigned to a new placement and mentor teacher in Spring quarter. Fall quarter field experience was dedicated to observation, with pre-service candidates required to observe in their field placement classrooms a minimum of one full day each week throughout Fall. Student teaching began in Winter quarter, at which time pre-service teacher candidates were expected to be in their field placement classrooms four days per week and begin to take on responsibility for planning lessons and teaching students. In Spring quarter, pre-service teacher candidates were required to be in their new placement classrooms the full five days per week, taking on increasing responsibility for planning and teaching until the final two weeks of "full takeover" student teaching. During the takeover period, pre-service teacher candidates were expected to take on all roles and responsibilities of their mentor teachers, including planning, teaching, and assessment responsibilities in addition to managing the class, interacting with families, and performing the additional duties and routines required of teachers at school sites (e.g. lunch duty, attendance at faculty meetings, etc).

University supervisors' roles and responsibilities. In the 2013-2014 school year, each supervisor was assigned four to eight pre-service teachers in Winter and Spring quarters. Most supervisors were assigned to oversee candidates at more than one site, and therefore visited several schools and multiple districts in the area. Supervisors' primary responsibilities included visiting pre-service teachers in the classroom a minimum of three times to observe lessons and

lead post-observation feedback conferences, then submitting electronic evaluations of lesson observations using the university's digital platform. Although not required, supervisors also were encouraged to preview and provide feedback on student teachers' planned observation lessons. Supervisors also were encouraged to communicate with mentor teachers and/or invite them to participate in post-observation feedback conferences when possible and were instructed to "establish professional communication" with mentor teachers (see Supervisor Packet, Overview of Roles, Responsibilities and Expectations). Finally, supervisors were required to complete final evaluations of both pre-service teachers and classroom mentor teachers to provide the university with feedback on the field placement classroom and learning experience for pre-service teacher candidates.

In addition to field-based responsibilities, supervisors were responsible for scoring pre-service teacher candidates' state credential portfolios submissions. The edTPA portfolios included multiple components, such as written descriptions of field placement classroom contexts and students' particular learning needs, analyses of student work samples, lesson plans, and a short video clip (approximately 10-15 minutes) of a lesson they designed and taught with accompanying reflective commentary (i.e. the "teaching event"). Supervisors were provided with rubrics for grading the portfolio submissions, and were required each year to attend two days of training at the university to calibrate scoring and ensure consistency in recommending pre-service teacher candidates for state teaching credentials.

The school site. The partner school, Ludlow Magnet School, is designated a science, math, and technology "magnet" because it draws students from throughout its district based on a lottery open to all families residing within the district boundaries. The school offers grades K – 6 and in 2013-2014 enrolled 450 students: 64% White, 20% Hispanic, 13% Asian, and 3% Black,

with 23% of students eligible for free or reduced-price lunch. There were a total of 20 classroom teachers at the school, with nine of them hosting UC Irvine student teachers. Ludlow Magnet School was selected for the study for several reasons: 1) multiple student teachers from UC Irvine were placed at the school each year; 2) the principal had previously expressed interest in partnering more closely with the UC Irvine teacher credential program; 3) several of the teachers had expressed interest in learning more about the UC Irvine program and the expectations for student teachers during field experience; 4) the school is located close to the UC Irvine campus and had a separate "UCI Room" made available as a space to use for professional development meetings.

SWUN Math. In addition to the general description of the school context provided above, it is important here to describe the special curricular circumstances surrounding this study, as district policy related to mathematics instruction at Ludlow Magnet School had direct bearing on student teaching in the 2013-2014 school year. In the year prior to the study, the district that oversees Ludlow Magnet School adopted a new mathematics curriculum called SWUN Math. According to district policy mandate, all teachers were required to implement this new curriculum into their classrooms, following the sequence of lessons and units of study as well enacting the instructional approaches and routines specified in SWUN materials. Although the SWUN materials and website asserted alignment with the Common Core State Standards (http://swunmath.com/wp-content/uploads/2013/05/swun-common-core.pdf), teachers argued that the SWUN curriculum *constrained* the kinds of instructional approaches called for in the Common Core. Teachers and administrators at Ludlow Magnet frequently expressed frustration with the curriculum materials and organization of topics within SWUN, and argued repeatedly that implementation of the curriculum compromised mathematics instruction at the school.

There were three main aspects of the SWUN curriculum that teachers pointed to as problematic. First, most lessons followed the same instructional format in which the teacher would demonstrate a mathematical procedure to the class ("I do"), guide students to follow the procedure through teacher-led instruction ("We do"), then ask students to use the same procedure to solve problems independently in class and for homework ("You do"). Teachers expressed concern that this lesson format did not allow students opportunities to construct mathematical knowledge on their own, and conflicted with teachers' efforts to ground instruction in questioning, discussion, and mathematical investigation. In particular, several of the mentor teachers experienced with using Cognitively Guided Instruction (CGI) noted a fundamental contradiction between the CGI approach and SWUN. Second, teachers pointed to the lack of a teacher's manual or supplemental materials to accompany lessons and units of study. According to teachers at Ludlow Magnet School, the entire SWUN curriculum consisted of student in-class worksheets, homework pages, and assessments, which did not provide enough background on the mathematics underlying the problems presented for novices such as pre-service teachers to extend and enrich student learning in lessons. Finally, teachers criticized the lack of access to upcoming units of study and materials. According to teachers, the SWUN curriculum was released online in pieces throughout the school year. Upcoming lessons were typically released approximately two weeks before the lessons were scheduled to be presented in class. Teachers argued that this made it extremely difficult to preview upcoming topics with students, research topics of study more deeply on their own, or present topics in a different order based on the needs of the class. In addition to these issues with the curriculum itself, teachers also expressed frustration at the mandatory computer-based assessments students were required to complete

which were then reviewed at the district office to monitor student progress and teachers' fidelity of implementation.

Mentor teachers' roles and responsibilities. Mentor teachers at Ludlow Magnet School typically hosted student teachers throughout the entire school year. Teachers were assigned either a single pre-service teacher candidate or a pair (based on their requests) for fall observation and winter quarter student teaching. All mentor teachers were provided with a packet of materials from UC Irvine with general guidelines for student teacher observations and supervisor visits, a proposed outline and schedule of student teacher roles and responsibilities, sample lesson planners used at the university, a list of courses student teachers were taking, and copies of the evaluation forms mentor teachers were required to complete for each pre-service teacher candidate.

UC Irvine invited all mentor teachers to attend student teaching orientations in both winter and spring quarters. Because Ludlow Magnet School is located close to UC Irvine campus and because so many student teachers were typically placed there, orientations commonly were at held on site at Ludlow Magnet School. At the orientations, the UC Irvine Multiple Subject Coordinator would provide general information regarding student teaching (e.g. dates for teaching takeover, guidelines for student teachers' professional behavior), and university supervisors would meet briefly with assigned student teachers and any mentor teachers in attendance (attendance at orientations was optional for mentor teachers). In 2013-2014, for the first time all UC Irvine mentor teachers also received a link to a video slideshow and "lecture" prepared by the Multiple Subject Coordinator; these slides provided detailed information about the specifics of the program schedule, including more specific expectations for mentor teachers

and student teachers outlined by the university and suggestions for co-teaching models mentor teachers may choose to implement in their work with pre-service teachers in the classroom.

Participants. I invited all seven UC Irvine multiple subject supervisors overseeing student teachers in 2013-2014 to participate in the study; three were chosen based on interest and availability. Participating supervisors all had prior professional experience as classroom teachers and/or school administrators, and had worked as supervisors of student teaching from 1 – 18 years (mean = 7.8. years). All nine mentor teachers hosting UC Irvine student teachers at Ludlow Magnet School were invited to participate in the study, and six teachers were chosen based on interest and availability. Mentor teachers' experience as classroom teachers ranged from 5 – 15 years, and prior experience as mentor teachers ranged from 1 – 12 years (mean = 4.8 years). In addition, all participants (mentor teachers and supervisors) were assigned to work with student teachers at Ludlow Magnet School during winter and spring quarters of the 2013-2014 school year, and each supervisor "shared" oversight of at least one pre-service teacher with a mentor teacher in the group.

In addition, in the 2013-2014 school year I served as a UC Irvine multiple subject supervisor with pre- service teachers assigned to participating mentor teachers' classrooms. It is important to note here that I had prior experience working with several members of the group in my role as university supervisor, as I had worked with pre-service teacher candidates at Ludlow Magnet School as a UC Irvine supervisor for two years prior to the study. I have ten years of experience as a professional development designer and leader, eight years of experience as a classroom teacher, and three years of experience as a classroom mentor teacher for pre-service teacher candidates. Due to my professional background experience and personal history with members of the study group, in addition to designing and facilitating I participated in discussions

and learning activities over the course of the intervention. Because I was both a participant and researcher, I consider my status that of an "insider-outsider" (Dwyer & Buckle, 2009) for the purposes of this study. Accordingly, I have included myself in Table 2 below, where I present a breakdown of winter and spring quarter pre-service teacher placements and the supervisors and classroom teachers assigned to support them during their student teaching field experience.

Table 3.2
2013-2014 Pre-Service Teacher Assignments

Mentor teacher, Grade level	Pre-service teacher assignments	UC Irvine Supervisor
Justine, 1st grade	Winter: Monica, Kim Spring: Joyce, Kelly	John
Lauren 2nd grade	Winter: Elizabeth, Kiki Spring: Shannon, Juliet	John
Marie 2nd grade	Winter: Sandy Spring: Casey	Jessica
Angela, 4th grade	Winter: Johanna Spring: Susan	Margaret
Stephanie, 5th grade	Winter: Sarah Spring: Melissa	Jessica
Diana, 6th grade	Winter: Bridget, Jennifer Spring: Elizabeth, Kim	Judy

Note*:* All names above are pseudonyms, with the exception of the researcher (Jessica).

Professional Development Intervention Design: The Mentoring Study Group

As noted earlier, Figure 3.1 presents the overall conceptual framing for this study. Figure 3.2 below draws upon the particulars of context detailed above to describe the specific problem space into which the Mentoring Study Group was introduced. Based on my preliminary analysis of the UC Irvine – Ludlow Magnet School context for this study, Figure 3.2. highlights the dimensions of the intersecting school site and university systems that were likely sources of tension for teacher education practitioners in their work; as described in Chapter 2, CHAT intervention models understand these contradictions within and across these dimensions as key sources that, when illuminated and confronted, drive innovation and provoke new learning (Engeström, 2011a; Virkkunen & Newnham, 2013). The dimensions of primary interest for the design of intervention tasks and activities included: *instruments*, *rules/norms,* and the *shared object* of activity itself.

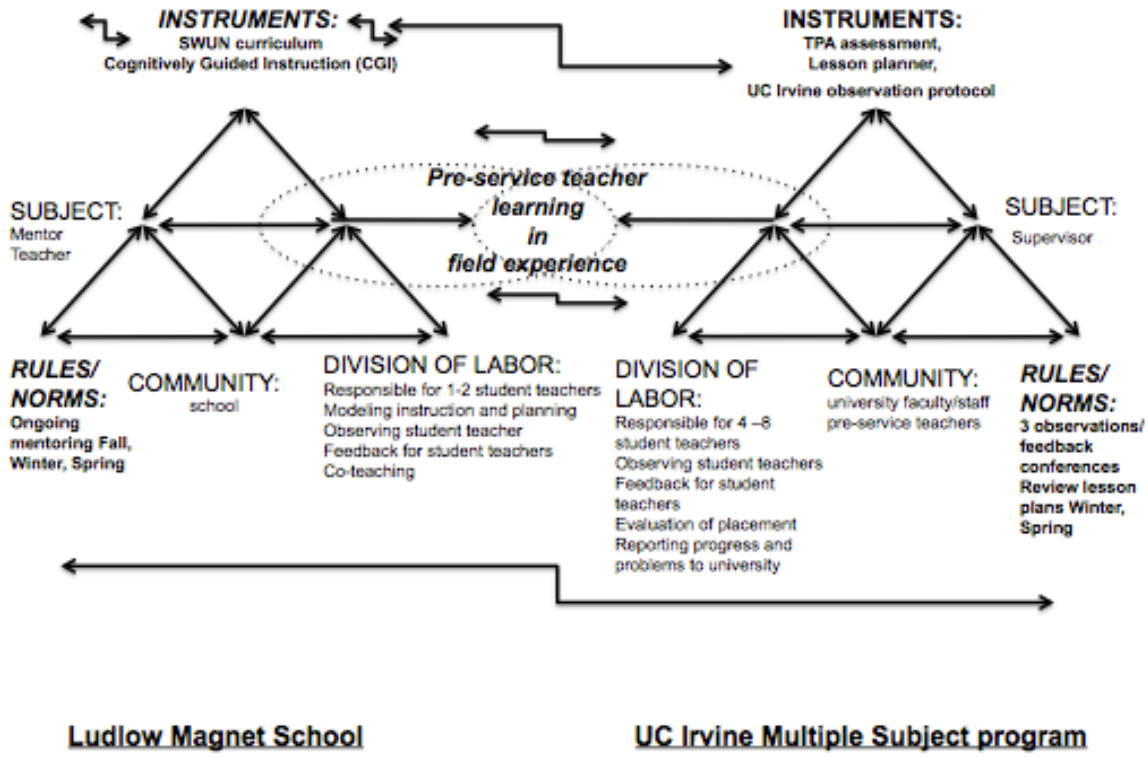


Figure 3.3 Problem Space for the Mentoring Study Group

Content area focus: mathematics. The practical purpose of the Mentoring Study Group was for participants to develop a shared protocol for observing mathematics teaching and offering feedback to pre-service teachers in field experience. Although pre-service teachers in the Multiple Subject credential program at UC Irvine received preparation for teaching all content areas, I chose to focus on a single content area with the Mentoring Study Group -- mathematics -- to afford depth and specificity in discussions of the core practices of classroom instruction (Grossman & McDonald, 2008). Moreover, because participants in the group taught or supervised in classrooms representing multiple grade levels, anchoring discussions in one content area helped the group maintain a common focus. I selected the content area of mathematics for this intervention study for several reasons. First, as described above, for several

years leading up to the study UC Irvine multiple subject faculty were engaged in a learning from math teaching project. The math methods course pre-service teachers took in 2013-2014 was developed specifically to support learning from practice, and thus was also aligned with the goals of this dissertation study. Second, because Ludlow Magnet School had a science, math, and technology emphasis, mathematics was also a main instructional focus for teachers at the school. Third, the mandated adoption of the SWUN mathematics curriculum at Ludlow resulted in tension and challenge for mathematics instruction, and thereby offered the potential to help illuminate the problems of practice that emerge when attempting to connect theory to practice in field experience. In other words, the curriculum itself raised potential contradictions and points of tension I aimed to utilize as catalysts for expansive thinking and learning in professional development meetings.

An emergent design. Consistent with a CHAT intervention approach to professional development, for the purpose of maintaining a space in which new ideas could emerge and grow I planned a general outline to frame the scope of the group's work ahead of time, but prepared each meeting agenda and learning activities throughout the intervention in direct relation to group discussions, participant suggestions, and ongoing experiences in meetings and in practice (Virkkunen & Newnham, 2013). Moreover, I considered the agendas themselves subject to change and negotiation between and during meetings, as my role as a facilitator-researcher within the intervention was to support the *participants* in developing a unique learning trajectory grounded in the particulars of daily practice (Engeström, Rantavuori, & Kerusuo, 2013). Of note here is that although multiple aspects of the intervention were intentionally left open to negotiation and change, the Mentoring Study Group design explicitly guided participants to create a shared tool that would be introduced directly into practice during the intervention.

However, although the creation of the tool was planned for, its content and function in practice was not specified ahead of time; this allowed participants to determine the vision of teaching the tool would represent the ways it would be used to coordinate and guide their direct work with pre-service teachers in the classroom.

Table 3.3 below presents the general outline of the intervention I designed to frame and guide planning for Mentoring Study Group meeting discussions, tasks, and activities. To create this outline, I began by determining central learning goals for each phase of the intervention. With the broad goal of provoking expansive learning for the group, I based these phases on the sequence of strategic learning actions presented in the conceptual model offered by Engeström and colleagues (Figure 2.4). It is important to note here that although I targeted particular expansive learning actions in each phase of the intervention design, I did not aim to limit participant engagement in learning actions strictly according to the sequence presented in expansive learning conceptual model (Figure 2.4). Informed by studies presented in related research literature, instead I anticipated – and was open to -- the learning process occurring in a much "messier" manner (e.g. Engeström & Sannino, 2010; Engeström, Rantavuori, & Kerusuo, 2013). With central goals meeting phases established, I next drew upon my knowledge of the particular details of the UC Irvine – Ludlow Magnet School context (summarized in Figure 3.2) to identify key learning activities that would encourage participants to engage in expansive learning actions and to identify the tensions in their work to highlight contradictions within and across systems of activity. Finally, I articulated the facilitation strategies and principles that would allow all mentor teachers and supervisors to contribute to discussions and activities as they negotiated a shared vision for their work and a tool to support and coordinate their efforts. In the section below, I describe the main components of the design for each phase in detail.

Table 3.3

Design of the Intervention

	Phase 1 *Meetings 1 – 2*	Phase 2 *Meetings 3 – 5*	Phase 3 *Meetings 6 – 7*
Expansive Learning Actions (Engeström, 1987)	*1. Questioning* *2. Analyzing*	*3. Modeling* *4. Examining* *5. Implementing*	*6. Reflecting* *7. Consolidating*
Central Goals	• understand existing practices • identify historical and current challenges • consider notions of "shared object" and expansive learning	• develop a shared protocol • consider new challenges, adaptations, and tensions that arise in practice.	• reflect on the use of the protocol and adaptations • revise, refine, and revise protocol based on experience
Learning Activities	• video (PACT teaching event):. Identify and chart feedback participants would offer • group discussion: past and current challenges to working with pre-service teachers in the • CHAT conceptual model: present and discuss interacting activity systems and notion of a "shared object"	• create the protocol: use resources brought (or requested) by participants • video (PACT teaching event): consider how the protocol would guide observations and feedback • group discussion: use of the protocol in practice	• group discussion: raising and reflecting on adaptations • group discussion; revise protocol based on experience • video (PACT teaching event): consider how revised protocol would guide observations and feedback
Facilitation	• manage participation to ensure that multiple perspectives are represented and discussed * highlight contradictions for group consideration and discussion • attend to central goals of meetings • follow up on participant ideas and suggestions for solutions		

Phase 1. The central goals of Phase 1 included making public participants' existing mentoring practices, voicing persistent challenges of supporting learning in practice, and introducing the concept of a *shared object* as a way to think about supporting pre-service teacher learning in field experience. Drawing upon CHAT interventionist work methodology, Phase 1 was designed to align with the strategic learning actions of questioning and analysis to support participants in articulating a starting point (see Chapter 2, Table 2.1) for collaboration. In addition, the Phase 1 plan included an emphasis on establishing norms for multi-voiced discussions to support the group's learning and growth throughout the intervention. Thus, I

planned learning activities that explicitly guided all participants to make their existing mentoring practices public and allowed the group to consider the range of perspectives and approaches represented. For example, in Meeting 1 I planned to show a video clip of a pre-service teacher, then ask participants to share points of feedback they would offer based on what they saw. The goal of this activity was for the group to be able to surface the range of ideas for feedback and collectively consider points of conflict or contradiction without privileging particular mentoring practices or evaluating the merit of individual participants' ideas. In addition, during this phase I planned to introduce the CHAT conceptual model (see Chapter 2, Figure 2.1) and the notion of a shared object of activity among members of the group. By sharing the model with participants, I aimed to encourage participants' agency in determining the outcomes and direction of learning in the intervention.

Phase 2. Phase 2 was designed for participants to create a shared tool to coordinate their work with pre-service teachers and to negotiate a shared vision of supporting learning in practice. Informed by expansive learning actions of modeling the new solution, examining and testing the new model, and implementing the new model in practice, central goals for this phase included developing a protocol tool and collectively examining its implementation. To allow for participant agency in introducing new ideas or strategies for developing the tool, the Phase 2 design did *not* specify the resources to be used in creating a shared protocol ahead of time. Instead, I planned to follow participants' lead in determining the sources of ideas and information they would draw upon to create it. Once the group developed a shared tool, I planned to use video artifacts of teaching to offer opportunities for collective consideration of how it would guide observations and feedback to pre-service teachers in the field. In addition, for

this phase I planned for group discussion activities focused on sharing the multiple adaptations participants made when implementing the tool in practice.

Phase 3. Finally, Phase 3 aimed to support participants in reflecting on the collaboration, deepen understanding of the shared object of their work, and revise and refine the shared tool. Through learning activities planned to elicit multiple perspectives and ideas, Phase 3 was designed for participants to consider the ways a shared tool could be adapted in practice to support each and all participants' direct work with pre-service teachers. For example, Meeting 6 included a charting activity in which participants posted responses to the following prompts: "In what ways have you used the protocol in your work with student teachers?"; "Ideas for changes/adaptations/additions to the protocol"; and "Moving forward….. other ideas for coordinating our work with student teachers in practice." In addition, plans for this phase included the reintroduction of the video-based activity from Meeting 1 described above; this would allow participants to consider whether and in what ways the group had moved towards a more shared perspective over the course of the intervention.

Facilitation. The emergent design of the Mentoring Study Group called for facilitation practices that were responsive, dynamic, and attentive to the special features of a CHAT interventionist approach to professional development. For this reason, the Mentoring Study Group design specified particular facilitation practices I planned to employ to maintain space for the emergence of unexpected ideas and to build upon the interests and developing understandings conceived by the group. Of particular importance for facilitation was attention to multi-voiced discussions, as expansive learning theory asserts that attention to multiple perspectives is fundamental to the development of new knowledge, and describes expansive learning as "an inherently multi-voiced process of debate, negotiation, and orchestration" that

"includes the voices and non-academic genres" of participants (Engeström, 2011a, p. 78). Drawing out and considering ideas representing multiple perspectives made the contradictions within and across the university and school sites systems of activity visible and available for collective consideration; as described in Chapter 2 (see Table 2.1), confronting contradictions is a main catalyst driving expansive learning. I viewed attention to multi-voiced discussion as particularly important in light of the historically uneven power dynamics between universities and schools described in Chapter 1 as the Mentoring Study Group participants included teacher educators from both UC Irvine and Ludlow Magnet School. In this regard, my goal as a discussion facilitator aligned with Gutiérrez and Vossoughi (2010), who argued that the inherently different funds of knowledge developed in separate settings can "become[ ] a resource for analyzing and constructing potential solutions together" (p. 105). To account for the historical hierarchies of knowledge and power between universities and schools, I explicitly specified that through my facilitation I would "manage participation to ensure that multiple perspectives are represented and discussed" so that I could maintain a space for transformative learning to occur.

In the next chapter, I present the research design, data collection, and analytic methods used to understand the process of learning in the Mentoring Study Group and address the research questions posed for this dissertation.

CHAPTER 4

Data and Methods: Analyzing a Space for New Learning

This chapter describes methods used for data collection and analysis. In the sections below, I first describe the data collected for the Mentoring Study Group intervention. Next, I provide an overview of my research approach including my rationale for the methods. Following that, I explain how I organized the data and prepared for interpretive analysis using a priori coding frameworks based on CHAT theoretical models. Finally, I describe the specific analytic methods I used to answer each research question.

Data Sources

This study draws upon multiple qualitative data sources to understand how the group developed new tools and concepts for practice as they negotiated a shared vision for mentoring in professional development meetings and used this vision in their direct work with pre-service teachers in the field. Here, I present and describe both primary sources (professional development meetings, interviews) and secondary sources (researcher journal, meeting artifacts, supplemental artifacts) analyzed to answer the main research questions posed for this study.

Professional development meetings. I video recorded all seven of the professional development meetings, ranging in length from 68 - 83 minutes. To make sure all participants were visible in video records, I used two video cameras, placed at opposite ends of the meeting room table. In addition to microphones for each video camera, I placed a digital audio recorder in the center of the meeting table to ensure that I captured and recorded all participants' comments, questions, and idea. All meetings were transcribed in full.

Participant interviews. I conducted semi-structured interviews with each participant two times: *initial interviews* occurred at the beginning of the study (January 2014), and *final*

interviews after all professional development meetings concluded (May/June 2014). The interviews lasted approximately one hour, and were audio recorded and transcribed in full. The interview protocols for initial and final interviews can be found in Appendix B. Initial interviews consisted of two main components, and final interviews included the two main components, plus an additional component designed for participants to reflect upon their own learning and change over the course of the intervention:

Part I: Being a teacher educator. The purpose of this part of the interview was to understand how participants conceived of their roles as teacher educators, including the ways they approach their work with pre-service teachers and the main challenges they have faced in the past. I asked participants to describe their perceptions of the expectations and goals from across settings (i.e. mentor teachers' perceptions of university expectations for their work; supervisors' perceptions of mentor teachers' expectations for their work). I also asked participants to share the aspects of supporting pre-service teacher learning in practice they found most challenging. This information was collected not only for later data analysis, but also to inform the emergent design of the professional development meetings and the questions and topics of discussion I used in facilitating the meetings.

Part II: Noticing student teaching. The purpose of this part of the interview was to understand which aspects of instruction stood out to mentor teachers and supervisors when observing pre-service teachers, and the ways they made decisions regarding the feedback they offered. Each participant was presented with a video clip prompt showing a pre-service teacher leading a mathematics lesson (drawn from the PACT Teaching Event archive at UC Irvine). After viewing the clip, I asked participants to identify what they noticed about the teaching and the kinds of feedback they thought would be important to offer to the pre- service

teacher in the video. By using the same video clip for initial and final interviews for all participants, this data component of the interview allowed me to compare with precision what each participant noticed in the clip and to identify potential shifts that occurred in what participants noticed after the intervention occurred.

Part III: New ways of thinking and doing (final interview only): The purpose of this part of the interview was to understand how participants perceived changes in their ways of thinking and conducting their work with pre-service teachers in the field. In the final interview, all participants were asked to describe any new practices, routines, or approaches to mentoring they attributed to their participation in the Mentoring Study Group. In addition, I asked them to describe new ways of thinking or new knowledge developed through participation. The goal of asking these questions was to collect additional data to support changes observed in practice, confirm perspectives shared during meetings, and make visible any ideas or perspectives not raised in meetings.

Meeting reflections. Attending to the facilitation choices made during meetings is important for a model of professional development based on an emergent design, as these choices demonstrate the specific ways participants themselves negotiated the process and outcomes of the intervention. Therefore, immediately following each of the seven professional development meetings, I created meeting reflections that included my impressions of what occurred in terms of the CHAT theoretical frame and the expansive learning conceptual model and my facilitation choices in relation to the goals outlined in the Mentoring Study Group design created prior the study (see Table 3.3). For example, in the reflection for Meeting 5, I noted that I intentionally "stood back to see where the conversation wanted to go, but I think there were times when John dominated too much. [I'm] not sure how to manage his participation without

insulting him!" This comment addresses my stated facilitation goal of "manag[ing] participation to ensure that multiple perspectives are represented and discussed" to maintain a space for multi-voiced discussions, as called for in a formative intervention design (Engeström & Sannino, 2010). In addition, meeting reflections note the particular adjustments I made to the agenda or planned learning activities and discussions during meetings based on participant ideas, suggestions, and interests. For example, in the Meeting 4 meeting reflection I noted that I did not show a video planned into the agenda because participants raised topics for discussion that were "productive, and time was very tight" since the meeting had started late due to logistical issues. Although a review of video or transcript data from meetings also provides documentation of what did and did not occur during meetings, the meeting reflection captures the intent behind my choices in facilitation and therefore affords examination of the ways participants navigated and negotiated the process. All Meeting Reflections were created as Word documents, and range in length from 1 – 3 pages.

Researcher journal. Throughout the study, I kept a journal documenting my thoughts as I planned the professional development meetings and reflected upon the process of learning as it developed over time. To be clear, the researcher journal is distinct from the meeting reflections described above, as the purpose of the researcher journal was to capture my thinking in terms of the broader investigation study, including the theoretical foundations, the review of literature, and the potential implications for the UC Irvine – Ludlow Magnet School system(s) of activity; meeting reflections focused exclusively on what happened in meetings and my facilitation choices. The researcher journal also included my thoughts on emerging themes and my own insights as a university supervisor. Journal entries ranged from a single paragraph to three pages, were dated, and kept as electronic documents in a folder on my computer. Journal entries were

created according to my thoughts and planning rather than a fixed schedule of writing. There were a total of 23 journal entries created during the professional development intervention, ranging from 1 – 6 entries per month.

Meeting artifacts. Charts, whiteboard representations, and other meeting artifacts (e.g. post-it notes used in learning activities) not captured by the video cameras were photographed and included in professional development meeting data. Agendas for each meeting were kept as data sources, and resources shared by participants themselves, myself, or others (e.g. UC Irvine course instructors) were collected, photographed if need be, and digitally stored.

Supplemental artifacts. I collected supplemental relevant artifacts throughout the study on an ongoing basis, such as UC Irvine course syllabi as requested by participants, additional outside resources introduced by participants, unsolicited communications from participants related to our work in The Mentoring Study Group, and SWUN curricular materials. The artifacts were used to trace the development of the shared language represented on the protocol, to provide a portrait of the context for this study rich enough to support analytic interpretation, and to confirm and triangulate findings.

Approach to Analysis

Qualitative Research Methodology

This dissertation is situated firmly in the qualitative research tradition: qualitative approaches informed my stance as a researcher, the questions I investigated for the study, the methods I used for data analysis, and the goals I maintained for presenting findings that make a contribution to the field. With this in mind, before describing my overall analytic approach and the methods used to examine data for each research question, here I briefly highlight important

points of distinction regarding qualitative research to make clear how and *why* I made the methodological choices I will describe below.

Embracing complexity. First, throughout data collection and analysis for this study, I have embraced the richness and complexity of conducting research in an educational setting, and I have maintained the assumption that the social context in which a study is conducted is inextricable from the research findings that emerge (Feldman, 1995; Miles, Huberman & Saldana, 2013). Therefore, consistent with many qualitative research methodologies, I have approached the corpus of data collected for the study holistically, and I have sought to uncover patterns and themes that describe the experienced realities and perceptions of the participants in the study through a "systematic search for meaning" (Hatch, 2002, p. 148) across the multiple sources. My goal throughout the presentation of results of the study in Chapters 5 – 8 is to remain faithful to the circumstances under study, and therefore I illuminate patterns and themes through descriptions that include unique details of the study through the voices of participants themselves (Lin, 1998).

Building theory through data analysis. Next, like Langley's (1999) description of (qualitative) process research, I am concerned with both how and *why* change occurs. I thus view data analysis and theory building as mutually constitutive activities. A main goal of this dissertation study is to advance theories of learning and change in addition to understanding the particular outcomes of the Mentoring Study Group intervention. A focus on theory development in relation to data analysis is common to many qualitative research approaches, such as design-based research, which takes on theory development as a main and driving purpose of research endeavors (Cobb, Confrey, Lehrer & Schauble, 2003; Edelson, 2002). Other lines of qualitative research such as ethnography (Glaser & Strauss, 1967; Nardi, 1996), grounded theory (Corbin &

Strauss, 1990), and interpretive analysis (Feldman, 1995) argue similarly for constant movement between examinations of theory and relevant literature, data analysis, and data collection as fundamental to the research process.

Data analysis for this study both invokes CHAT conceptual models and calls them into question to understand the ways they do – and do not – capture and address the process of learning within the group. Beyond a general connection to qualitative traditions, an integrated knowledge-theory approach is important for the CHAT interventionist lines of research described in Chapter 2. The studies reviewed earlier examine theoretically-based interventions to understand both the knowledge that is created to address experienced problems and challenges at work, and to continue developing and enriching the conceptual and theoretical models on which the interventions are based (Engeström, 2007; Engeström, Sannino, & Virkkunen, 2014; Heikkila & Seppänen, 2014).

Role as a researcher. I maintain an interpretive stance as a researcher, and I draw heavily upon my own knowledge and relationship to the topics under study, the context for the study, and the participants themselves to make sense of the data. My goal in doing so is to use my "insider" knowledge to "create an interpretation ….to allow people who have not directly observed the phenomena to have a deeper understanding of them" (Feldman, 1995; p. 1). Through a systematic approach to data analysis, I draw upon my understanding of the particular circumstances of the Mentoring Study Group to connect the ideas raised by participants to the systems of activity in which they are embedded (i.e. UC Irvine and Ludlow Magnet School), and I frame these connections in terms of the broader context of related CHAT theories to make meaning through data analysis and answer the questions posed for this study. Moreover, aligned with Hatch's (2002) description of a "constructivist paradigm" for research, I understand that

"researchers and participants in their studies are joined together in a process of coconstruction. From this perspective, it is impossible and undesirable to be distant and objective" (p. 15). I remain oriented towards discovery and through this research I seek to generate of new ways of thinking and new questions to pursue (M. Feldman, personal communication, January 9, 2015).

Authenticity and trustworthiness. Finally, throughout the process of data analysis, I have systematically employed methods that have allowed me to maintain a close connection to the data and related research literature for the purpose of developing findings that are credible and authentic. To ensure and address trustworthiness of these findings, here I draw upon four criteria offered by Lincoln and Guba (1985) that are widely used to evaluate the integrity of qualitative research (as cited in Zhang & Wildemuth, 2005) to describe how I maintained rigor and integrity throughout the study. First, I established *credibility* through triangulation by checking themes and results across all primary and secondary data sources (e.g. participant interviews), and by sharing and discussing findings with study participants themselves. For example, four of the six mentor teachers who participated in the study have been co-presenters with me at academic conferences and events in the last two years. In preparing for these presentations, I discussed findings at length with each of these mentor teachers to make sure the findings I developed and described resonated with their own perspectives and experiences in the intervention. Next, to ensure *dependability* and *confirmability,* I have been transparent and explicit regarding my own role as a researcher, the activities of the data collection and analytic process, and I have drawn explicit and clear connections to the theoretical foundations throughout my presentation of the study (Miles, Huberman & Saldaña, 2013). Finally, I have addressed *transferability* by presenting descriptions that are rich enough for other researchers to consider how the model of intervention that guided the Mentoring Study Group could be adapted

or taken up in other settings. Although the features of context must be taken into account for any intervention or study, the Mentoring Study Group model I designed is intended to be transferable to other school-university partnerships or other settings for work activity that exist in the spaces of intersection between organizations.

Data Organization

As described above, my analytic stance towards this research was interpretive (Feldman, 1995), and my methodological approach for determining findings and themes was primarily inductive (Hatch, 2002; Miles, Huberman & Saldaña, 2013). Because this approach required that I identify and confirm themes across all data sources and phases of the intervention to trace the development of themes and learning within the group, being able to navigate through the full data set was crucial for this research. In light of the richness, complexity, and quantity of data collected for this study, it was therefore necessary to organize the data so that I could move between sources and across phases of meetings as needed. To accomplish this, I took the following two steps: creating content logs and using ATLAS.ti software.

Content logs. I began data analysis by creating content logs for every meeting and interview using the raw audio and video files. My goal was to generate a series of reference documents that would facilitate the holistic approach to analysis described above by helping me locate particular comments, discussions, and ideas across the entire data set quickly and simply. In addition, the process of constructing the content logs called for me to review the entire corpus of data, which is in and of itself a key beginning step in qualitative research (Feldman, 1995; Hatch, 2002; Miles, Huberman, & Saldaña, 2013). To create the content logs, as I reviewed audio and video data, I completed a table organized into three columns: "Time," "Description of Action and Talk," and "Notes." Because the content logs were intended for my own reference

and were not used for direct analysis, but rather for locating events, comments, or discussions of interest, I decided to segment the data in places that were intuitive to make the logs best suited to use. Typically, I identified breaks for the logs in conversations when a participant changed topic or asked a question, when a learning activity in a meeting ended and a new activity of discussion began, or when I asked questions in initial or final interviews. I looked for these kinds of naturally occurring breaks and shifts in the raw data to segment, then used the time stamps embedded in the data files to mark each new row. Figure 4.1 provides an example of a content log created for Meeting 5.

Time	Description of Action and Talk	Notes
8:30	Justine says she used the 5 practices to find out what her ST wanted to strengthen. Justine says her ST had the same questions about the 5 practices as the participants in the group. In particular, she asked about rich tasks. Justine says her ST wanted to work on questioning.	ADAPTATION TO PROTOCOL: what ST's want to work on
9:42	Marie talked about using the protocol for her own observation. She says there were some notes she was taking that she wasn't able to "Fit" into the protocol – such as connecting to prior learning. Marie thought that would probably fit best in "rich tasks." Justine says she talked about that too, even going back to engagement. Jessica asks if the group would prefer to list out all of the ideas around the protocol or if they would like to focus in on each in particular. The group agrees to list everything out first. Marie says the 5 practices do not address management.	PROTOCOL ADAPTATION: needs to address management
11:55	John asks Marie if her ST has a copy of the 5 practices. Marie says yes, and then shares how she and her ST planned the lesson together and talked about rich tasks. Jessica says the ST was using cue cards/post-its during the lesson. As her supervisor, Jessica asks Linda if that is standard for her.	PROTOCOL: used for planning
13:50	Linda says she has worked extensively with the ST on asking better questions to help students construct their own understandings. Jessica asks how Linda's comment connects to Marie's discussion of questions with the ST. Marie says the issue was more about how to respond to students when she has actually asked the questions.	PROTOCOL: needing responding in-the-moment

Figure 4.1 Sample Content Log

ATLAS.ti. Like many researchers currently engaged in qualitative investigations, I used computer software tools to support data organization and basic coding (Hatch, 2002; Leech & Onwuegbuzie, 2011; Miles, Huberman & Saldaña, 2013). I selected ATLAS.ti software for this study, and I used it both as a means for data organization and as a tool to support the analytic process. To organize the meeting data, I uploaded all seven transcripts, then used the coding capabilities of the software to segment the data into segments as defined by the meeting graphs (described below) so that I could locate particular comments, discussions, or interactions within the activities and tasks of the intervention as I analyzed the data (see below for detailed description of analysis for each research question). The coding feature of ATLAS.ti also allowed me to tag comments that mentor teachers and supervisors made separately, which allowed me to investigate differences in participants' ideas according to the two subgroups within the intervention.

Using the "Code Manager" feature of ATLAS.ti, I was able to review all comments marked with the same code to compare developing themes and categories throughout the analytic process. It is important to note here that, aligned with my interpretive approach to analysis and the development of findings through an integrative and iterative approach, I did *not* approach the code categories or frequencies themselves as final results of analysis. Instead, consistent with research describing the utility of computer-assisted software for conducting domain analyses and analysis of content (Leech & Onwuegbuzie, 2011), I used these the "Code Manager" to locate participant comments so that I could further analyze, compare, and interpret their meaning in the context of the study as a whole. See Figure 4.3 below for a screenshot sample of transcript coding.

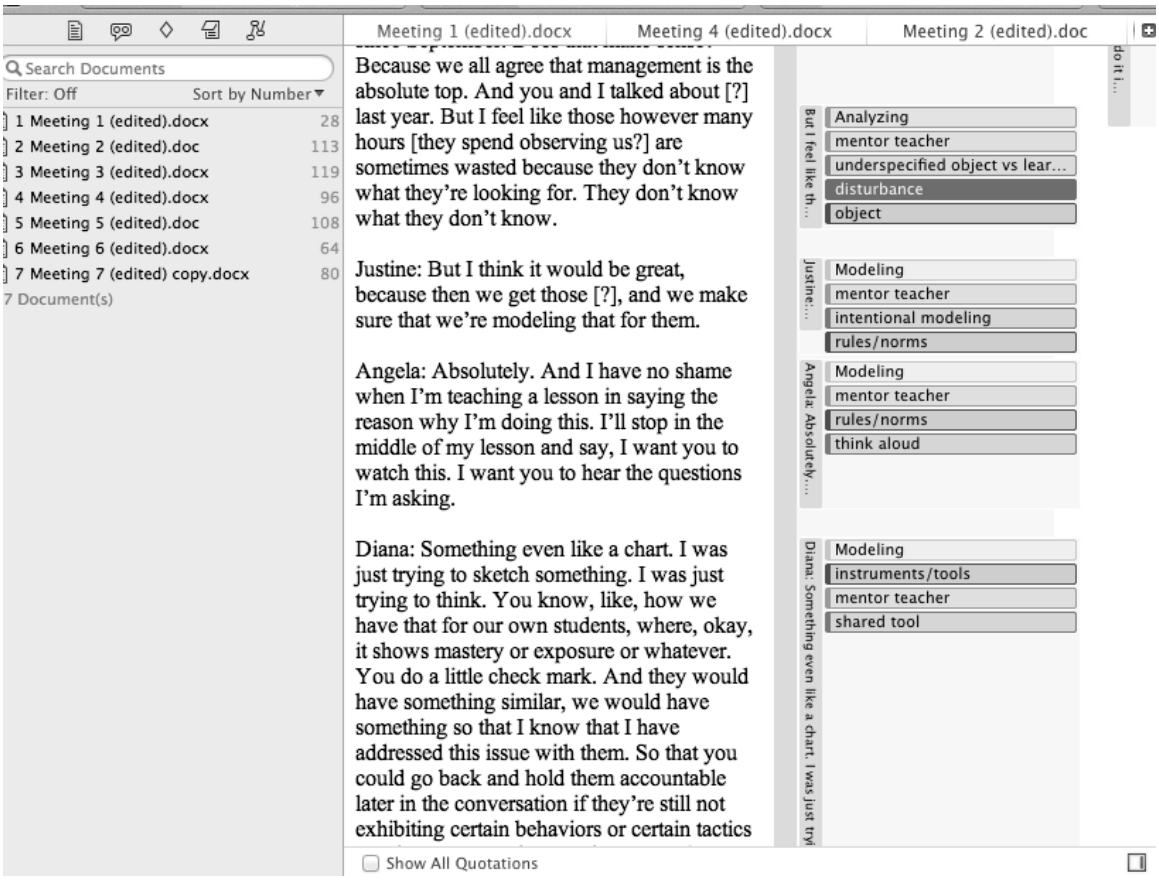


Figure 4.2 Sample Meeting Transcript Coding Using ATLAS.ti Software

In addition, I drew upon the "Code Co-occurrence Table" tool in ATLAS.ti to support data analysis. For example, by examining the co-occurrence of codes such as "Mtg 1.2" and "disturbance," I was able to identify the problems of practice raised in the first meeting of the group (described in detail below in methods for Question 1), and I could then compare these to disturbances raised at other points across the intervention. As another example, I also used the co-occurrence tool extensively to connect subgroup codes of "mentor teacher" or "supervisor" throughout the process of developing themes and categories of findings to captured potential distinctions or patterns of comments for participant subgroups. Figures 4.4 below presents a screenshot example of a code co-occurrence table.

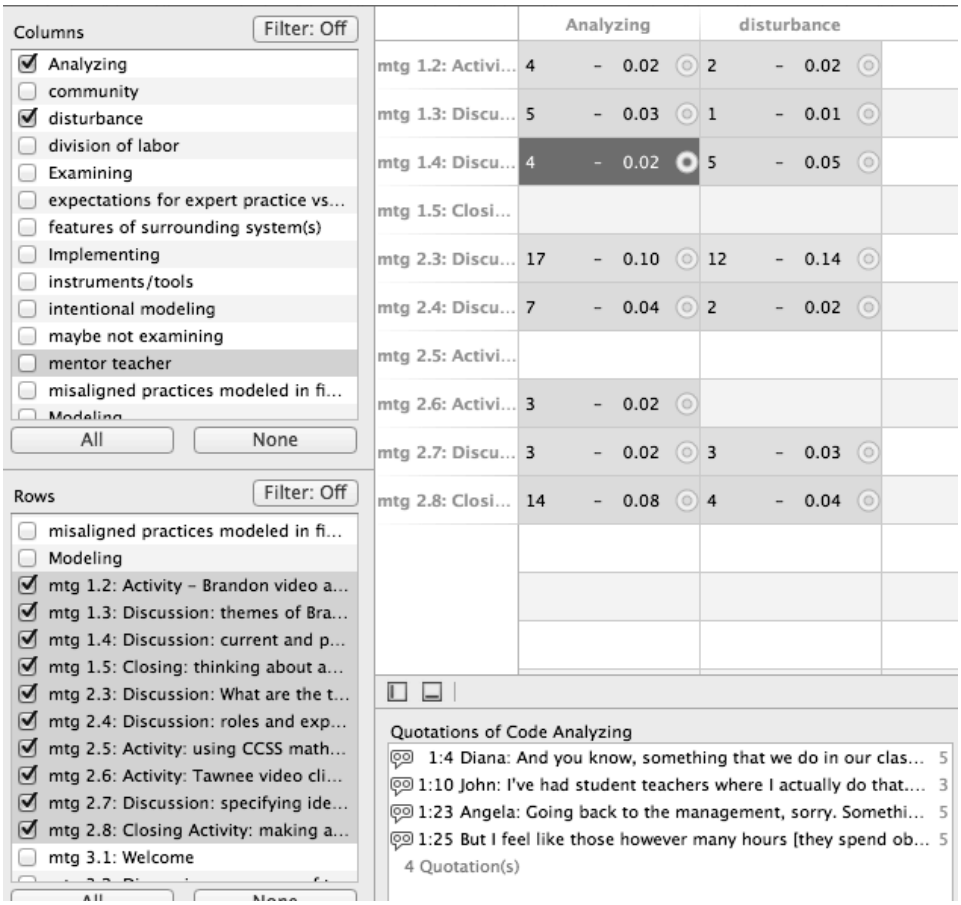


Figure 4.3 Sample ATLAS.ti Code Co-occurrence Table

Preparation for Interpretive Analysis

In addition to organizing the data so I could navigate within and across multiple sources, I took steps early in the analysis to segment the data based upon activity and discussion segments within meetings. Below, I describe the steps I took to set up and support this aspect of the interpretive analytic process.

Meeting graphs. I created meeting graphs to segment meetings and construct a "map" of the sequence of activities and discussions that occurred. This was an important step for analysis, as it allowed me to capture and locate moments in which participants themselves launched or pursued lines of talk that were not planned into the agenda. Recall that an emergent design was an important feature of the Mentoring Study Group intervention (see Chapter 3). Thus, meeting

graphs illuminated distinctions between planned and unplanned activities so that I could understand how participants took agentic initiative by introducing their own topics of discussion within the intervention meetings (Engeström, Rantavuori & Kerusuo, 2013). These meeting graphs created analytic units that allowed me to identify participant-led conversational episodes, as planned and unplanned discussion topics were marked by time and named. Moreover, meeting graphs provided a guide for identifying meeting discussions to analyze for each research question, as the graphs distinguished between portions of the professional development meetings targeting particular expansive learning actions (e.g. discussions focused on constructing a shared tool targeted *modeling*) versus those that served other purposes for the group (e.g. welcoming the group at the start of the meeting, sharing information about deadlines for submitting evaluations and other university documents).

To create the meeting graphs, I reviewed meeting transcripts and videos with meeting agendas at hand. I began by creating a table with separate rows for each planned agenda item, such as the following (from Meeting 4): Welcome: review of last meeting and plan for this meeting; Discussion: feedback from student teachers; and Closing: planning for how to use protocol before the next meeting. As I reviewed the videos and transcripts, I added rows for each discussion or line of inquiry initiated by a participant that departed from the agenda. For example, in the final meeting of the intervention, I had planned a video-based activity in two parts to understand how the shared tool functioned to coordinate the topics of focus participants identified when viewing lessons. In the first part of the activity, the group watched a PACT video clip with the shared tool as a guide, then participants were asked to share the feedback they would offer the pre-service teacher in the clip based on what they saw. Based upon a chart of the suggestions participants offered, the second part of the planned activity was to discuss the ways

the protocol supported shared areas of focus and to consider other features or topics to add. However, following the first part of the activity (feedback on the video clip), participants initiated and pursued a discussion of whether pre-service teachers in general are being guided to lead "formula lessons" rather than responding to students in the moment of teaching. This conversation lasted for 13 minutes before moving on to the second part of the planned activity. To capture this departure from the plan based upon participants' initiation, I listed the "formula lesson" discussion in a separate row using italics. In addition, all rows presented in the meeting graphs are marked by time to enable comparison of the overall time spent engaged in pre-planned versus participant-initiated activities. Figure 4.2 below presents the Meeting 7 graph as an example.

Meeting 7
Video File: 100_0165.MP4

1 minute *5:31 – 6:30*	**7.1 Welcome: plan for today** • 2 objectives for the meeting: 1) examining the protocol again using video, and 2) "what next?" discussion for moving forward
26 minutes *6:30 – 32:30*	**7.2 Activity: Kathleen video and feedback (examining the protocol)** • Participants watch the Kathleen video with the protocol tool as a guide for viewing. • Participants share feedback for Kathleen based on the video and tool.
13 minutes 32:30 – 45:30	***7.3 Discussion: maybe we are teaching them to do a formula lesson*** • *Participants discuss whether the ST's are being guided to do a "formula lesson" as opposed to developing responsive teaching.*
30 minutes *45:30 – 1:15:10*	**7.4 Activity: using feedback for Kathleen to consider shared vision and adapt the protocol** • Participants consider ways the protocol supported shared areas of focus for feedback • Participants consider changes to the protocol to best support shared vision of math teaching • participants discuss the importance of connecting with and responding to students
3 minutes *1:15:30 – 1:18:41*	**7.5 Closing: marking the most important ideas for moving forward** • participants indicate which of the ideas for moving forward they think are most important

Figure 4.4 Sample Meeting Graph

Meetings range from 5 - 11 segments each. Length of segments ranges from 1 – 32 minutes, and average 11 minutes each. Out of a total of 45 segments across all meetings, 10 were initiated by participants. Meeting graphs for all seven Mentoring Study Group meetings can be found in Appendix C.

Initial-final interview tables. To support analysis of any new ways of thinking or new ideas and concepts for practice participants developed over the course of the intervention, I drew upon the initial and final interview logs I created for each participant (see description above) to construct tables that identified the content of responses participants offered to the questions I asked at the beginning of the intervention (initial interviews) and at the end (final interviews). This allowed me to review the responses participants offered to the questions I asked before and after the intervention to identify changes in thinking or practice as identified by participants themselves, and also enabled me to triangulate findings for Questions 1 and 2 related to participants' perspectives on the key problems they faced in their work and the potential solutions they developed in the group.

As described above, I asked the same questions of all participants in initial and final interviews, with the exception of additional questions relevant only to the final interview (e.g. "Is there anything new that you do in your work or any new ways of thinking that you attribute to your participation in this study?"). To create the tables, I began by creating rows for responses to the main questions I posed in interviews (see Appendix B), and I created an additional row to capture ideas participants shared that were not in direct response to my questions. I labeled the rows as follows: role of the MT (mentor teacher); role of the Supervisor; What should the ST (student teacher) learn?; New learning and practices; Challenges; Video; and Other. I organized columns to separate initial interview responses from final interview responses to support

comparison of participants' responses to the same questions. The example below presents an excerpt from an initial-final interview table, with bulleted points to describe the participant's response to the question, "How would you describe your role as a mentor teacher?"

Question/Topic	Initial Interview	Final Interview
Role of the MT	• uncertainty around the expectations for work with ST's. Not sure if she is "doing it right." o improvises for each ST, but does not have guidance o uses a shared journal with each ST to "get more specific" o wants a protocol *to know what she should contact supervisors about and for reflection* o unsure of what kind of feedback to give ▪ wants a standard reflection sheet • wants more communication with supervisors o suggests contact prior to visits so supervisors know what to look for	• role model for ST's • support for ST's • wants more communication with supervisors o welcome emails, communication between observations o wants a protocol *to know what supervisors should be looking for during observations and a weekly schedule for Fall observations*

Figure 4.5 Sample Initial-Final Interview Table

A priori coding frameworks: expansive action "moves" and activity system dimensions. Integrating data-driven and theory-driven coding to support the development of thematic findings in relation to the theoretical foundations of a study has been promoted as a rigorous methodological approach to interpretive research (Ferreday & Muir-Cochoran, 2008). Similarly, CHAT intervention research typically examines learning both through the existing frameworks and conceptual models offered by the theory *and* through other methodological approaches useful in uncovering important themes and issues related to the topic under investigation. For example, Engeström, Rantavuori, and Kerusuo (2013) used the expansive learning cycle conceptual model to code for learning actions made evident in a *Change Laboratory* study conducted at a university library, then adopted an inductive analytic approach to identify and describe sub-types of learning action categories. Consistent with this research, I

looked to the cycle of expansive learning actions as a framework for analyzing the process of learning in the Mentoring Study Group. However, based upon my review of the data and my goals for the study I chose to adapt the framework to code participant turns of talk as expansive action "moves" to support my analysis for this study. Below, I describe my reasoning and the way I used the expansive learning action "moves" for analysis.

The research literature reviewed for this study asserts that "bounding an expansive learning action in empirical data is no simple matter," and although "learning actions typically involve some sort of exchange…even a singular speaker's utterance…may be regarded as a learning action in specific cases" (Engeström, Rantavuori, & Kerusuo, 2013; p. 86). With this in mind, I approached the data to identify participant engagement in expansive learning actions as it occurred, and I did not expect to assign expansive learning actions as codes across all segments. Instead, in conducting meeting transcript data analysis, I was interested in examining the particular ways participants in the Mentoring Study Group engaged in multi-voiced discussions, as these discussions are described as crucial for the process of learning in CHAT models of intervention (Sannino, 2010; Virkkunen &Newnham, 2013). Furthermore, a main goal of this research is to capture the unique contributions mentor teachers and supervisors made to the learning process based upon their experiences in the field to investigate in what ways professional development for teacher educators can support new knowledge and learning in the field of research and in practice.

As I approached the data with these goals and the cycle of expansive actions model (Engeström, 1987; 2001) in mind, I discovered that the meeting discussions of primary interest for this study – those in which participants discussed the key challenges in their work and worked to design solutions – most often included suggestions and ideas that represented aspects

of multiple expansive actions rather than maintaining a dominant focus on one particular expansive action or another for sustained exchanges. In particular, I saw that participants often situated suggestions for new practices or a shared tool within comments describing the historical aspects of the problems they faced in their work, or they exchanged turns of talk that included back-and-forth movement between two or three expansive action "moves." Below, I briefly describe and present an example from the data to illustrate.

Within the conceptual model, the expansive action of *analyzing* focuses on considering and understanding the underlying causes of contradictions, tensions, or problems experienced at work. *Analyzing* is described through two dimensions: 1) *historical-genetic:* tracing the historical evolution of the problem(s); and 2) *actual-empirical:* identifying the structural relations within or across systems (Engeström, 2011b). The next expansive action in the cycle, *modeling,* identifies the action as constructing an "explicit, simplified model of [a] new idea that explains and offers a solution to the problematic situation" (p. 79). The model proposes that expansive learning can be described through movement through the sequence of these actions as groups make progress towards concrete learning and change (Engeström, 1987; 2001). However, within Mentoring Study Group discussions, rather than remaining focused on *analyzing* or *modeling* for multiple turns of talk, participants tended to explain suggestions for new solutions (*modeling)* in terms of the historical or underlying systemic causes of problems (*analyzing*) within comments, or they were provoked to *analyzing* or *modeling* moves when other participants contributed comments. For example, in Meeting 2 the group discussed the roles and expectations for supervisors and mentor teachers to understand the problem of offering coordinated guidance and feedback to the pre-service teachers they shared. The exchange below represents the integration of *analyzing* and *modeling* "moves" in this discussion, as John and Diana both considered ways the program

structure contributes to tension and conflicting feedback offered to pre-service teachers, and also made suggestions for a "framework" to guide topics of focus and the field-based practice of supervisors seeking guidance from mentor teachers to identify the areas of challenge to focus on with pre-service teachers.

> John: *I think the student teachers are worried about what [supervisors] are going to see and they're not worried so much about [mentor teachers] because you've developed a relationship with them. But when we come in, it's only for three times and we've got these 'all over the board' suggestions for observations, and then you're left picking up the pieces. It would be helpful for us to ask the master teacher, "What is it that you're working on?"*
>
> Diana: *And that's what I really appreciated about you last year is that you would ask me. So, yeah, [if we have] some kind of framework, like, "we focused on these five of ten things in the classroom. Of these things…."*

This kind of exchange, in which participants made suggestions for solutions in direct relation to *analyzing* or identifying problems, was common throughout all meetings across the three phases. Therefore, I created an expansive learning action "moves" coding framework by drawing upon the expansive learning cycle model to describe how individual participants in the Mentoring Study Group approached discussions, including representative sample excerpts drawn from meeting transcript data. The full coding framework for expansive learning action "moves" is included in Appendix D. Table 4.5 below presents an example through the "move" code for *modeling*:

Expansive learning action "moves"	*Example*
Modeling CHAT definition: constructing an explicit, simplified model of the new idea that explains and offers a solution to the problematic situation (Engestrom, 2011b) Mentoring Study Group "move" definition: making a suggestion or contributing an idea for a practice or a tool to support mentoring pre-service teachers in field experience	*I don't know what your rubrics look like….. it might be interesting to have a common rubric that they are privy to prior to the lesson, and then when we do debrief, that we have the same lens for both of us, so that we don't give a myriad of different things so [pre-service teachers] don't get confused* *You can add student engagement [to the protocol]. It doesn't matter what the affect is if there is student engagement.*

Figure 4.6 Sample Expansive Action "Move" Code

In addition to capturing the ways participants connected developing ideas for practice (*modeling)* to experience in practice *(analyzing, examining, implementing),* analyzing the transcripts at the level of turns of talk allowed me to maintain attention to the sources of knowledge brought to the group by mentor teacher and supervisor subgroups in multi-voiced exchanges. As mentioned above, this was important both for examination of a model of intervention based on such discussions, and also for understanding potential value of involving teacher education practitioners in efforts to resolve historical issues in practice-based teacher preparation. For example, mentor teachers often invoked their experiences in direct work with individual pre-service teachers in discussions, whereas supervisors tended to draw upon their experience across multiple classrooms. In the exchange drawn from Meeting 5 presented below, John (a supervisor) addresses the problem of pre-service teachers having difficulty responding to students while teaching. To support his thinking, he referred the typical progression of pre-service teacher learning he identified through his experience as a supervisor. In response, Justine invoked her direct experience with the pre-service teacher in her classroom to describe how she attempted to address the problem through intentional modeling and guidance. Although both

participants were addressing the topic of learning to respond to students while teaching, the example below demonstrates how they approached the issue through distinct sources of practical knowledge:

John: *That's why it's really difficult in that first [field placement]assignment because [pre-service teachers] are almost anal about how they want to get things done. They have the lesson plan and they're darn well going to just steam right through it…It's almost like they should be starting to become a little more comfortable with kind of autocorrecting and listening carefully and responding to what is being said [by students].*

Justine: *This is exactly the same conversation that my student teacher and I had because she needs help with questioning. so, this is going to be something that I am going to model and make sure that I go over it a lot.*

I note this here to draw attention to the purpose of coding expansive action "moves," as this approach allowed me to see how multi-voiced collaboration occurred in the intervention, and therefore supported interpretative analysis. In the example above, I coded John's comments as an *analyzing* "move," as he raised both the manifest challenge of pre-service teachers sticking to a lesson plan as opposed to responding to student thinking while teaching. Justine's response is coded as a *modeling* "move" to capture her suggestion of the field-based pedagogical practice of (instructional) modeling to demonstrate how she uses questioning while teaching. This supported my interpretive analysis because it allowed me to hone in on the ways participants invoked different "moves" to address topics of focus for the group, and to look for patterns or constellations of particular "moves" used within meeting segments and over the course of the intervention.

To analyze meaning from the coded turns of talk "moves," I used the ATLAS.ti Code Co-occurrence Table feature to locate meeting segments of interest for understanding the multi-

voiced aspects of discussions or the ways learning activities encouraged certain expansive actions in particular. For example, I used ATLAS.ti to identify segments that included multiple "moves" together, those that were focused on a single "move," or those that included "moves" not targeted in the Mentoring Study Group phase design (see Table 3.3). To analyze these segments of interest, I drew upon my knowledge of the key issues presented in the literature on field-based teacher learning (e.g. lack of program-supported opportunities for teacher education practitioners to communicate about areas of challenge for pre-service teacher candidates) as well as my own knowledge of the context of the Ludlow-UC Irvine school partnership (e.g. SWUN curriculum and the ED 322 course emphasis on ambitious instruction) to identify the expansive actions featured across meeting segments, meetings, and phase.

In addition to coding for expansive learning action "moves," I analyzed meeting transcript data using the triangular model representation of activity systems as a framework (see Sannino, 2010). Like the "moves" framework, I drew upon the research literature to create code definitions for the Mentoring Study Group, then I applied this framework to the meeting transcript data. Figure 4.3 below presents an example from the activity system coding framework I developed. The full coding framework can be found in Appendix D.

Activity System Dimension	**Definition**	***Example***
Instruments/ tools/signs	tools or materials that have bearing on mentoring and/or pre-service teacher learning in field experience	*Our concern is that SWUN doesn't go…. There aren't questions. I've been teaching for 11 years, 10 have been in 4th grade, so I know what to ask. If I handed my student teacher SWUN and said "good luck" she's not going to be able to ask the questions.* *Something even like a chart. I was just trying to sketch something….You do a little check mark. And they would have something similar, we would have something so I know I have addressed this issue with them….. it definitely gives a focus.*

Figure 4.7 Sample Activity System Dimensions Code

Once again, I used the Code Co-occurrence Table feature of ATAS.ti to connect participant expansive action "moves" to the dimensions of the system(s) of activity they addressed as a way to locate meeting segments and conversational exchanges that addressed particular issues of interest. For example, by looking for co-occurrence between *examining* and *instruments/tools,* I was able to identify discussions in which participants considered the potential affordances and limitations (*examining*) of introducing the shared tool into practice. As in my use of the expansive action "moves" framework described above, I did not use frequency counts or codes for activity system dimensions as findings themselves; rather, I drew upon frequency counts and locations of these comments to interpret their meaning in terms of the research questions and theoretical framing for the larger study.

With this understanding of my overall research stance and analytic approach in mind, below I describe the specific methods used to answer each of the research questions individually to pursue the broad investigation: In what ways did a professional development model designed for expansive learning support teacher education practitioners in identifying and addressing key problems of practice related to pre-service teacher learning in field experience? In the sections that follow, I describe the process of developing themes and categories to illustrate particular problems of practice the group identified over the course of the intervention (Question 1), and the new tools and practice-based concepts they constructed to support their work (Question 2), and the process of group learning as it occurred over the three phases (Question 3).

Methods of Analysis for Questions 1 - 3

Question 1: What Problems Did the Group Identify?

As described in Chapter 3, the design of the Mentoring Study Group aimed to support participants in identifying and addressing the key problems of practice that challenged their

work. Importantly, within the conceptual frame for this study, such problems of practice, referred to as "disturbances" in work activity, are understood to be manifestations of contradictions within or across intersecting systems of activity (Engeström, 1987; 2001). Moreover, engagement in the process of uncovering and confronting these contradictions is conceived as an "engine of expansive learning in an activity system" (Engeström & Sannino, 2010; p. 7), and formative interventions target contradictions in particular to provoke new learning and innovation. According to Helle (2000), the manifestation of contradictions that occur as "disturbances" in work appear as "errors, problems, breakdowns, ruptures of communication, obstacles, ...[that] interrupt the fluent flow of work" (p. 87). Furthermore, the formative intervention model itself is intended to provoke expansive learning to support transformation and participant agency through "encounters with and examinations of disturbances, conflicts, and contradictions in the collective activity" (Engeström, Sannino, & Virkkunen, 2014; p. 124) as a driving force for change and innovation. As described by Helle (2000), Engeström and Mazocco (1994) assert that in developmental work research (such as the formative intervention *Change Laboratory* model), "a disturbance may occur between people and their instruments or between two or more people….identification of types of disturbances and way of managing or containing them opens up a new layer of work for analysis – [a] layer of constant negotiation and problem solving" (p. 91).

Based on the CHAT conceptual framework for this study and related research literature, I approached the examination of the problems of practice participants identified through the analytic lens of work "disturbances:" meaning, I considered the problems of practice raised in meetings in terms of their connections to underlying contradictions within or across the UC Irvine and Ludlow Magnet School systems of activity. Drawing upon my review of the literature

(Chapter 1) and personal background knowledge as a supervisor of student teaching (as noted above), I looked in particular for references to problems related to the limited time supervisors spend observing in the field (Levine, 2011; Zeichner, 1992), contradictions between the SWUN curriculum and the approaches to instruction advocated at UC Irvine, and the lack of guidance offered to participants to support mentoring practices in the field (Hatch & Grossman, 2009; Zeichner, 2002). However, in reviewing all meeting transcripts I also looked for problems of practice not captured by these categories, as my goal was to understand the problems participants saw as most important to discuss and address.

To understand what these disturbances indicated in terms of their relation to each other and the CHAT conceptual framework, I utilized an inductive approach to analysis to develop "understandings…by starting with specific elements and finding connections among them" (Hatch, 2002; p. 161). To capture and account for multi-voiced quality and the potential distinctions among the problems participants identified as persistent or most challenging in practice, as described above my frame for segmenting units of meaning to analyze (Hatch, 2002) in meeting transcripts consisted of turns of talk within discussions and activities. In addition to capturing the voices of individual participants, analyzing problems of practice at the level of turns of talk allowed me to examine how the problems of practice participants identified were invoked and addressed in discussions focused on constructing solutions. Furthermore, this approach allowed me to connect the emergence of new problems of practice to the introduction of the shared tool into practice in Phases 2 and 3 of intervention.

With the analytic frames described above and the CHAT theoretical framework in mind, data analysis for Question 1 occurred through a series of phases. First, I began by reading through all meeting transcripts and marked the problems of practice participants raised by coding

them as "disturbances" within individual turns of talk. For example, in Meeting 2, a supervisor commented:

> "…and then on down the line during supervision, [a] student teacher will say to me, 'Oh, [my mentor teacher is] not doing what...we're being taught at UC Irvine.' And I'll think to myself, 'Oh, I thought [mentor teachers] are supposed to know what we're teaching the student teachers [at UC Irvine]…And so it's like there's some frustration going on there between the mentor teacher and the student teacher year after year after year."

I assigned a general code of "Disturbance" to this comment in the first phase of analysis as a marker, and although I did not establish category themes at this time, I used the "Comment" feature of ATLAS.ti to note my thinking around the potential theme of disturbances it may represent. Next, I developed potential themes of the Disturbance code based upon the instances marked in meeting data, with attention to my own background knowledge related to mentoring in field experience and my review of related research literature (see Chapters 1 and 2). As I developed potential themes, I used the "Code Manager" feature of ATLAS.ti to locate the disturbances across all seven meetings, and I compared each idea again to refine and revise the themes into categories of disturbance topics (e.g. "Underspecified Goals and Pedagogies for Learning in Field Experience," "UCI Lesson Planner"). At this point, I triangulated my analysis with initial-final interview tables (see above), meeting reflections, and the researcher journal to confirm that the categories made sense within the larger frame of the study. With the category themes established, I then returned to the units coded as disturbances in the transcripts and added the category names as an additional code to understand how frequently disturbances within each category were raised across the three phases and seven meetings of the intervention.

Finally, I connected the categories of disturbances to the dimensions of activity systems they addressed (e.g. *norms/rules, shared object, instruments/tools*) to illuminate the

location of underlying contradictions within or across the UC Irvine systems of activity. This offered another way to connect findings particular to the Mentoring Study Group to the theoretical framework grounding this study, and furthermore allowed me to draw connections between the particular problems participants identified and the new solutions they developed through collaboration and introduced into practice. With the frequency counts for categories and connections to the activity system dimensions in place, I was then able to determine main categories of focus for Phases 1, 2, and 3 of the intervention. The resulting categories, frequencies, and activity system connections will be presented and described in detail in Chapter 7.

Next, I describe the methods of analysis for Question 2 to demonstrate how the group addressed the *shared object* through the development and introduction of a shared tool and new concepts for practice.

Question 2: What New Tools and Concepts Did the Group Create and Implement into Practice?

According to Engeström (2011b), transformation of practice through the development and implementation of new tools and practice-based concepts is a key indicator of expansive learning, and therefore bears the research implication that "the analyst needs to trace the steps of expansive concept formation, from early unstable attempts and suggestions to stabilization steps such as naming and modeling" (p. 13). Furthermore, Engeström asserts that because "different stakeholders produce partial versions of the concept…the formation and change of concepts involves confrontation and contestation as well as negotiation and blending" (p. 13). I revisit these concrete and practice-oriented aspects of expansive learning here to make clear the purpose of analyzing the development of new tools and concepts in the Mentoring Study Group as

evidence of learning in the intervention. Moreover, the quotations included in this paragraph speak directly to how I conceive my role as researcher in analyzing expansive learning, as I consider the tools themselves and the new concepts for practice constructed by practitioners to be essential for understanding learning in this study.

With this premise in mind, here I describe the analytic process I engaged in to make sense of the concrete learning that occurred and to connect concrete outcomes as attempted solutions for the key problems identified by the group (see Question 1). Primary data analyzed for this question include meeting transcripts, artifacts related to the development of the shared tool (based on the "five high-leverage math practices" emphasized in the UC Irvine math methods course), and final interview transcripts and transcript logs. Meeting reflections, the researcher journal, and initial-final interview tables were used to confirm findings and to identify features of the shared tool and/or practice-based concepts that were not directly addressed in meeting discussions or final interviews.

To document the development of the shared tool and concepts for practice, like Feldman (1995) I rooted my thinking in a basic assumption of semiotics that "signification systems" are made visible through language and tools, and these systems parse the world to help organize and make sense of experience. From this perspective, to understand the way the Mentoring Study Group participants created new concepts and a shared tool in relation to their "world" (i.e. their *shared object* of pre-service teacher learning in field experience), I drew upon interpretive methods described by Feldman (1995) and Hatch (2002) to conduct category domain analyses of the shared tool and the new concepts for practice. For the purpose of understanding how the shared tool and concepts for practice developed over the course of intervention, I conducted this

analysis by phase. Consistent with the iterative, inductive approach I maintained throughout the broader study, the analytic process for Question 2 occurred in several steps.

First, I examined all meeting transcripts to locate instances in which participants made suggestions for a shared tool to coordinate their work or new mentoring practices to support learning in the field. Although I reviewed all meeting segments during this step, I paid special attention to the participant turns of talk coded as *modeling, examining,* and *implementing,* as within the expansive learning conceptual framework these actions are intended to describe the construction (*modeling*), consideration *(examining),* and introduction *(implementing)* of new tools and concepts into practice as groups make progress towards concrete learning and change. In particular, based upon the Meeting 1 suggestion for a "common rubric," I looked for comments aimed at specifying and creating the shared tool, such as the Meeting 2 suggestion to "give them that checklist of – oh, what were the three management strategies or something like that, so they have tasks that they need to identify rather than just…." In addition, I looked for the field-based pedagogical practices participants suggested (e.g. "I'll stop in the middle of my lesson and say, 'I want you to watch this…'") to develop category themes. I created domain tables to represent the main themes for Phases 1 – 3.

Next, I connected themes across phases to trace development and change over time. For example, in Phase 1, participants described a potential "common rubric" as a shared tool to provide a "common lens" for mentor teachers and supervisors in observing and offering feedback to pre-service teachers in the field. In Phase 2, participants referenced the "five high-leverage math practices" to describe the shared tool, and mentor teachers suggested the field-based pedagogical concept for practice of Think Alouds in which they drew attention to the ways they modeled these practices in their lessons.

Finally, I revisited initial-final interview table data to confirm category themes, and to look for any other suggestions for a shared tool or practices not identified in meeting transcripts. I then drew upon results of analysis for Question 1 in conjunction with recommendations from the literature reviewed (e.g. suggestions for targeted feedback for pre-service teachers), my knowledge of context (e.g. mentor teachers' backgrounds in Cognitively Guided Instruction and frustration with the SWUN curriculum), and my own experience as a teacher education practitioner to interpret ways the shared tools and new concepts did – or did not – resolve the main work disturbances identified over the course of the intervention.

To examine subgroup differences in how participants came to understand their work and to identify ways they took up new concepts and tools in practice over the course of the study, I analyzed final interview transcripts for each participant and created a role-ordered matrix (Miles, Huberman & Saldaña, 2013) that enabled identification of themes common to mentor teachers, supervisors, and the group as a whole. The steps I took to create and analyze the matrix are described below.

First, I created the format for the matrix. I assigned each participant a separate row, and I created columns to display participant responses to the final interview questions and responses analyzed. The columns were named: New actions, New thinking, Ideas for the future, and Obstacles. To complete the columns, I began by reviewing final interview transcripts to identify participants' responses to the questions: "Is there anything new that you do in your work or any new ways of thinking that you attribute to your participation in this study?" and "What is your big 'takeaway' from this study? What have you found to be most useful – new knowledge, new ways of thinking, new practice?" (see Appendix B). Next, I looked across the full interview transcript to identify ideas for the future and any obstacles participants pointed to related to

taking up to new learning in practice to understand features of the interacting university and school site systems that may raise new challenges and tensions for participants seeking to make changes in practice following the study. For example, in her final interview Lauren asserted the importance of a shared vision of teaching for mentor teachers and supervisors as a key outcome in terms of a new way of thinking about her work. However, Lauren also pointed to the lack of structured opportunities for mentor teachers and supervisors to meet as an obstacle to taking up this shared vision in practice, as the field experience programmatic format limited communication between university-based and school-based practitioners. Once the full role-ordered matrix was completed, I identified themes of responses by subgroup. Finally, I confirmed these themes using meeting transcript content logs, meeting reflections, and the researcher journal.

Question 3: How did the intervention design support the group in identifying and addressing problems in their work?

Question 3 aims to illuminate ways in which the Mentoring Study Group demonstrates how a model of intervention grounded in CHAT can support practitioners in identifying and addressing the key problems they face at work. I approach this question by analyzing the Mentoring Study Group intervention meetings through the four defining features of formative interventions described in Chapter 2: Starting Point, Process, Outcomes, and Researcher's Role (note: in the explanatory effects matrix, the dimension is referred to as "Facilitation" to capture my role within meetings). To enable interpretation of the learning outcomes for the group in terms of the model design, I created an explanatory effects matrix (Miles, Huberman, & Saldaña, 2013) to allow me to "trace back – and forward – the emerging threads of causation" (pp. 140)

within the intervention. Below, I describe the data sources and analytic approaches I used to create the matrix for this question.

Facilitation. For meetings of the intervention, my role as the researcher for this study included that of design and facilitation. Although facilitation is not a main focus of this study, to understand how the design of the intervention supported the group process it is important to account for and include my ongoing decision-making as a facilitator of emergent professional development. As described in Chapter 3, I created a general outline for the intervention ahead of time to help bound and frame the purpose of the group, but aligned with CHAT intervention research I viewed my primary role as a facilitator to be one of supporting the participants themselves in negotiating the particular outcomes of their collaboration (Engeström & Sannino, 2010). With the overall purpose of the intervention in mind, to guide my facilitation choices throughout the study I planned the following four main goals for myself ahead of time (see Table 3.3): 1) manage participation to ensure that multiple perspectives are represented and discussed; 2) highlight contradictions for group consideration and discussion; 3) attend to central goals of meetings; 4) follow up on participant ideas and suggestions for solutions. To capture and trace how I made decisions consistent with these facilitation goals, I drew primarily upon meeting reflections and my researcher journal to identify the key facilitation choices I made *between* and *within* intervention meetings, and I confirmed that I took up these choices by reviewing meeting graphs and transcripts. Below, I describe the specific steps I took to analyze these decisions.

To understand facilitation between meetings, I reviewed all meeting reflections and my researcher journal to identify the choices I made in planning agendas in response to participants' suggestions, ideas, and interests. For example, Meeting 1 and 2 meeting reflections include statements such as "teachers seemed really interested in finding out what [UC Irvine] is looking

for from the [pre-service teachers]" and "they want to know more about what [pre-service teachers] are learning specifically in coursework to help identify ideas presented in coursework with classroom practice...for the next meeting, I should talk to [the math methods instructors] to find out the specific emphases of the math methods course." These notes demonstrate my intention to "follow up on participant suggestions and ideas for solutions" (see Table 3.3) by providing access to the information they requested. In addition, my researcher journal entries from this time include statements such as "[mentor teachers] seem to feel 'out of the loop'" and "as a new supervisor, Linda wants to 'do supervision right' but doesn't know how.'" These statements offer additional support and explanation for my facilitation decision to invite the university math methods instructors to join Meeting 3 and share the topics of focus they present in the course.

I also reviewed meeting reflections to illuminate the facilitation decisions I made within meetings in terms of the four main goals for facilitation I maintained throughout the study (described above). For example, the meeting reflection journal from Meeting 4 notes that, "I asked repeatedly if there was anything the protocol does *not* capture. This was hard for people to answer. However, I raised that those Think Aloud close interactions [participants had suggested as a field-based pedagogical practice] may not be addressed through the protocol [focused only on the 'five high-leverage math practices']." This example shows my thinking process and choice to offer multiple opportunities for participants to identify what was missing from the protocol to ensure that "multiple perspectives are represented and discussed," as through invoking this idea I aimed to highlight ideas for field experience generated within the group that were not be fully captured or represented by the "five high-leverage math practices" emphasized in the university course.

Using the methods described above, I looked for evidence of my decision-making within and between meetings in relation to the four main goals of facilitation described above across all phases of the intervention. To confirm that the actions I noted in meeting reflections actually occurred in meetings, I examined all meeting graphs and transcripts to locate instances in which I took up these decisions through my facilitation throughout the intervention.

Process. To understand the group learning process in terms of the cycle of expansive learning conceptual model (Engeström, 1987; 2001), I drew upon the multiple data sources collected for the study to interpret the development of the main problems identified in each phase (Question 1) and the construction and implementation of concrete tools and solutions (Question 2) in terms of the expansive actions sequence the model describes. This part of the analysis occurred in three phases.

First, CHAT interventions aim to introduce tasks and activities that call for expansive action as a means for making progress towards learning (Virkkunen & Newnham, 2013). Therefore, I reviewed the Mentoring Study Group design outline created before the study (Table 3.3) to identify the expansive actions and the central goals for each phase, and I looked in meeting graphs to identify the learning activities I introduced to provoke targeted expansive actions within meetings. For example, the targeted expansive actions for Phase 2 were *modeling, examining,* and *implementing.* Because participants had agreed to bring the potential shared tool into practice following Meeting 4, in Meeting 5 I introduced a topic for discussion called "How have you incorporated the protocol into practice?" This discussion aimed for *implementing*, which occurs through "means of practical applications, enrichments, and conceptual extensions" (Engeström, 2011b, p. 79), and also aimed to provoke *examining* by providing an opportunity for participants to discuss the potentials and limitations of the shared tool based upon their

experiences using it in practice. Therefore, throughout this discussion I not only invited participants to share their experiences with bringing the shared tool into their direct work, but I emphasized the importance of finding out about ways participants had modified or adapted the tool in practice to draw out potential enrichments or changes based on experience. I also highlighted the topics of discussions participants initiated that addressed the targeted actions for the phase, such as the Meeting 5 discussion: "What is the purpose of this group? How will this tool and this work impact mentoring practices in the future and beyond Ludlow?" I used the highlighted segments of the meeting graph to confirm that participants were indeed presented with learning activities related to targeted expansive actions within each meeting and across each phase.

Next, with the meeting segments targeting expansive learning actions identified, to begin interpretive analysis I used the ATLAS.ti Code Co-occurrence Table feature to look for the presence of expansive action "moves" in these segments. In addition to looking for "moves" particular to the targeted action (e.g. *implementing* "moves" within the Meeting 6 discussion activity described above), I also looked for non-targeted "moves" to capture participant agency and interests in discussions that departed from plans and agendas (see Appendix E for a frequency table of all expansive action "moves" identified within meeting segments across the seven meetings). I looked within the segments themselves to identify the learning actions at the level of the group so that I could understand how participants engaged in multi-voiced discussions. For example, Meeting 4 included a segment labeled "Discussion: How can the protocol coordinate work?" that targeted *modeling* and *examining* in particular. Using the expansive action "moves" coding framework I identified 10 *analyzing* "moves" in addition to 14 *examining* "moves," 1 *implementing* "move," and 8 *modeling* "moves" within this segment. As I

examined the transcript for this discussion, I was able to see that following multiple *examining* "moves" (e.g. "yeah, it gives us a shared language for our observations" and "this allows us to take a lesson plan and make comments specific to the ['five high-leverage math practices']"), participants began connecting *examining* to *analyzing* to open deeper questions about the challenges of pre-service teacher learning in the field. The example below demonstrates the integration of *examining* and *analyzing*, as a supervisor began by considering how the shared tool can coordinate topics of emphasis (*examining*), and then raised a deeper issue of pre-service teachers "performing" lessons (*analyzing*):

> If I were working with Justine and [the "five high-leverage math practices'"] were in the lesson plan design then we would be able to talk about something that really has been a major emphasis in [the pre-service teacher's] class over time…. Because I get the impression sometimes from our student teachers that… "you need to come at 11:00 because this is when I'm doing my grand lesson of some kind of performance. I'm going to be doing my best performance…"

By maintaining attention to both the meeting segments aiming for particular expansive actions and the expansive action "moves" coded across the data, I was able to identify the main learning action that characterized segments within meetings and I was able to capture multi-voiced features of discussions as well. This was important for understanding how the model design supported the group process, as it enabled me to understand how practitioners invoked practical expertise and knowledge to address problems related to the *shared object* of their work.

Finally, I drew upon findings for Questions 1 and 2 to interpret the discussions analyzed for the group in terms of an expanding conception of the key problems participants faced in their work (Question 1) and the solutions they constructed and implemented (Question 2), and to confirm my interpretation of expansive actions at the level of the group. For example, although not targeted for Phase 3, I identified *modeling* as a main learning action in Phase 3. Drawing

upon findings for Questions 1 and 2, I was able to confirm that the group engaged in *modeling* throughout Meetings 6 and 7 as they modified the shared tool based on experience bringing it into practice and developed ideas for field-based pedagogical practices that would address the key problems of practice they identified for that phase. By attending both the to the process and outcomes of learning, I aimed to offer a rich description of both *what* and *how* the group learned in the Mentoring Study Group intervention.

In addition, within the Process column of the explanatory effects matrix, I present analysis of the particular actions that describe *how* participants engaged in expansive actions within meeting discussions according to subgroup distinctions. To determine this, I began by examining meeting graphs to identify the main topics of discussion and learning activities in relation to the expansive actions previously identified (see above). Next, I looked within meeting segments to identify the particular ways mentor teachers and supervisor subgroups participated in discussions to determine the processes through which they engaged. For example, the Meeting 5 graph (see Appendix C) identifies "Discussion: how have you incorporated the protocol into practice?" Below, the meeting graph identifies "Participants discuss challenges of enactment of teaching in-the-moment." I examined the meeting transcript for Meeting 5 to locate that discussion, and then identified that both supervisors and mentor teachers pointed in particular to questioning in-the-moment as a key challenge for pre-service teachers in the field. Within this discussion, Linda (supervisor) asserted that share worked with her pre-service teacher on "really asking better questions because she had started out by asking a lot of yes-no questions." Marie (mentor teacher) noted that after asking questions to students, her pre-service teacher "just kind of accepted what [students] said and went on. So, she didn't really deepen their understanding or clear misconceptions." With confirmation that both mentor teacher and supervisors raised issues

related to challenges pre-service teachers faced in questioning for learning, I added the idea "Consider challenges of in-the-moment questioning to guide student learning (MT, S)" to the "Process" column for Meeting 5.

Starting Point and Outcomes. To determine the meetings in which the starting point was initiated or developed within the intervention, I drew upon my analysis for Questions 1 and 2 to understand the starting point(s) for collaborative work within the group. To create the "Starting Point" column, I began by reviewing the problems of practice and categories of disturbance analyzed to answer Question 1. These categories provided the main problems the group aimed to address through the development of concrete and conceptual tools and solutions. The specific methods for developing categories of disturbance and concrete learning outcomes are described above, and therefore I will not re-present them here. Next, I reviewed the table created for Question 2 to connect the problems for each phase with the construction of the shared tool and field-based pedagogical practices as a solution. For example, in Phase 1 the group identified Underspecified Goals and Pedagogies for Field Experience as the main disturbance. In addition, in Meetings 1 and 2 participants made repeated suggestions for a shared tool that represented a shared vision of teaching. Thus, I determined the "Starting Point" at the beginning of the intervention as "What is the vision of math teaching for field experience?" The "Outcomes" column was drawn directly from the analysis conducted to answer Question 2 (see above). However, for the explanatory effects matrix, rather than synthesizing developing domain tables of concrete learning outcomes by phase, I included notation of the for domains within individual meetings.

With the methods described above in mind, Chapters 5 – 8 will present results of analysis for the intervention. Chapter 5 offers a summary overview of findings for the three research questions, and Chapters 6, 7, and 8 describe results each individual question in detail.

CHAPTER 5

Overview of the Mentoring Study Group

In Chapters 6 – 8, I will present results of data analysis to answer the three main research questions posed in this study: 1) What key problems did the group identify?; 2) What new tools and concepts did the group create and implement into practice?; and 3) How did the intervention design support the group in identifying and addressing problems in their work? In this brief chapter, I provide a general description of the Mentoring Study Group intervention as it occurred and an overview of the outcomes of data analysis. My goal here is to contextualize the findings to come, and to connect the results for each question to the broad purpose of the study: understanding how a professional development model designed for expansive learning supported teacher education practitioners in identifying and addressing key problems of pre-service teacher learning in field experience.

To begin, I offer two important points of distinction regarding the overall approach of this study that are essential for interpreting the findings below. First, a reminder that the intervention design created for the Mentoring Study Group aimed to provoke expansive learning (Engeström, 1987; 2001) as a means for participants to collaborate in order to construct and implement solutions to the particular problems of practice they identified for themselves. Therefore, consistent with the role of the researcher in formative interventions, these chapters present analyses that document the unique learning outcomes as they occurred, as opposed to comparing findings to predetermined outcomes or particular desired results (Engeström, 2011a). In addition, throughout these chapters I feature excerpts drawn from meeting transcript data to illustrate findings through the voices of participants in the study. Beyond providing supportive evidence for the findings I present (Hatch, 2002), my goal in highlighting these excerpts is to

draw attention to practitioners as key agents in the transformation of work activity (Engeström, Sannino & Virkkunen, 2014). As the teacher education practitioners working most closely with pre-service teachers in field experience, I view the mentor teachers and supervisors in this study as uniquely knowledgeable and positioned to uncover, confront, and resolve the problems of practice they encounter at work. Therefore, as much as possible I aim to enable them to tell the story of learning and change in the Mentoring Study Group through their own words.

Understanding Learning in the Mentoring Study Group

With this in mind, here I briefly revisit two main features of the theory of expansive learning and formative interventions that informed my approach to data analysis: a focus on group learning rather than individuals, and the concept of ascending to the concrete (see Chapter 2 for detailed descriptions of each). First, as discussed earlier, the theory of expansive learning was developed to support and explain learning and change within work organizations. Related research considers the structures for participation and coordination within systems of activity of primary focus for intervention and study (Engeström, 2001). For this reason, analyses of expansive learning focus beyond the level of individual participants to consider instead the concrete and conceptual innovations developed around a *shared object* of work activity; these changes are identified as main indicators of learning and growth (Engeström, 2011; Engeström et al., 2005; Virkkunen & Newnham, 2013). As Engeström and Sannino (2010) assert, "traditionally [researchers] expect learning is manifested in changes in the *subject*, i.e. the behavior and cognition of the learners. Expansive learning is manifested primarily as changes in the *object* [emphasis added] of the collective activity." (p. 8). Accordingly, the results in these chapters describe the progression and change in how the group conceived of the *shared object* of activity (i.e. pre-service teacher learning in field experience), both through analysis of the

disturbances in work activity participants identified and addressed over the course of the Mentoring Study Group intervention (Question 1) and through analysis of the concrete and conceptual tools developed and implemented into practice by the group to resolve the problems they identified (Question 2). Throughout these chapters, I point to changes related to the *shared object* as evidence of expansive learning.

Next, as discussed in Chapter 2, expansive learning is linked inextricably to practice and is marked by movement towards concrete innovations and change. Thus, identifying the development of new tools and patterns of activity is essential for understanding learning, and movement towards increasingly practice-oriented concepts to guide work activity is analyzed here as evidence of expansion. Results for Question 2 highlight concrete outcomes most directly in describing the development of the tool itself and the introduction of new and innovative concepts related to ways of supporting pre-service teacher learning in the field. An example is how to use the shared tool to identify topics of focus throughout the observation phase in fall quarter and during student teaching winter and spring quarters. Question 3 also examines movement towards the concrete, as the learning actions presented in the cycle of expansive learning are themselves a conceptual instantiation of this process (Engeström, 2001). Finally, the analysis of work disturbances for Question 1 reveals the particular challenges that arose as the group developed, implemented, and refined the shared tool to support their work with pre-service teachers in the field; by definition, disturbances in work activity are bound to practical experience, and the new solutions participants developed and introduced are understood in terms of how they function and mediate concrete practice and routines of work.

Overview of Results

Here I present a descriptive overview of learning outcomes as they occurred over the three phases of the Mentoring Study Group to help the reader follow the emergent process of learning as described through results of analysis. Broadly, analysis reveals a dialogic process between the persistent problems of practice (disturbances) participants encountered in their work and the potential tools and concepts that were introduced to resolve these problems over the course of the intervention. Put another way, as problems were identified and potential solutions introduced in each phase, new contradictions and problems emerged in meeting discussions that, in turn, encouraged further refinement of tools, specification of challenges, and expanded conceptions of the *shared object* of activity.

Analysis of disturbances in Phase 1 reveals that the group focused most closely on problems related to a lack of clarity around the particulars of what pre-service teachers were presented with in university methods courses and were expected to observe and enact in field experience; these disturbances are included in the category Underspecified Goals and Pedagogies for Learning in Field Experience that will be described in detail in Chapter 6. In particular, participants pointed to missed learning opportunities for pre-service teachers who were unclear about the important features of teaching to focus on for observation, and frustrations related to a chronic disconnection between the university and school site that prevented mentor teachers from accessing information about university-based topics of focus or expectations for specific mentoring practices. Within and emerging from discussions addressing Underspecified Goals and Pedagogies for Learning in Field Experience, in Meetings 1 and 2 the group also began making suggestions to create a shared tool for mentor teachers and supervisors that would guide

topics of focus in field experience and open up new learning opportunities during the fall quarter observation phase. The construction of this shared tool and the development of concepts for its use in practice were main topics of focus in Phase 2.

At the beginning of Phase 2, the group was joined by the university math methods instructors and presented with the "five high-leverage math practices" emphasized in the math methods course (see Figure 3.2). In Meetings 4 and 5, the group developed and implemented a shared observation protocol tool into their direct work with pre-service teachers in the field based on these "five high-leverage math practices." With knowledge of the specifics presented at the university and experience implementing the shared tool in practice, during Phase 2 participants identified new disturbances related to efforts to prepare pre-service teachers to enact practices that demanded expertise from novices. In particular, the group discussed multiple Challenges of Learning to Enact Ambitious Instruction and considered the potential ways modifications to the shared tool could better address this goal. During Phase 2, the group also addressed both the potential for improvement and the limitations of the "five high-leverage math practices" protocol, and they continued to offer suggestions for modification to the shared tool based on meeting discussions and reflections on its use in practice.

Finally, in Phase 3, during final reflections on the "five high-leverage math practices" shared observation protocol tool and discussions of ways to modify and improve the tool, the group began to raise new disturbances that suggest learning through a broadened conception of the *shared object*. As participants proposed and considered ideas for mentoring practices to support ambitious teaching (e.g. modeling teacher decision-making within lessons, offering positive feedback to pre-service teachers for generating questions in the moment to support student learning), they uncovered a fundamental contradiction between efforts to prepare new

teachers for ambitious instructional practice and a System (that) Prepares Pre-service Teachers for "Formula Lessons." Participants questioned whether the typical assignments and topics of focus in teacher preparation (e.g. the edTPA) actually worked against the development of ambitious instructional practice, as pre-service teachers were implicitly guided to "stick to the plan" rather than to respond to students' developing conceptions and unanticipated questions. To address the need for attention to demands for generating questions in the moment to build upon students' ideas (as promoted through the "five high-leverage math practices"), the group added a "+1" to the shared tool to address the need to respond to students *while teaching.* This concrete change was an explicit attempt to move beyond lesson plan "formulas" disturbance, and was accompanied by additional practical plans to model and unpack in-the-moment decision-making in fall quarter to focus more explicitly on preparing pre-service teachers for the complex dynamics of actual classroom teaching experience.

With this broad summary of the Mentoring Study Group learning outcomes in mind, I present findings for research questions separately in detail in Chapters 6 - 8, including examples from the data to illustrate the themes evident in the data and to describe the development of concrete tools and practices over the three phases of the intervention.

CHAPTER 6

Key Problems for Practitioners

According to Engeström (2011a), contradictions are the "necessary but insufficient engine of expansive learning in an activity system" (p. 78). Designed to provoke and sustain expansive learning, formative interventions offer a structure through which practitioners can uncover and confront contradictions within or across intersecting systems of activity as they identify key problems in their work and collaboratively develop and implement solutions. These contradictions are theorized to be at the root of problems of practice encountered at work but impossible to observe directly; therefore, contradictions must be approached through their concrete manifestations (Engeström & Sannino, 2011; Helle, 2000).

Like others, in this chapter I investigate structural and historical contradictions through the frame of "disturbances" in work activity. A disturbance is a general concept, distinguished from the more specific "problems" that are "used to define a situation, [and] where the participants have become aware of the disturbances and try to solve them" (Helle, 2000; p. 8). Furthermore, disturbances are understood to be "symptoms or manifestations of inner contradictions of the system in question" (Engeström & Sannino, 2011; p. 372), and therefore help to illuminate the underlying sources of problems of practice. Therefore, through examining the question, "What problems did the group identify?" my broad goal is to access the key contradictions within and across the UC Irvine-Ludlow Magnet School systems of activity that challenge the work of mentoring pre-service teachers in the field. Below, I present results of data analysis to show the main categories of disturbance participants identified across the three phases of the study, and I connect these to the underlying contradictions they suggest.

Question 1: What problems did the group identify?

I identified eight distinct categories participants noted in their work through analysis of work disturbances (see Chapter 4). Table 6.1 presents these disturbance categories and the frequency with which they were addressed within meetings. In addition, Table 6.1 links categories to related dimensions of activity systems (see Figure 3.1) to highlight the key "locations" within and across the UC Irvine and Ludlow Magnet School systems of activity that contributed to complication and challenge for the work of mentoring pre-service teachers in the field. Organizing results in this way helps to illuminate the features of the surrounding systems of activity that were main sources of the problems that emerged in practice, and also makes visible the group's expanding conception of the complexity of the *shared object* over the three phases of meetings through shifts in the categories of disturbances they discussed. Below, I describe the results presented in Table 6.1 in detail.

Table 6.1
Analysis of disturbances: Themes and Frequencies

Activity system dimensions	Categories of disturbances	PHASE 1		PHASE 2			PHASE 3		
		Mtg 1	Mtg 2	Mtg 3	Mtg 4	Mtg 5	Mtg 6	Mtg 7	Total
SHARED OBJECT	Underspecified Goals and Pedagogies for Learning in Field Experience	5	14	3		2			24
	Challenges of Learning to Enact Ambitious Instruction			9	3	4	2	1	19
	System Prepares Pre-service Teachers for "Formula Lessons"				5	1		8	14
								Shared object total instances:	57
INSTRUMENTS AND TOOLS	edTPA and the "Teaching Event"	1		3			2	1	7
	UCI Lesson Planner		3						3
	Misalignment Between Instructional Practices Modeled in Field Settings and UC Irvine		1			1	1	3	6
	SWUN curriculum	2	3	5					10
								Instruments/tools total instances:	26
NORMS/ RULES DIVISION OF LABOR	UC Irvine Program Structure				4	4		2	10
								Norms/rules and Division of Labor total instances:	10

A review of Table 6.1 makes clear that the group focused attention on problems related to the *shared object* both within and across all phases. Disturbance frequency counts reveal a total of 57 instances in which participants voiced challenges or problems related to the *shared object* over the three phases, whereas *instruments and tools* were identified in 26 instances, and *norms/rules* and *division of labor* were addressed in only 10 instances. Although it is noteworthy that within each phase there were points at which participants also described problems and challenges related to *instruments and tools*, and *norms/rules* and *division of labor*, the *shared object* received the most attention both within all seven individual meetings and across each

phase. For this reason, in this section I acknowledge and briefly describe participant references to the tensions between the particular *instruments and tools* that guided practice at Ludlow Magnet School and UC Irvine (e.g. SWUN curriculum, UC Irvine lesson planning tool, edTPA requirements) and the constraints on communication embedded in the institutional structures in place for supervision and mentoring in field experience (e.g. requirements for only three supervisor observations each quarter), but I focus most closely on themes related to the *shared object* of learning in the field.

As noted earlier, the analysis of disturbances finds that the group began Phase 1 by focusing on frustrations related to the general lack of specificity regarding goals for learning in field experience and the pedagogies practitioners could or were expected to use in mentoring, then shifted attention towards disturbances related to the unique challenges of learning to enact ambitious instruction in Phase 2, and finally considered the broader questions related to how the surrounding systems of teacher education can more authentically prepare new teachers for the dynamic realities of the classroom, including the demands for responsiveness called for in enacting ambitious teaching in Phase 3. These results indicate that over the course of the intervention the group expanded their understanding of the complexity of mentoring and learning to teach in field experience, as they moved from a more limited scope of seeking to connect course content to the classroom to consider whether barriers to the development of ambitious instructional skills for beginning teachers were embedded within the surrounding systems of activity. Furthermore, results demonstrate that the group recognized that the shared tool for guiding observations and feedback on teaching introduced into practice in Phase 2 did not fully resolve the problems of practice participants regularly encountered in their work. In Phases 2 and 3 the group uncovered and eventually focused most closely on problems related to concurrent

and opposing forces of aiming to prepare new teachers for ambitious (and, therefore, responsive) teaching through learning activities that so heavily emphasized pre-planning and reflection that pre-service teachers resisted deviating from planned tasks and questions -- even upon recognizing the need to do so. Below, I present examples for each phase to show how the group collaboratively identified key problems and crafted potential solutions of new tools and concepts to guide their work in the beginning phases of the intervention, then deepened their understanding of the *shared object* as they raised new questions and discussed tensions and challenges that emerged as a result.

Phase 1 theme: Underspecified Goals and Pedagogies for Learning in Field Experience

Overall, analysis reveals that in Phase 1 the group was primarily concerned with work problems related to Underspecified Goals and Pedagogies for Learning in Field Experience. Throughout both Meetings 1 and 2, participants described the concrete issues that came up as a result of underspecification, such as frustrations with pre-service teachers who were unable to identify important features of the classroom and instruction to observe and enact and mentor teachers' lack of knowledge about the particulars of methods course content to guide the instructional practices they modeled and discussed in the classroom. In the first two meetings (Phase 1), participants consistently asserted that Underspecified Goals and Pedagogies for Learning in Field Experience was the source of the main challenges in their work, both historically and in current practice. The challenges related to underspecification comprised the totality of comments related to the *shared object* across the entire phase: Table 6.1 shows that in Meetings 1 and 2 participants offered a total of 19 comments related to the this particular theme -- more than twice the frequency of work disturbances described for all other activity system dimensions in Phase 1 combined.

In particular, in Phase 1 the group repeatedly pointed to the absence of guidance around which topics were most important to focus on during field experience. Participants connected the lack of guidance to chronic missed opportunities for pre-service teachers to learn through observation, and to constraints on mentoring due to teacher educators' uncertainty regarding the instructional strategies which were most important to model in the classroom and to highlight in lesson plans, and how to focus their observations during feedback conferences. Moreover, both mentor teachers and supervisors asserted that although Underspecified Goals and Pedagogies for Learning in Field Experience resulted in problems for both mentor teachers and supervisors, mentor teachers were most impacted given the amount of time pre-service teachers spent with them in field experience and the general expectation that field placement classrooms were aligned with the approaches to teaching promoted at the university. Without specification of the practices and approaches, however, mentor teachers were unsure of what exactly to emphasize and model. Through the works of the participants themselves, below I offer evidence from meeting transcript data to illustrate dimensions of the main category of focus for Phase 1.

"[Pre-service teachers] don't know what they're looking for…. They don't know what they don't know": missed opportunities to learn through observation. Problems related to the disturbance of Underspecified Goals and Pedagogies for Learning in Field Experience was first raised in Meeting 1 within a discussion of current and past personal experiences with mentoring pre-service teachers in the field. This discussion occurred following a video-based activity in which participants watched portions of a video clip a UC Irvine pre-service teacher had submitted for his credential portfolio application in the year prior to the study. After viewing the clip, participants in the group were asked to share points of feedback they might offer the pre-service teacher based on what they saw. With the ideas charted for the

whole group to see, I asked participants to identify common themes within the feedback comments they raised to determine the extent to which the group had a shared vision for mentoring and pre-service teacher learning. Participants identified a few thematic points of agreement (e.g. classroom management, the "role" of the teacher and students), then began sharing personal experiences mentoring pre-service teachers that reflected ideas listed on the chart and spoke broadly of the challenges of mentoring and learning in the field. Several participants raised problems of missed learning opportunities because pre-service teachers do not know what to focus on in field experience. Segment 1 below provides an example of how participants connected problems rooted in Underspecified Goals and Pedagogies for Learning in Field Experience to the constraints on learning in practice:

Segment 1

Diana: *I had an issue a few years ago where I had a student teacher that was really floundering with management issues… And in her defense, she said to me, "But I've never been shown how to do management in here." And I almost fell down. Okay? And so I said, "Oh, really? Oh!"… So I said, "Well. Let's go through all of the different things that constitute management," and we compiled this list. And I'm not kidding you, our list was like [this] long [holds arms out]. And I said, "Your objective for now….focus in and only look for management for the next however many days, and then we're going to debrief again … and so she did. And then we came back and she goes, "I didn't know what I was looking for." And I thought that was really interesting. And so that was a big learning thing for me. Because I'm like, "How do you not know? What is wrong with you?" But it was a really productive thing….*

Diana's comment above highlights the challenge that, without specification of topics of focus, pre-service teachers were not able to recognize the instructional practices and strategies being modeled in field experience. According to Diana's account, the list of "what constitutes management" made the strategies visible for the pre-service teacher, who then articulated the problem she had faced as, "I didn't know what I was looking for." Moreover, Diana pointed to

her own frustration with pre-service teachers that stemmed from the absence of topics of focus when sharing her own reaction to the experience: "How do you not know? What is wrong with you?"

Following this comment, the group immediately began making suggestions to resolve the problem of Underspecified Goals and Pedagogies for Learning in Field Experience, including establishing a common set of topics of focus that mentor teachers, supervisors, and pre-service teachers would use as a guide for topics of focus during student teaching in winter and spring quarters. Later in this discussion, another mentor teacher, Angela, returned to Underspecified Goals and Pedagogies for Learning in Field Experience to identify problems not just during student teaching, but throughout the fall quarter observation phase as well. In the excerpt below, Angela pointed to underspecifiction to justify her suggestion of introducing structure into the Fall quarter observation phase:

Segment 2

1 Angela: *Something I'm always troubled with is fall observation hours…*
2 *…One thing I've always wanted is something more structured...*
3 *I feel like those however many hours they spend observing us*
4 *are sometimes wasted because they don't know what they're*
5 *looking for…they don't know what they don't know.*

Towards the end of Meeting 2 a supervisor, John, returned to the problem of "wasted" observation hours that Angela first raised in Meeting 1. The group then discussed the potential uses of a shared tool the group could use to guide the topics of focus and learning experiences offered in field experiences. In this discussion, participants made suggestions for using topics listed on a shared tool as a guide for the features of teaching to which they could draw pre-service teachers' attention when modeling instruction. Following Justine's comment that, "We would have to make an effort to be really, really specific in what we're [modeling]….because [pre-service teachers] might be looking for it, but again, it goes back to do they really know what

they're looking for?," John suggested that the topics of focus would support pre-service teachers who were struggling to learn in field experience. In response, Angela invoked her own field experience to fully articulate the learning opportunities missed in the absence of topics of focus:

Segment 3

John: *Because those observation hours can just be lost…. They're just sitting there daydreaming…and it has nothing to do with what [the mentor teacher] is doing and….*

Angela: *I think [when I was a student teacher] I was looking at the wrong things. I was looking at the bulletin boards and I was looking at… things that were pretty and, like, caught my eye. But I didn't know… I had no clue that seeing how [a teacher] transitions is way more important than bulletin boards.*

It is important to note here that the pre-service teacher candidates did have field journal assignments on various topics for observation (e.g. "How does this teacher support students' ability to construct viable arguments?") throughout the fall quarter. However, those assignments did not direct pre-service teacher candidates to ask specific questions of mentor teachers regarding instructional practices or routines, and mentor teachers were not required to (and did not typically) review journal entry assignments. Furthermore, participants' multiple examples of pre-service teachers not knowing what to look when observing (see Segments 1 -3 above) indicate that the university field assignments in fall quarter, regardless of their intended purpose for learning in field experience, did not function as a tool that coordinated a shared vision of mentoring or shared understanding of goals for pre-service teacher learning among participants in the group.

"What are they learning specifically?": constraints on mentoring practices. In addition to pointing out the difficulties pre-service teachers faced in recognizing the important features of the classroom and mentor teachers' instructional practices to focus on during field experience, participants in the group agreed that Underspecified Goals and Pedagogies for

Learning in Field Experience presented obstacles that constrained mentor teachers' ability to highlight the instructional practices that connected to course emphases and topics of focus. In other words, without knowledge of the content of methods courses, mentor teachers could not draw pre-service teachers' attention to the ways course content was featured, taken up, and/or problematized in actual classroom practice. Thus, in Phase 1 meetings mentor teachers sought out more specific details of coursework to inform what they would model, highlight, and talk about with pre-service teachers in the classroom.

The example below presents evidence of mentor teachers' interest in course content. The excerpt is drawn from a discussion in Meeting 2 which participants were asked to offer ideas for what skills, knowledge, and practices they would like to see pre-service teachers develop through field-based learning. Note that the question posed prior to this response did not direct participants to look for ways to bring university course content into the classroom, but rather was intended to elicit ideas that represented both practice-based knowledge of teaching as well as goals for learning in field experience that were research-based or connected to university coursework. The question I asked the group was, "What are the things we want [pre-service teachers] to learn [in field experience], and what might we name [those things]?.... has anyone given that any thought [since the last meeting]? Does anyone have ideas?" Immediately following this question, mentor teachers began asking for "better definition*"* of the particular instructional practices pre-service teachers were directed by UC Irvine to observe in the classroom so that they could be explicit in modeling those practices and hold both themselves and pre-service teachers more accountable for learning in the field. The excerpt below presents the moment in which one mentor teacher, Justine, requested specific information about course content. A supervisor, Margaret, then agreed with her and articulated the need to better connect

coursework to field experience. Margaret went on to identify this as an historical issue, asserting that the persistence of Underspecified Goals and Pedagogies for Learning in Field Experience had resulted in chronic misalignment in the instructional practices modeled in field placements and strained relationships between mentor teachers and pre-service teacher candidates over time:

Segment 4

Justine: *But what I'm thinking is…. what are they learning specifically in [methods courses]?... What are the strategies and things being taught? Even if it was just like big ideas or just a few of the concepts, I would make sure I was discussing or at least having a few of those things if I knew a little bit more… because people want to do their best.*

Margaret: *Well, I'm just really glad you said that because as simple as that may sound, it's something, I think, that mentor teachers really do want to do their best. When they're given a student teacher, they're not always given the curriculum that the student teacher has. And then on down the line during supervision, the student teacher will say to me, "Oh, they're not doing what…we're being taught at UC Irvine." And I'll think to myself, "Oh, I thought they are supposed to know what we're teaching the student teachers…. And so it's like there's some frustration going on there between the mentor teacher and the student teacher year after year after year.*

Margaret's comment above illuminates the historical aspect of challenges related to disconnection between the university and partners schools, as she notes the frustration "year after year after year" for mentor teachers and the pre-service teacher candidates. Moreover, this comment ties together the related subthemes described above that speak to the missed learning opportunities for pre-service teachers in field experience, and the constrained potential of mentoring to support connections across settings due to the lack of specification regarding field-based learning. As noted, in Phase 1 the group moved quickly from agreement regarding key problems of practice to suggestions for solutions in the form of new tools and concepts to guide field experience. I will discuss the development of these concrete tools in detail as I present the learning outcomes for Question 2. Here, I briefly present the themes related to problems with the

instruments/tools as identified by participants in Phase 1. Of note below are the problems and constraints embedded within the existing tools oriented towards the *shared object* of activity that were in place prior to the Mentoring Study Group intervention.

Instruments and tools: SWUN curriculum and the UC Irvine lesson planner. Within the meeting transcript data for Phase 1, there were two main categories of disturbance related to *instruments and tools*: the district-mandated SWUN mathematics curriculum at Ludlow Magnet School, and the "long form" lesson planning tool UC Irvine required pre-service teachers to use. Although these tools were not identified as the primary issues challenging mentoring and learning in the field, I present a few examples here to better describe the problem space into which the Mentoring Study Group intervention was introduced, and to support the interpretation of learning outcomes presented in this chapter.

First, mentor teachers expressed frustrations with the SWUN curriculum for their own teaching practice and described SWUN as a problematic tool for supporting pre-service teachers in learning to teach mathematics. Mentor teachers asserted that SWUN lacked conceptual depth and offered minimal curricular resources for teachers, which was particularly challenging for pre-service teachers. When first discussing the SWUN curriculum in Meeting 1, Angela asserted that novice teachers needed more guidance for leading lessons than the materials provided, stating: "I've been teaching for ten years…. So I know what kind of questions to ask. If I handed my student teacher SWUN… she's not going to be able to ask the questions…[she] doesn't know what kind of questions to ask. [She] doesn't know where [students are] going to get confused." Interestingly, although this comment was focused on the SWUN curriculum in particular, it also reflects the primary category of focus for Phase 1 -- Underspecified Goals and

Pedagogies for Learning in Field Experience. It is clear from Angela's statement that SWUN was not considered a useful guide in determining topics of focus for field experience.

Next, in Meeting 2 several mentor teachers pointed to the UC Irvine lesson planner as unwieldy, and their comments make it clear that the lesson planner did not operate as a tool for communication across settings that connected the goals and priorities for learning advocated by the university program with classroom practice. Instead, mentor teachers described the tool as "wordy" and difficult to understand due to the highly particular use of vocabulary for teaching that was inconsistent with the language of teaching more familiar to practicing teachers. In a discussion of problems related to the UC Irvine lesson planner in Meeting 2, Stephanie pointed to the university-school disconnection highlighted by the lesson planner as she commented, "That goes back to us not being connected with what's happening in the classrooms because they're learning certain verbiage and they're being taught to do things in ways that we have not been taught or we've been gone [from the university] environment for so long." Through this comment, Stephanie not only addressed the limitations of the lesson planner tool, but also drew attention to the need to develop a shared vocabulary for teaching to connect learning across the university and school site systems. Although the development of a new tool with an accompanying shared vocabulary was not taken up immediately at this point, the comment illustrates the group's awareness of the disconnection – and the need for better communication – from the beginning of the Mentoring Study Group intervention.

Uncovering a potential contradiction: preparing pre-service teachers vs. lack of shared vision of teaching. In terms of the CHAT frame for this analysis, the key disturbance of Underspecified Goals and Pedagogies for Learning in Field Experience points to a potential underlying contradiction within or across the UC Irvine – Ludlow Magnet School systems of

activity. As described above, participants attributed missed learning opportunities for pre-service teachers, frustration for mentor teachers, and a lack of coordination among participants in the group in general to this disturbance, and their comments point to the historical persistence of problems (e.g. "there's some frustration going on there between the mentor teacher and the student teacher year after year after year"). As practitioners, participants were charged with guiding pre-service teacher learning in field experience, but were not offered a vision of teaching to promote and were left without field-based pedagogical practices as a guide. Thus, practitioners experienced the tensions of taking on responsibility for supporting learning in the field without specification of what it means to learn in the field.

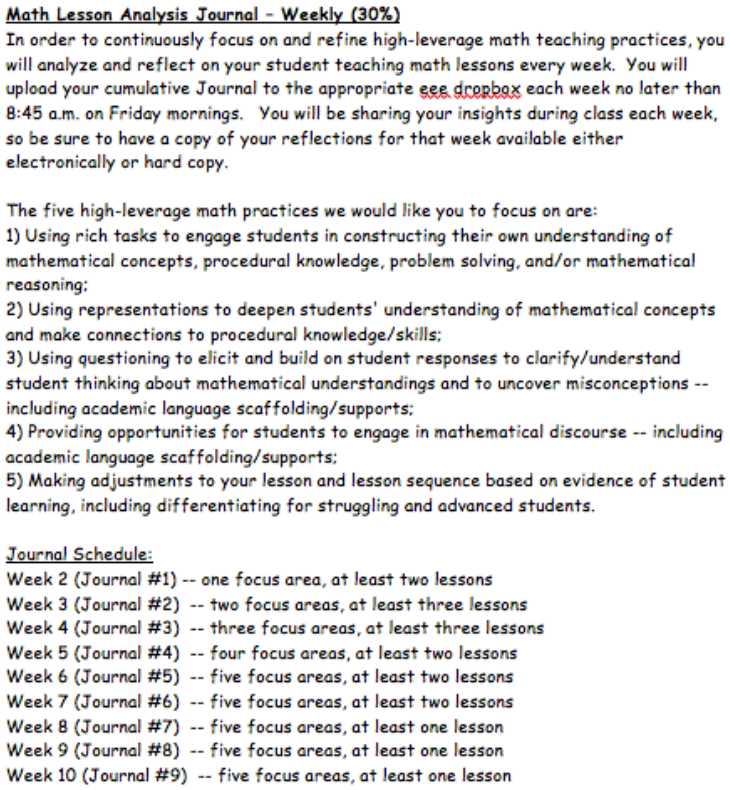
As participants engaged in the intervention, the discovery of the tensions related to the main category of disturbance in their work provoked suggestions for ways to move towards concrete change (e.g. introduction of a shared tool, structured observations). This process began in Phase 1, and the analysis of disturbances for Phase 2 provides evidence that as the group gathered information to develop concrete goals for mentoring strategies, an expansive process continued participants opened up new problems related to the challenges of learning to enact ambitious teaching, resulting in an increasingly complex understanding of what it means to mentor pre-service teachers to learn in the field.

Phase 2: Challenges of Learning to Enact Ambitious Instruction

Prior to presenting findings of analysis of disturbances for Phase 2, it is important to account for special circumstances of Meeting 3 that contextualize and help make sense of the outcomes described below. Based on meeting discussions and the problems raised by participants in Phase 1, it was clear to me that the group wanted more information regarding the content of university coursework and expectations for field experience that would enable them to devise practical solutions through connecting the topics of focus emphasized in field experience with those introduced at the university. Because of the interest in finding out what exactly pre-service teachers were learning in their methods courses, at my request in Meeting 3 the UC Irvine math methods instructors, Liz and Sally, agreed to participate in the Mentoring Study Group meeting. In addition, my faculty adviser joined Meeting 3 and participated in discussions as a joint facilitator.

During Meeting 3, Liz and Sally shared the research-based "five high-leverage math practices" presented in the math methods course syllabus and emphasized through course assignments (see Figure 6.1). As discussed in Chapter 3, these practices were explicitly intended to promote the goals of ambitious mathematics teaching, and were aligned with the Common Core standards and the portfolio assessment for teacher candidates (PACT) in California that year. I refer to these practices again here because once presented to the group in Meeting 3, the "five high-leverage math practices" largely anchored discussions related to the development of the shared tool the group created and implemented into practice during Phase 2 and finalized in Phase 3. Moreover, the category Challenges of Learning to Enact Ambitious Instruction speaks

directly to the "five high-leverage math practices" and their potential use as the basis of a shared observation protocol tool[1].



Math Lesson Analysis Journal – Weekly (30%)
In order to continuously focus on and refine high-leverage math teaching practices, you will analyze and reflect on your student teaching math lessons every week. You will upload your cumulative Journal to the appropriate eee dropbox each week no later than 8:45 a.m. on Friday mornings. You will be sharing your insights during class each week, so be sure to have a copy of your reflections for that week available either electronically or hard copy.

The five high-leverage math practices we would like you to focus on are:
1) Using rich tasks to engage students in constructing their own understanding of mathematical concepts, procedural knowledge, problem solving, and/or mathematical reasoning;
2) Using representations to deepen students' understanding of mathematical concepts and make connections to procedural knowledge/skills;
3) Using questioning to elicit and build on student responses to clarify/understand student thinking about mathematical understandings and to uncover misconceptions -- including academic language scaffolding/supports;
4) Providing opportunities for students to engage in mathematical discourse -- including academic language scaffolding/supports;
5) Making adjustments to your lesson and lesson sequence based on evidence of student learning, including differentiating for struggling and advanced students.

Journal Schedule:
Week 2 (Journal #1) -- one focus area, at least two lessons
Week 3 (Journal #2) -- two focus areas, at least three lessons
Week 4 (Journal #3) -- three focus areas, at least three lessons
Week 5 (Journal #4) -- four focus areas, at least two lessons
Week 6 (Journal #5) -- five focus areas, at least two lessons
Week 7 (Journal #6) -- five focus areas, at least two lessons
Week 8 (Journal #7) -- five focus areas, at least one lesson
Week 9 (Journal #8) -- five focus areas, at least one lesson
Week 10 (Journal #9) -- five focus areas, at least one lesson

Figure 6.1 The "Five High-Leverage Math Practices"

With this consideration of the circumstances of Meeting 3 in mind, Phase 2 analysis outcomes demonstrate that following the introduction of the "five high-leverage math practices"

[1] Here I draw attention to my use of the term "ambitious teaching" to describe the approach to instruction represented by the "five high-leverage math practices." Although participants themselves did not invoke this term in discussions, members of the group often referred to Cognitively Guided Instruction (CGI) to describe the ways the "five high-leverage math practices" were enacted in practice. Because CGI reflects an ambitious approach to teaching (see Chapter 1), in my analysis I considered comments that referenced CGI to be evidence of talk related to ambitious teaching. For example, participant comments regarding the difficulty in learning to enact questioning to guide discussion-based learning through CGI are included in the theme of Challenges in Learning to Enact Ambitious Instruction. Throughout this chapter and in the discussion of findings in chapters that follow, I will use the term "ambitious teaching" to describe the kind of instruction advocated by university instructors and addressed by the Mentoring Study Group through discussions of the advantages and limitations of the "five high-leverage math practices" protocol.

the group spoke with increased specificity regarding problems of practice related to pre-service teacher learning in the field. Furthermore, over the three meetings of Phase 2 participants began to talk about pre-service teacher learning as a highly complex *shared object* of activity. Evidence of the group's developing understanding of the *shared object* can be found within discussions focused on the particular features of ambitious instruction most challenging to learn to enact, and in the ways participants collectively considered the demands for expertise and in-the-moment decision-making ambitious instruction required. Thus, Phase 2 is marked by an expanding notion of the goals for learning in field experience and increased attention to the specific challenges and problems faced by teacher educators and pre-service teachers in the field.

As shown in Table 6.1, in Phase 2 there were a total of 27 comments focused on problems related to the *shared object,* whereas *instruments and tools* was addressed nine times and *division of labor and rules/norms* were addressed eight times over the entire phase. However, Phase 2 disturbances focused on the *shared object* mark a decrease in comments related to Underspecified Goals and Pedagogies for Learning in Field Experience as two new categories emerged: Challenges of Learning to Enact Ambitious Instruction and Preparing Pre-service Teachers for "Formula" Lessons. Because Challenges of Learning to Enact Ambitious Instruction was featured in Phase 2, I describe this theme in detail here. The category of Preparing Pre-service Teachers for "Formula Lessons" will be introduced in this section but not discussed in depth until Phase 3 findings are presented below, as this was taken up as a key point of interest in the final two meetings of the intervention.

As noted above, problems concerning Challenges of Learning to Enact Ambitious Instruction emerged immediately following the introduction of the "five high-leverage math practices." There were two main dimensions of the category evident in the data. First,

participants repeatedly argued that pre-service teacher candidates may not have been capable of enacting ambitious teaching in field experience due to lack of experience in the classroom. They noted that ambitious instruction places high demands on both breadth and depth of teachers' knowledge of typical student conceptions and misconceptions, prior academic learning, and the content itself. By definition, pre-service teachers have access to only a limited knowledge base and few developed skills in instructional practice. Second, the group spoke at length about the barriers pre-service teachers faced in general when called upon to respond to student learning needs as they emerged and occurred in practice. Responsiveness, in the form of generating questions to guide student learning while teaching, was identified as a key aspect of ambitious instruction. Participants argued that pre-service teachers resisted deviating from planned learning tasks and activities, especially when being observed by supervisors or when filming lessons for their credential portfolio submissions. Thus, the group began to consider the possible paradox that by sticking closely to lesson plans designed with ambitious instructional intent, pre-service teachers actually sacrificed opportunities to enact ambitious teaching in the moment. Below, I present examples from the data to illustrate each of these key dimensions.

"The [five high-leverage math practices are] definitely a challenge even for teachers that are well-seasoned. I just wanted to say that.": demands for expert knowledge. As mentioned above, participants repeatedly called into question whether pre-service teachers were capable of learning to enact to the "five high-leverage math practices" in field experience given their limited practice-based knowledge of teaching and classroom experience. The excerpt below illustrates the way participants addressed this idea, and is drawn from Meeting 3 during a discussion in which participants "unpacked" the meaning of the "five high-leverage practices" with the math methods instructors to determine if the group indeed brought a shared

understanding of these practices to their work with pre-service teachers. In this discussion (and throughout meetings in Phase 2), participants often pointed to questioning as the most challenging of the "five high-leverage practices" to enact, asserting that questioning placed unique and heavy demands on in-the-moment decision-making to guide student learning. In the excerpt below, Diana connected her own competence in the high-leverage practice of questioning (see Figure 6.1) to her years of classroom experience. In raising this idea, Diana contrasted her decision-making while teaching with a pre-service teacher's attempts to anticipate and respond to student questions:

Segment 5

Diana: *I think it's hard for student teachers to pre-think and anticipate questions because it's in the moment. You don't know. There could be days that I could go in there and I think I've planned this fabulous lesson and knock it out of the park in a sense where [students] all "get it" like that. Having taught for 15 years, you could figure out where to go next. They don't. And vice versa, when the kids are… like, today [the pre-service teacher] was stuck. She did not know how to dig her way out.*

In this example, it is noteworthy that Diana suggested the knowledge she developed through experience enabled her to "figure out where to go next." As this knowledge is not available to pre-service teacher candidates, a novice may not have adequate resources to "dig her way out" when student learning did not occur as anticipated.

In other comments addressing the need for expertise to enact ambitious teaching, mentor teachers pointed out the challenges they themselves continued to face in practice, and framed questioning once again as potentially out of reach for pre-service teachers. The excerpt below is drawn from a discussion that occurred towards the end of Meeting 3 in which the group was planning for the next meeting agenda together. Several participants expressed interest in

continuing discussions about the meaning of each of the "five high-leverage math practices" in the next meeting. In the excerpt presented below, Justine returned to the idea that the practices demanded a level of expertise that might be unavailable to pre-service teachers. In response, the math methods instructor (Liz) declared that pre-service teachers were not expected to master the "five high-leverage math practices" in the short term (i.e. during student teaching). Mentor teachers then reasserted the difficulty of generating questions to guide student learning, suggesting that they still saw these "five high-leverage math practices" as problematic even if pre-service teachers were not expected to demonstrate mastery:

Segment 6

Justine: *I'm just looking at [the five high-leverage math practices]. I'm just thinking on my own traveling through [Cognitively Guided Instruction] and just where I started. I still, to this day, struggle with uncovering the misconceptions or trying to pull out explaining – "what were you really trying to say?" [The five high-leverage math practices are] definitely a lot of challenge for teachers that are well- seasoned. I just wanted to say that.*

Liz: *You know, we actually talk to our student [teachers] about this and say, "This is the beginning of a journey for teaching. We don't expect you to be masters of these things yet, but we hope that by seeding this long term goal for you to be developing, we hope that you'll take those and keep paying attention to them.*

Marie: *I know, like [Justine] said. I don't feel like I've mastered those [practices] in every lesson.*

Justine: *We talked about that when [Marie and I] did our co-teaching with [Cognitively Guided Instruction]. It was kind of neat during last summer where we were able to be in the classroom together and kind of go, she'll do a lesson and I'll do a lesson and we'll talk about it, go around and question the kids. But sometimes we're like, "I don't even know what to ask this kid next!"*

In this example, note that Liz's comment acknowledged ambitious instruction as an expert practice that pre-service teacher may not yet be positioned to fully demonstrate. However,

although Liz recognized the gap between ambitious teaching and novice skills and knowledge, she did not make specific suggestions of how to mentor a pre-service teacher candidate towards ambitious instruction in field experience. Instead, Liz's commented that she "hope[d]" pre-service teachers would benefit from "seeding this long term goal" in their teaching; the particulars of how to pursue that goal in practice were still left unaddressed and undefined at this point.

"I think the idea of what she wanted to do…could have been very valuable. But the way [learning activities] were presented to the class….:" planning lessons and enacting ambitious instruction. In addition to considering the possible challenges to learning to teach ambitiously in field experience attributable to novice knowledge and skills, the group also talked about Challenges of Learning to Enact Ambitious Instruction due to the instructional strategies pre-service teachers invoked (or did not invoke) during lessons. In other words, participants addressed distinctions between planning lessons and actually enacting ambitious teaching. The next excerpt is drawn from Meeting 3, during a discussion in which the group "unpacked" the meaning of rich tasks. In this example, Angela recounted an incident to illustrate the difficulty pre-service teachers faced in attempting to teach ambitiously, even within lessons planned specifically to include rich tasks. In response to Angela's comment, the methods instructors (Liz and Sally) once again acknowledged the problem of planning but not enacting ambitious instruction. Notably, their quick confirmation suggests that Liz and Sally were already aware of this as a problematic issue faced by pre-service teachers:

Segment 7

1 Angela: *I think they might have a good task that with the right*
2 *questioning could become a rich task. But there is a*
3 *difference between telling [students] how to do [a task]*
4 *versus [asking questions] "What do you see? What do you*
5 *notice? What's happening here?"….my point is...when the*

6		*[planned] lesson came -*
7	Sally:	*[The pre-service teacher] didn't know what to ask or what to*
8		*say.*
9	Angela:	*And where to go…I think the idea of what she wanted to do*
10		*and the tasks that she had could have been very valuable.*
11		*But the way that they were presented to the class and the*
12		*manner in which the class was told to do these things versus,*
13		*"Explore, talk to your neighbors, take out that whiteboard*
14		*and draw pictures and do that." I don't think it was -*
15	Liz:	*You can plan a rich task, but not enact it.*

Following this exchange, mentor teachers offered other examples of the ways in which pre-service teachers struggled to enact ambitious lessons, both in terms of problems with presenting content (as illustrated in Segment 7 above) and in knowing how to follow up on student ideas through questioning. Liz then shared the definition of rich tasks presented to pre-service teachers in the math methods course at the university, but once again the group moved on without addressing the question of *how* to mentor pre-service teachers into enacting rich tasks in practice. Also, once again the methods instructors demonstrated awareness of the distinction between planning and teaching ambitiously (*"*You can plan a rich task, but not enact it."), but did not offer suggestions of particular mentoring strategies or field-based learning activities directed towards pre-service teacher learning.

Instruments/tools, norms/rules, and division of labor. Similar to findings of analysis for Phase 1, although there were points in Phase 2 in which the group did point out disturbances related to *instruments and tools* and *norms/rules*, categories of disturbances related to these dimensions were not main points of focus within the data. Here I note examples from a few instances to more fully describe the process of learning within the group as related to the construction and resolution of contradictions, and to provide additional contextual information related to the intersecting UC Irvine and Ludlow Magnet School systems of activity. First, in Meeting 3 participants returned to categories of disturbance related to *instruments and tools* as

they discussed the "five high-leverage math practices" with the math methods instructors. There were several instances in which participants – and methods instructors – noted the conflict between the procedural emphasis of the SWUN curriculum and the ambitious approach to instruction advocated at the university. During this meeting, mentor teachers raised SWUN as a problem for mentoring through statements such as, "I have something to ask our math professors. I'm thinking about this delicate dance we have… managing the things we know are good teaching versus the SWUN adoption that we are being mandated to implement in our classrooms." In response, methods instructors asserted that SWUN was indeed a barrier to a *shared object* of supporting pre-service teachers to enact ambitious instruction. According to Sally, "If our candidates were to teach a lesson like [SWUN] for their teaching performance assessment, they would not pass." Thus, SWUN was referenced as creating disturbance in work activity directed towards supporting pre-service teacher learning. However, it is worthy of note that once the group had the "five high-leverage math practices" introduced in Meeting 3, disturbances related to SWUN ceased to be a topic of focus.

Next, in Meeting 4 participants began identifying disturbances related to the UC Irvine program structure itself as they considered the potential uses and limitations of the "five high-leverage math practices" as the basis for a shared tool. As the group moved towards specificity in discussing ways the shared tool could support mentoring activities and learning in practice, they identified multiple obstacles for communication among practitioners embedded within the *division of labor* among participants and the schedule of courses and field assignments. In particular, participants noted that supervisors and mentor teachers needed time to communicate about pre-service teacher progress and areas of challenge, and they expressed frustration that the scheduled three visits supervisors made to the classroom for field observations did not provide

opportunities for teacher educators to connect. Thus, the lack of time in the program structure became a barrier to communication. As articulated by Linda, "I think that all of this [work to improve mentoring] involves conversations, and that's what we don't have time to do...the conversations just aren't available to have." In another example, Diana shared an obstacle she encountered in her work due to the university schedule of content areas pre-service teachers are to take on in winter quarter. The program called for pre-service teachers to begin by leading math lessons, as math was the content area assessed in the credential portfolio pre-service teachers were required to submit. However, teaching math right away conflicted with Diana's approach to mentoring, thereby creating tension for her work. Because she viewed math as a more difficult subject to teach, Diana argued, "Well, and here is the thing… I usually release social studies or science…[those subjects] just to kind of get their feet wet…then math typically comes later." These examples demonstrate that participants indeed noted disturbances across all dimensions of the system during the intervention. However, consideration of the frequency counts suggests that categories of problems more directly focused on the *shared object* held more sustained interest and attention.

System prepares pre-service teachers for "formula lessons." Finally, as mentioned above, in Phase 2 another category related to the *shared object* emerged in discussions, which was developed more fully in Phase 3 but is worthy of note here to trace the process through which the Mentoring Study Group expanded their understanding of the *shared object* of their work. In Meeting 4, consistent with a formative intervention approach to professional development (Engeström, 2011a), I asked the group to identify additional aspects of learning to teach that were important but not included in the "five high-leverage math practices." The goal was to modify the shared tool based upon the expertise and knowledge brought by participating

practitioners themselves. In the discussion that followed, the group began to discuss the special difficulty pre-service teachers faced as the field experience schedule called for the transition from teaching discrete lessons at predetermined points planned well in advance to taking on increased responsibilities for teaching over larger portions, and eventually all, of the school day. As participants considered the potential advantages and limitations of the "five high-leverage math practices" as a tool to prepare pre-service teachers for takeover, they began to consider ways the system of teacher preparation more broadly actually functioned as a System (that) Prepares Pre-Service Teachers for "Formula Lessons*"* as opposed to helping pre-service teachers teach in relation to the dynamic and complicated realities of working in schools. The excerpt below begins when John described the persistent problem of pre-service teachers struggling with "auto-correction" (i.e. in-the-moment adjustments), and referred back to the idea that novices struggle to move beyond the lesson plan when necessary. Angela responded to John by questioning whether the system of teacher preparation itself encouraged pre-service teachers to follow their plan regardless of developing learning needs. As mentioned above, this theme was introduced in Phase 2, but was not taken up as a key point of interest until the final meetings in Phase 3:

Segment 9

John: *Some of this [struggle to respond in the moment] is developmental as far as everyone is concerned….But I found that this auto-correction is something that is really hard, especially when you have a lesson plan that has been approved by [a supervisor or mentor teacher]. And [pre-service teachers] want to prove [they] can get through it. And [they're] going to get through it come hell or high water.*

Angela: *But I think that's where the struggle came in with this during takeover… I was picking up on those open-ended…"what did you notice about when it was time to do this part [of the lesson]?... it wasn't that [the pre-service teacher] wasn't able to do it. I think that because she was teaching [lessons]*

in isolation she had kind of been trained that you just teach. You teach until you are done with the lesson. You teach until 60 minutes is up. And, "I said I'm going to do this math game so I'm doing the math game." And I think that [it's] not because she was afraid to [adjust her teaching] but just that's kind of what she had been trained to do….. I could see the panic in her and she said, "It's not working."

Uncovering a potential contradiction: vision of ambitious instruction vs. novice knowledge and skills. Taken together, the excerpts presented in this section demonstrate that once introduced to the "five high-leverage math practices," participants began to identify increasingly complex challenges related to the *shared object* of pre-service teacher learning in field experience. Through the process of learning in Phase 2, new questions regarding the expertise needed for ambitious instruction, the distinction between planning and enacting ambitious teaching, and the constraints embedded within the broader systems of teacher education began to emerge. Moreover, the absence of specific information offered regarding strategies for mentoring pre-service teachers toward ambitious teaching provided by the methods instructors (see Segments 6 and 7) suggests that the ways field-based learning problematized goals of ambitious instruction were distinct from learning in methods courses, and were not necessarily addressed within the teacher preparation program. In the description of Phase 3 findings below, I present evidence to demonstrate the continued process of expansion with the Mentoring Study Group intervention, including the ways the group sought to address the difference between learning in field experience and learning in coursework by modifying the "five high-leverage math practices" protocol to address the demands for generating questions and responding to students within and throughout lessons.

Phase 3: System That Prepares Pre-Service Teachers for "Formula Lessons"

The *shared object* was addressed a total of 11 times in Phase 3, as compared to 7 and 2 times for *instruments/tools* and *norms and routines*, respectively. Notably, in Meetings 6 and 7, participants no longer spoke at all of challenges related to Underspecified Goals and Pedagogies for Learning in Practice. This suggests that sharing and collectively examining the specifics of the math methods course during Phase 2 functioned as a partial resolution to disturbances related to underspecification as identified in Phase 1. However, throughout Phase 3 the group continued to discuss problems related to challenges in learning to enact ambitious instruction.

By the end of the final phase of the Mentoring Study Group intervention, analysis of disturbances reveals that participants arrived at a broadened understanding of the obstacles to mentoring pre-service teachers towards ambitious instructional practice. The participants understood that efforts to support pre-service teachers in being able to respond to student questions and developing conceptions while teaching was constrained by programmatic emphases on pre-planning, anticipation of student ideas and knowledge, and reflection. Importantly, this way of thinking about the *shared object* is both deeper and more complex than earlier conceptions, and the disturbances participants note in Phase 3 reveal increased attention to the forces beyond the concrete tools of the SWUN curriculum or the structures that guided field assignments or observation schedules. Instead, the *shared object* itself appeared to contain a fundamental contradiction in aiming for ambitious teaching through pedagogies for teacher preparation that encouraged sticking to a "formula lesson." Findings presented in this section will therefore focus most closely on the *shared object* category of disturbances that reveal the System Prepares Pre-Service Teachers for "Formula Lessons."

"It wasn't going the way she wanted, but she stuck with the plan because that's what she planned and that's what she was going to do": following a "formula" for teaching. The disturbance of the System Prepares Pre-Service Teachers for "Formula Lessons" was a main feature of Meeting 7 discussions in particular. The example below demonstrates not only attention to problems related to this category, but reveals a newly developed conception of the *shared object* in terms the surrounding systems of activity in which the *shared object* was situated. Following a video-based discussion activity similar to that described in Phase 1 findings, participants considered whether and how the "five high-leverage math practices" shared tool could coordinate feedback among members of the group to support a more shared approach to mentoring pre-service teachers in the field. After watching another video clip submitted by a pre-service teacher for the credential portfolio, the group once again was asked to offer points of feedback. This time, however, the group had the "five high-leverage math practices" shared tool in front of them as a guide. Participants noted in particular that the pre-service teacher missed multiple opportunities to guide student learning through questioning during the lesson, and they began to discuss how to support pre-service teachers in developing in-the-moment questioning skills. Angela returned to the question of "formula lessons" (see Phase 2 for description of earlier references to this category) to consider whether perhaps the pre-service teacher in the video clip constrained her own ambitious teaching because she felt compelled to follow the lesson plan she had created for the filmed "teaching event" lesson. Linda took up this idea, building upon it to articulate "formula lessons" as potentially a broader, more pervasive problem inherent to teacher preparation program efforts:

Segment 11

Angela: *But do you think that [sticking with the lesson plan] is part of the teaching event? Do you think that it's partly because it's so outlined and, like, the steps that they write*

down [in the lesson plans]?...in my class…when there is need for adjustment they're not making adjustments because it's like, "But that's not what I wrote." You know?

Jessica: *What do you think, supervisors? I have thoughts, but….*

Linda: *I think what we tend to think is the right lesson and what we're maybe training them to do – hopefully not, but maybe - is a formula lesson. And so when we go [with the protocol] and [ask], "Okay, is this a rich lesson? Did [the lesson] address [the five high-leverage math practices]?," we're listening with a different ear now. But I think if you saw this lesson last spring [before we created the protocol], you would say, "It's ok, it's our formula lesson." But now that you are looking at different things, you may be thinking, "Wow, I'm going to re-train student teachers to look at these things." And we would say when we saw them adjusting… "Hey, that's fabulous!"*

In response, Diana and Angela then considered the possible reasoning that leads pre-service teachers to stay with a "formula lesson," and they suggested possibilities about why pre-service teachers did not enact responsive instructional practices even upon recognizing the need to do so to support student learning. In the excerpt below, participants questioned whether pre-service teachers develop a misconception about teaching as they go through programs of teacher preparation, as they come to view following a lesson plan as a higher priority than responding to student learning needs as they emerge in practice:

Segment 12

Diana: *I think it's safe to do a systematic formula-type lesson, so [pre-service teachers] know they have to follow x, y, and z in order to get to the end goal of having [students] know [a] concept. And I think they are hesitant to deviate from that because what they deem as a failure would be, "oh, there's lots of talking, there's a lot of noise..." What they might see and think of as noise or not on-task behavior…could really be rich behavior. I think they're afraid to venture out of that comfort zone… they're truly afraid and they're just thinking of what they want to say next as opposed to what they should be saying [to guide student learning], because it didn't stick with the plan. So they're constantly having that inner monologue.*

Angela: *Right, and as far as this goes in planning, [the pre-service teacher] might have noticed….. it wasn't working. But, rather than changing, she just kept going with it…I start wondering with this video [clip] if it was along with the same sense of maybe she could sense it wasn't going the way that she wanted but she stuck with the plan because that's what she planned and that's what she was going to do.*

Following this exchange, the group considered the ways the system of teacher education may be encouraging "formula lessons" through the portfolio assessment "teaching event" and the heavy emphasis on planning for ambitious teaching by attending to students' developing conceptions day to day. Angela and Diana both shared experiences with pre-service teacher candidates questioning why they do not plan for a full week of lessons plans ahead of time, and asserted that ambitious teaching demands daily planning in direct relation to student learning. Linda approached the problem in terms of the demands some districts place on teachers to follow a script. In the exchange below, Justine responded to Linda by reasserting the idea that teaching must move beyond the script, which implies interest in a more ambitious approach to mentoring in the field:

Segment 13

Linda: *But, I'm going to argue in [pre-service teachers'] defense. Because if you look in a lot of districts, it is scripted. "This is Day 1, and this is Day 100…. This is the page we're on and this is the lesson we're doing…."*

Marie: *Oh, it used to be [that way in] our school district, too.*

Angela: *Well, it just depends on what school you teach at.*

Stephanie: *If you're in program improvement. Program improvement is different.*

Linda: *And if you think about it, that's probably the system that [pre-service teachers] came out of [as students]. You just push on and you don't have to master [topics].*

Justine: *But it goes back to the whole thing. We're here to meet the student's needs. Every single student's needs. How is that possible by doing it the ["formula lesson"] way? You know, we can't have the whole thing planned out.*

Thus, although several members of the group acknowledged the realities that school mandates can present obstacles to ambitious instruction, Justine's comment resists acceptance of "formula lessons" as adequate practice for teaching (*"*We're here to meet the student's needs. How is that possible...?"). By pointing to the forces of influence on practice attributable to the broader system of schooling (i.e. district and school mandates), through this exchange the group demonstrated an expanded understanding of the complexity of the *shared object,* including conflicting goals of ambitious instruction and "scripted" curricula or pre-planning for teaching far in advance.

Instruments/Tools, norms/rules, and division of labor. In addition, in Phase 3 the group once again focused attention on other dimensions of the interacting systems of activity at points, although these were not the main dimensions connected to the category of a system that prepares pre-service teachers for "formula lessons." However, analysis of disturbances does reveal changes in the ways participants discussed problems related to *instruments and tools* and *norms/rules* as compared to earlier phases. For example, disturbances related to the edTPA and the "teaching event" in Phase 3 reflect the newly expanded conception of the *shared object* of activity, as in the final meetings of the intervention participants connected constraints on pre-service teacher learning embedded within the edTPA assignment to the larger problem that the System Prepares Pre-Service Teachers for "Formula Lessons*."* In the beginning of Phase 2, recall that participants raised problems related to pre-service teachers getting "stuck in a rut" of using powerpoints when recording lessons for the edTPA assessment, but did not further analyze the source of the problem. In Meeting 7, when discussing pre-service teacher performance for the edTPA assessment, participants actively questioned whether the edTPA assignment itself was in conflict with demonstrating ambitious teaching. In a Meeting 7 video-based discussion of a pre-

service teacher's lesson, Stephanie illustrated this new way of approaching the problem as she commented, "I'm assuming because [the video] is a ['teaching event'] lesson, [the pre-service teacher] might not be showing his true teaching potential. He might just be parroting the way the lesson is written." Although this comment demonstrates that the group still saw the edTPA as a potential obstacle in efforts to support ambitious instruction, the expanded understanding of the challenge pre-service teachers face indicates new learning and a more complex understanding of the problem.

Uncovering the underlying contradiction: vision of ambitious instruction vs. preparing for "formula lessons." Phase 3 disturbance analysis demonstrates an expanded conception of the orienting *shared object* of activity within the Mentoring Study Group, and a deeper understanding of the problematic nature of the work of mentoring and learning to teach in field experience. Figure 6.2 presents a graphic representation of the main categories of disturbances identified in each phase and the underlying contradictions these disturbances suggest. In addition to describing the categories of disturbances identified in meeting data, Figure 6.2 aims to portray that over the course of the intervention, the group moved beyond a general sense that there was a lack of clarity and focus for field-based learning to expand their understanding of a complicated *shared object* as they uncovered complex, diffuse, and fundamental tensions related to mentoring novices into expert practices of teaching. Thus, the disturbances identified in each phase signal new learning for the group and furthermore suggest that the new concepts and tools for practice (e.g. the shared tool) developed and implemented over the course of the intervention did not offer a full resolution for the day to day work of participants.

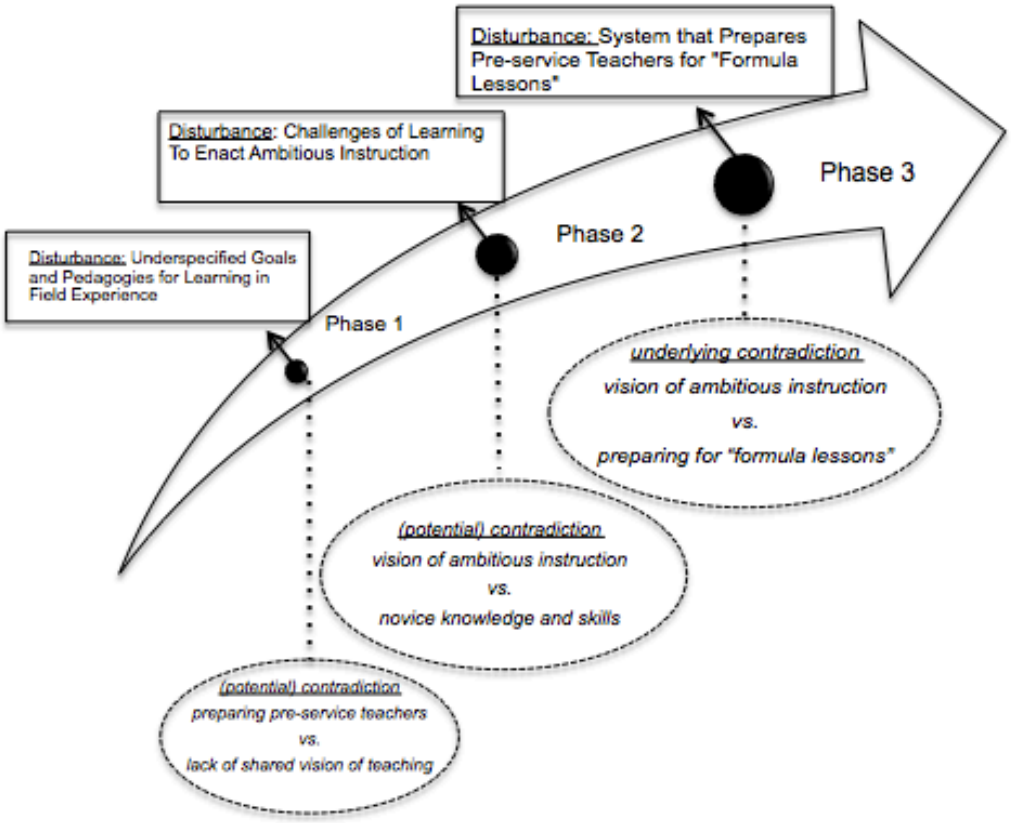


Figure 6.2 Disturbances and Underlying Contradictions by Phase

In the next chapter, I examine the ways the group attempted to resolve these problems through construction of the shared tool and a field-based pedagogy to guide their work with pre-service teachers in the field. Building upon the analysis of field-based problems of practice just described, I present findings for Question 2 next to describe learning in terms of movement towards manifest changes in practice and the development and introduction of new tools to coordinate work activity.

CHAPTER 7

New Tools and Concepts for Practice

The goal of the analysis presented here is to document the unique concrete learning outcomes for the Mentoring Study Group, i.e. the new tools and "functional concepts" (Greeno, 2012) the group developed to resolve the key problems of practice identified in their shared work activity. Thus, findings below describe the construction and modification of the *"*The Five High-Leverage Math Practices +1*"* protocol tool and the new concepts for field-based pedagogical practices to guide work in the field the group discussed and developed over the three phases of intervention. The shared tool and concepts for practice were devised to resolve the key challenges and problems participants identified in their work, and therefore this chapter builds upon the analysis of disturbances presented in Chapter 6. Bearing in mind the categories of disturbance described in the last chapter, here I take up the investigation of learning in the Mentoring Study Group through the lens of the solutions the group developed in the intervention.

Findings from this chapter will highlight the dialogic quality of identifying disturbances and devising potential solutions, which is theorized as crucial for the process of expansion in CHAT interventions (Engeström, 2007; Virkkunen & Newnham, 2013). To demonstrate this, through the meeting excerpts I select I aim to illuminate how the group drew upon their collective understanding of the disturbances in their work to construct potential solutions. In addition, I draw attention to ways the development and implementation of the shared tool supported the group in more deeply investigating disturbances within the systems of activity. For this reason, throughout this chapter I refer to the disturbance categories described in Chapter 6 to connect them to driving purposes and goals for concrete learning analyzed here. As described earlier (see Chapter 4), primary data used for this analysis includes meeting transcripts and

related artifacts of practice created over the course of the intervention. Analytic attention to both of these data sources is important to note, as consideration of transcript and artifact data taken together makes it possible to account for the multiple and varied adaptations participants made in and through practice in addition to understanding the development of concrete learning outcomes as they occurred in meeting discussions and activities.

Broadly, findings for this research question reflect the expanding understanding of the *shared object* described in Chapter 6, as the shared tool and concepts for a field-based pedagogy gained in both specificity and purpose for addressing a broadened understanding of pre-service teacher learning in field experience. Table 7.1 below presents the domains that describe the concrete learning outcomes themselves as they evolved over the three phases, including both the shared tool and the field-based pedagogical practices the group developed to describe ways to take up the tool in practice and work towards a shared vision of ambitious instruction throughout the school year. As noted above, because the development of the shared tool and field-based pedagogical practices occurred in relation to the problems participants identified in their work, I bring the key disturbances identified for the three phases back and include them in the table to illustrate the connections.

Table 7.1
Learning Outcomes for Questions 1 and 2

Phase 1	Phase 2	Phase 3
Question 1: What key problems did the group identify?		
Underspecified Goals and Pedagogies for Learning in Field Experience	Challenges of Learning to Enact Ambitious Instruction	System Prepares Pre-service Teachers for "Formula Lessons"
Question 2: What new tools and concepts did the group develop and implement into practice?		
→ → → "common rubric"	→ → → the "five high-leverage math practices"	→ → → The "Five High-Leverage Math Practices+1" protocol
→ → →	→ → →	→ → →
Intentional modeling: instructional practices	Intentional modeling: planning for and enacting ambitious instruction	Intentional modeling: ambitious instruction – attention to responsive planning and moving "beyond" lesson plans while teaching
Think Alouds: practices modeled and in-the-moment decisions	Think Alouds: in-the-moment decisions related to the "five high-leverage math practices"	Think Alouds: connection between teaching and student learning in planning and while teaching
Connecting university and field site: common topics of focus for supervisors and mentor teachers	Connecting university and field site: focus on "five high-leverage math practices" in lesson plans and observations	Connecting university and field site: focus on 5 practices +1 in lesson plans and feedback
----------	Structure for fall observation	----------

Consistent with Chapter 6, this chapter is organized according to the three phases of intervention to describe the development of the shared tool and the field-based pedagogical

practices the group identified to support mentoring and learning in field experience. In addition, this chapter also features the voices of participants in the Mentoring Study Group to illustrate findings from data analysis. As mentioned earlier (see Chapter 5), my goal in presenting meeting excerpts and comments is to center participants as key agents in the study, and also to demonstrate how the model of intervention designed for this study can support practitioners themselves in not only identifying the main problems they face in their work but in designing solutions as well.

Phase 1: Establishing Focus for Field Experience

"Well, we're talking about being on the same page, and connecting ourselves together." Recall from Chapters 5 and 6 that from the outset of the Mentoring Study Group intervention participants began constructing a shared tool and related field-based pedagogical practices as means for resolving the disturbance category Underspecified Goals and Pedagogies for Learning in Field Experience (see Table 6.1). Reflecting the key disturbance identified for Phase 1, throughout this phase participants discussed a potential shared tool and field-based pedagogical practices in general terms rather than through a common and particular vocabulary for teaching. Although participants asserted the importance of being "on the same page" and suggested that a shared tool could provide the "same lens" to mentor teachers and supervisors by through shared topics of focus, in Phase 1 the group did not articulate the particular vision a shared lens would represent, and they did not yet spell out the instructional practices or points of emphasis that would bring them onto the same page. Instead, they focused on the need for a shared vision and a common language of practice as a means through which to begin working towards coordination. Below, I present examples from Phase 1 meeting data that illustrate the

group's interest in moving towards a more coordinated, shared approach to mentoring in the field, discussed in the absence of a shared language of practice.

Shared tool: "It might be interesting to have a common rubric…the same lens for [mentor teachers and supervisors]….so we don't give [feedback on] a myriad of different things." The idea for a shared tool to coordinate topics of feedback for mentor teachers and supervisors first emerged in Meeting 1 following a discussion in which participants considered the range of feedback suggestions offered by members of the group based on a video of student teaching. During this discussion, a supervisor, John, suggested that because supervisors only visit the classroom three times each quarter, mentor teachers are more knowledgeable about pre-service teacher progress in learning to teach, and therefore should take the lead in identifying the topics of focus and emphasis for observation lessons. John asserted, "Well, when we're talking about [mentor teachers and supervisors] being on the same page…I think [supervisors] really need to ask the question, what are [mentor teachers] working on? Where do you see the student teacher right now?... and then start focusing there." In response, two mentor teachers, Diana and Justine, began making suggestions for a shared tool to coordinate mentor teacher and supervisor observations and feedback on teaching:

Segment 1

1	Diana:	*But, I thought maybe when you were saying this, John, I kind*
2		*of had a little epiphany. Almost like, I don't know what your*
3		*rubrics look like… But it might be interesting to have a*
4		*common rubric that we are privy to prior to the lesson, and*
5		*then when we do debrief, that we have the same lens for both*
6		*of us so that we don't give a myriad of different*
7		*[suggestions]. So [pre-service teachers] don't get confused.*
8		*Does that make sense?.... Because I don't know if….*
9	Jessica:	*I think I'm getting that concept. What do people think about*
10		*it?....*
11	Diana:	*Homing in on one or two things.*
12	Justine:	*And common vocabulary, too, for some of those things. Like*
13		*we were talking about. [For example], what is "classroom*

management," and what are its components?

The excerpt above demonstrates the group's awareness from Meeting 1 of the potential for pre-service teachers to "get confused" if mentor teachers and supervisors offer feedback on a "myriad of different things" and supports the early interest in constructing a shared tool to coordinate feedback on teaching by "homing in on one or two things." The use of general terms throughout this exchange also illuminates the absence of a shared language of practice or shared vision, as participants do not move beyond calls for a "common rubric" with "some of those things" to identify particular practices or topics of focus to include on a shared tool. This is important to note here, as it provides context for understanding the group's interest in learning about the specifics of university coursework in general, and the math methods course in particular as they began the work of constructing the shared tool in Phase 2.

Field-based pedagogical practices: "So, we would have to make an effort to be really, really specific that way…" In addition to suggestions to construct a shared tool for mentoring, in Phase 1 the group began making concrete suggestions for accompanying field-based pedagogies to guide mentoring activities in the field. Several suggestions focused on activities particular to the work of mentor teachers, such as intentional modeling and Think Alouds to open up how teachers make ongoing decisions while teaching, and participants' comments and suggestions were similarly more general than specific. In addition, the group pointed to the need for supervisors and mentor teachers to have shared topics of focus for observations and feedback. In addition to supporting pre-service teacher learning, participants suggested that shared topics would allow practitioners to "hold [pre-service teachers] accountable" for field-based learning. The excerpt below is drawn from the same Meeting 1 discussion presented in Segment 1 above, and occurred soon after the suggestion for a "common

rubric" described above. In this example, three mentor teachers (Justine, Angela, and Diana) considered the multiple ways they could use a shared tool in practice:

Segment 2

Justine: *But, I think it would be great [to have a shared tool], because then we get those [topics of focus], and we make sure that we're modeling that for [pre-service teachers].*

Angela: *Absolutely. And I have no shame when I'm teaching a lesson in saying, "the reason why I'm doing this..." I'll stop in the middle of my lesson and say, "I want you to watch this. I want you to hear the questions I'm asking."*

Diana: *Something even like a chart. I was just trying to sketch something…so that I know that I have addressed this issue with [pre-service teachers]. So that [supervisors] could go back and hold them accountable later in the [feedback] conference if they're still not exhibiting certain behaviors or certain tactics or whatever. You know what I mean? But I think it definitely gives a focus.*

John: *It creates a much more productive use of time.*

Angela: *Yeah, and then when [pre-service teachers] do start teaching, they can keep [the shared tool] in front of them…..*

Finally, the excerpt below addresses the fall observation phase, which the group agreed across all three phases of the intervention was an underutilized component of field experience. Participants sought to introduce more structure into fall, and considered the potential of mentor teachers using a shared tool as a guide for the particular instructional practices they would model and emphasize to prepare pre-service teachers for student teaching in winter and spring. In addition to offering evidence of the group's interest in making improvements to the fall observation phase, the excerpt below illustrates the general way participants talked about their work throughout Phase 1. As Angela and John discuss the potential of the tool in terms of field-based pedagogical practices it would afford (e.g. intentional modeling, targeted Think Alouds in fall), the absence of a shared language is once again apparent:

Segment 3

Angela: *And, I think mentor teachers, if [intentional modeling] is*

something we're thinking of doing in October and September, we have to be very specific. I have no problem stopping in the middle and saying, "Ok, this is why… I don't know if you heard this question, but now, I'm going here…So, what I'm hoping for is…" I'll do that in the middle of what I'm doing because I don't want [pre-service teachers] to be lost. So, we would have to make an effort to be really, really specific in what we're doing that way. Because they might be looking for it but, again, do they really know what they're looking for [during the Fall observation phase]?

John: *I think that's a really good point. …And so the idea here is that they're going to agree that this [topic of focus] is what the master teacher is going to demonstrate. And then after the lesson is taught, then [mentor teachers and pre-service teachers] are going to talk about the effectiveness of how it worked, what happened when, and how did [the mentor teacher] come back and adjust to compensate for that issue or whatever because this is the problem that the student teacher is having. So it's very focused. And I like the idea of doing something like that in the Fall.*

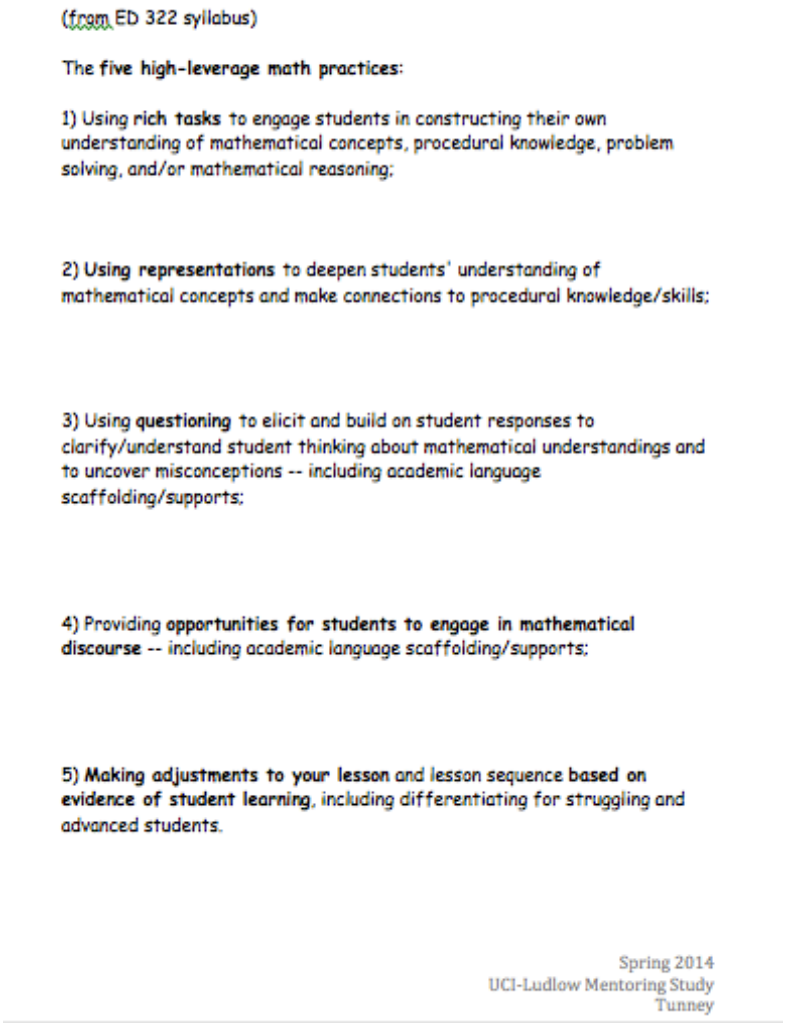
Taken together, the excerpts above demonstrate that from the beginning of the intervention, the group pursued concrete changes in practice through the introduction of a shared tool, specification of practice-based pedagogies of mentoring, and additional structures to guide pre-service teachers during the observation phase even in the absence of a shared vision of teaching and a common language of practice. In the description of concrete learning outcomes for Phase 2 presented below, I describe how the group pursued specificity as they gathered information about the particular emphases of the math methods course at the university in Meeting 3 (i.e. the "five high-leverage math practices"), and how they took up the language of these practices to further develop concrete ideas for field-based pedagogical practices. In doing so, they uncovered and worked to address a new disturbance: Challenges of Learning to Enact Ambitious Instruction (see Chapter 6).

Phase 2: A Shared Vision of (Ambitious) Instruction

The "five high-leverage math practices." The central goals of Phase 2 included developing a shared protocol tool and considering the particular adaptations and new tensions and challenges that arose upon implementing it directly into practice (see Table 3.3). When the math methods instructors joined the Mentoring Study Group in Meeting 3 to share the "five high-leverage math practices" presented to pre-service teacher candidates in the course (see Figure 7.1), through these practices they offered a common vocabulary of teaching to the group. Consistent with the shift towards increased specificity made evident in the analysis of disturbances presented in the last chapter, from Meeting 3 on participants used the language of the "five high-leverage math practices" to anchor their work to construct the shared tool and design related field-based pedagogical practices. Through these efforts, in Phase 2 the group uncovered practical problems related to Challenges of Learning to Enact Ambitious Instruction. Thus, the introduction of the "five high-leverage math practices," an attempt to move towards concrete learning and action, also can be understood as supporting the process of expansion of the *shared object* of activity: drawing upon a common language of practice, the group was able to move beyond calls for specificity and focus to open new lines of inquiry in ambitious practice.

In Phase 2, the group focused heavily on distinctions between planning for and enacting ambitious instruction. They investigated the sources of expert knowledge demanded by ambitious instruction, and they began to specify ways to support pre-service teachers in learning to respond to students while teaching through field-based emphases on the "five high-leverage math practices" in planning, feedback reflection, and through in-the-moment teacher Think Alouds. Below, I present examples to describe how the group approached construction of the

potential shared tool in Meeting 3, and how their experiences with the tool in practice called up new problems and helped the group move towards new solutions.



(from ED 322 syllabus)

The **five high-leverage math practices**:

1) Using **rich tasks** to engage students in constructing their own understanding of mathematical concepts, procedural knowledge, problem solving, and/or mathematical reasoning;

2) **Using representations** to deepen students' understanding of mathematical concepts and make connections to procedural knowledge/skills;

3) Using **questioning** to elicit and build on student responses to clarify/understand student thinking about mathematical understandings and to uncover misconceptions -- including academic language scaffolding/supports;

4) Providing **opportunities for students to engage in mathematical discourse** -- including academic language scaffolding/supports;

5) **Making adjustments to your lesson** and lesson sequence **based on evidence of student learning**, including differentiating for struggling and advanced students.

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UCI-Ludlow Mentoring Study
Tunney

Figure 7.1: The "Five-High Leverage Math Practices"

Shared Tool: "…are you giving [pre-service teachers] a definition of what a 'rich task' is? Because it would be great if we could have that definition." Throughout Meeting 3, the group collectively investigated the *"*five high-leverage math practices*"* presented by methods instructors in the course as the potential basis for the shared tool they sought to construct. They discussed the practices at length to develop agreement around the definitions, and they connected

the "five high-leverage math practices" to the instructional approaches and practices mentor teachers were currently modeling in their classrooms. Efforts to gain clarity were apparent in comments and questions for the math methods instructors such as, "Can I make the assumption that, in the course, you are giving [pre-service teachers] a definition of 'rich tasks'? Because it would be great if we could have that definition." At other points, participants sought to reframe the "five high-leverage math practices" in terms of Cognitively Guided Instruction (CGI), as several of the mentor teachers had expertise in CGI and saw the "five high-leverage math practices" as aligned with the CGI instructional approach. In doing so, the group moved towards specificity and depth in discussing mathematics instruction as compared to more general references to teaching evident in Phase 1 meetings. The example below illustrates this shift as participants, along with the math methods instructor (Liz), consider the meaning of "rich tasks:"

Segment 4

1	Justine:	*…I do a lot of CGI. I've just been getting fully trained and*
2		*throughout the year retraining, Lauren and I, and Marie and*
3		*I. Stephanie and I have also gone through Summer Science*
4		*…doing a lot of algebraic equations, and true and false,*
5		*and [asking] "why is it true?" A lot of [rich tasks] just has to*
6		*do with basically explaining your reasoning. There is no*
7		*right answer. And, also the discourse. That's huge.*
8	Lauren:	*There is a right answer. There is a journey to get to the -*
9	Stephanie:	*There is not one right way, [but] there is an answer.*
10	Liz:	*There are some tasks where actually there is not one right*
11		*answer. If I say, "you've got $2000, what's your plan on*
12		*taking a vacation this summer?" There's going to be lots*
13		*of different solutions which could all be correct, but that's a*
14		*different kind of a rich task than a lot of what you were*
15		*mentioning….*

Moreover, as the ideas for the construction of the shared tool became specific with the language of the "five high-leverage math practices," so did and the ways participants talked about taking up the tool in practice. Below, I describe Phase 2 developments related to using the

shared tool to support new practices for mentoring and ideas for program structures aimed at field-based learning.

Field-based pedagogical practices: "[the shared tool] just guided me into.... what to look for and what to write down to be able to share with her with…her lessons." In conjunction with the development of the shared tool, the group continued to pursue ideas for practice-based pedagogical practices to guide their work. Building upon the idea to coordinate the topics of focus supervisors and mentor teachers emphasized with pre-service teachers, in Phase 2 the group discussed the specific means through which they could make this happen in terms of the existing program structures that guided field experience and common practices in the field. The example below illustrates this movement from general calls for coordination in Phase 1 (e.g. "[supervisors] could go back and hold them accountable if they're still not exhibiting certain behaviors or certain tactics or whatever…," Segment 2, lines 10-12) to more specific suggestions such as using the "five high-leverage math practices" to coordinate topics highlighted in lesson plans created with mentor teachers or submitted to supervisors prior to observations:

Segment 5

1	Angela:	*How great would [the five high-leverage math practices]*
2		*be for [mentor teachers] to have. To have it….Because*
3		*rich tasks build off connections. [I could say], "Show me*
4		*how you're going to get these connections." This would be*
5		*so great for us.*
6	Jessica:	*So… what if we had on our protocol our first category…..*
7		*We're going to think about and talk about the [rich] tasks…*
8		*Then get really explicit using the same language about [rich*
9		*tasks]. I think that would be helpful for me, as a supervisor.*
10	Linda:	*It also has to be in the lesson plan that gets sent to the*
11		*supervisors [before observations] so we can check on these*
12		*[five high-leverage math practices]. It's like, [supervisors]*
13		*don't have discussion points, unless it's something from our*
14		*own perspective. I think that would be….*
15	Angela:	*I agree. Even for [mentor teachers]. If a mentor teacher asks*

for the lesson early, I'm always looking at it through my frame. "Well, if I was teaching this, how would…." - something like that. But if this [shared tool] was here, it would change. If I had that next to me while I'm looking at [the lesson plan], it would change how I'm looking at their lesson.

Jessica: *So, then the lessons that we get as supervisors, if they've they've been addressed by the mentor teacher [using the shared tool] might be more closely aligned.*

It is important to note here that although participants did not make suggestions for additions to the shared tool beyond the "five high-leverage math practices" when first introduced, after implementing the practices as a potential shared tool into their direct work with pre-service teachers following Meeting 4, in Meeting 5 participants began to raise questions of whether the "five high-leverage math practices" fully captured the work of learning to enact ambitious instruction. As the group collectively considered experiences using the tool in direct work with pre-service teachers, they opened a new line of inquiry unique to learning in the field: that of the distinction between planning for ambitious instruction and enacting ambitious instruction. In the exchange below, based on her experience with the "five high-leverage math practices" shared tool, Marie raises this distinction, thus problematizing the use of these practices as a means for fully accomplishing ambitious goals of learning to teach in field experience:

Segment 7

Marie: *And that was the thing. We sat down with [the "five high-leverage math practices"] and tried to involve [it] in the lesson. We talked about it before she went and wrote her lesson. We even talked about how she was going to engage them in discourse. They were going to think-pair-share about some of the questions she was going to ask. And then when she actually implemented the lesson, she didn't do that.*

Jessica: *Oh, she didn't think-pair-share?*

Marie: *No, she just called on students.*

Linda: *[But think-pair-share] was planned.*

Marie: *Yeah,…. I remember reading it in her lesson [plan]. But the kids never really talked to each other about it.*

Jessica: *So, Marie, do you have other thoughts on how this protocol did or did not support you in the things you think are important to talk to [Casey] about?*

Marie: *It did support me in the things I need to talk to her about. But I think we could probably add some additional pieces to it. …[for] right now, it's fine.*

Analysis of concrete learning outcomes for Phase 2 of the Mentoring Study Group once again illuminates a dialogic relationship between concrete experience and expansive learning, as it was in drawing upon their experiences implementing the tool in practice that the group was able to uncover the disturbance of Challenges of Learning to Enact Ambitious Instruction. However, at this point the group did not seek explicitly to modify the potential shared tool during Phase 2, even when prompted to do so (i.e. "So, Marie, do you have other thoughts on how this protocol did or did not support you…?"). It was not until Phase 3 that the group made a key change to the tool, adding a "+1" to direct pre-service teachers to attend to the in-the-moment questioning and adjustment to lessons necessary for enacting ambitious instruction. In Phase 3 meetings, the group also worked to further explicate the pedagogies of mentoring that would support a focus on the complex realities of teachers' ongoing decision-making in planning based on students' developing conceptions and learning day to day.

Phase 3: Moving Beyond "Formula Lessons"

"Now we're looking at different things…if I saw [a pre-service teacher] adjusting to that lesson, I would think, 'Hey, that's fabulous!'" In Phase 3, the group continued to share experiences with the potential shared tool into practice, and they explored potential solutions to problems related to the key disturbance identified in Phase 2, Challenges of Learning to Enact Ambitious Instruction (see Table 6.1). In Meetings 6 and 7 the group focused most heavily on making changes to the shared tool (e.g. adding the "+1," formatting the tool to support taking notes, adding attention to "learning objective") and continuing to develop field-based

pedagogical practices to help pre-service teachers understand the importance of planning and enacting lessons in response to students' developing conceptions (e.g. teacher Think Alouds regarding instructional decision-making based on ongoing attention to student learning).

Consistent with results for Phases 1 and 2, analysis of learning in Phase 3 reveals that participants continued moving towards concrete outcomes as they collectively considered and aimed to address the unique demands of learning in and through field experience. However, unlike the discussions that occurred in earlier phase meetings, in Phase 3 participants moved beyond efforts to bring the content of the math methods course into learning experiences offered in the field. Instead, they began to draw upon their own expertise as field-based teacher educators to make suggestions for ways the shared tool could be modified to make it a more useful tool for field-based mentoring activities. This points to expansive learning through a developing sense of agency (Engeström & Sannino, 2010) as participants constructed resolutions by enriching the tools (i.e. the "five high-leverage math practices") developed and promoted in university coursework. Below, I offer examples from the data to illustrate how the group modified the potential shared tool, and how they continued to specify practice-based pedagogies for mentoring to better address the complex realities of learning to teach ambitiously in and throughout field experience.

Shared Tool: "I like that because that really cues in that '+1' goes with [opportunities for] discourse, which came from the questioning…" Taken together, the two excerpts presented below will illustrate how the group negotiated changes and additions to the shared tool in the final meetings of the intervention. The first example illustrates how participants invoked their own knowledge of experience to consider potential modifications to the "five high-leverage math practices" shared tool as they considered whether to direct more

explicit attention to lesson learning objectives and classroom management topics by including them on the protocol. The group agreed that these features of teaching are important to address in planning and observations, and so they considered options for ways to include these ideas on the shared tool without undermining the emphasis on learning to enact ambitious instructional practices:

Segment 8

Linda: *When I do a running record [during an observation] I put the [learning objective] up there and keep bringing it back…to relate back to that objective. So, that objective just becomes overall what you're doing in responding to them. And writing ["objective" on the shared tool], I think that sort of covers that also.*

Marie: *[And] in using [the shared tool] as a planning piece, I guess having that-*

Stephanie: *-objective line just so [pre-service teachers] can refer back.*

Marie: *Yeah, [that would be] helpful for planning.*

Stephanie: *And, maybe the [classroom] management could just be a tagline at the bottom. So that way, it doesn't become a focus. But, kind of like, "Hey, don't forget!"*

Marie: *I just did a running record [when I observed my pre-service teacher] and I kept referring back to [the shared tool]. And I was going back and forth [between the running record and the shared tool]. And, I'm like, "This really fit in here, and that was a great representation. But then, on little side notes I'd write little management things. Or put them at the bottom.*

Jessica: *What do you guys think about that?*

John: *Well, everybody thinks management is an issue, and so I don't think we can drop it…we just need to figure out where it fits.*

Stephanie: *Or just emphasize that management is a part of every lesson, but this protocol is – obviously management is going to be integrated – but the focus of this [shared tool] is instruction.*

Ultimately, the group decided to include classroom management in a box at the end of the final version of the shared tool. Before presenting the final version of the shared tool, the next example below describes the process through which the group decided to add another component to the "five high-leverage math practices" shared tool in order to account for in-the-moment

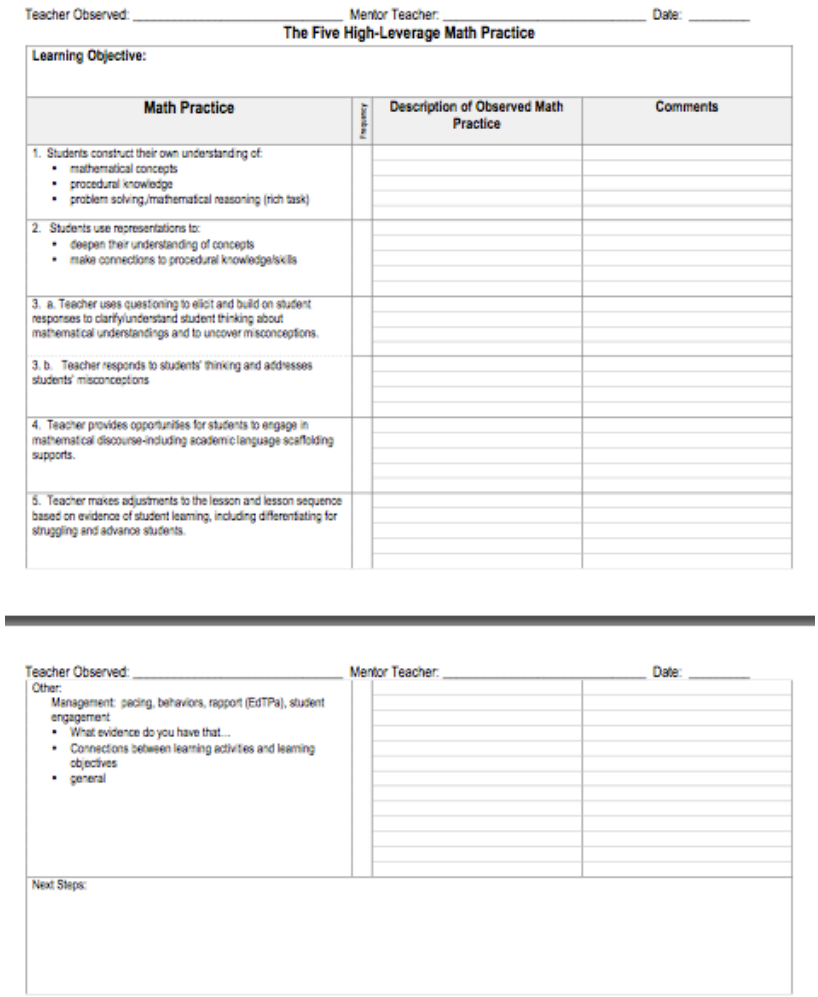
adjustments and decisions teacher make during lessons. The excerpt is drawn from Meeting 7, and presents the point in discussion when the group agreed to add the "+1" (i.e. "teacher responds to students' thinking and addresses students' misconceptions") to address the unique demands of making decisions while teaching. Helping pre-service teachers develop responsive teaching skills was a problem of practice raised repeatedly throughout meetings in Phases 2 and 3, and in the excerpt below the group considered whether the addition of a *"+1"* would help address the problem by highlighting the importance of attending and responding to student thinking on the shared tool itself:

Segment 9

1	Linda:	*["+1"] is "responding to students." Because it's [a] bigger*
2		*[concept] than discourse. Because [students] can be talking*
3		*and chanting this stuff but if you're not responding to what*
4		*they're saying and doing that adjusting [while teaching]…*
5		*["+1"] is responding to students* and *addressing*
6		*misconceptions.*
7	Stephanie:	*So, could we put the "+1"-*
8	Lauren:	*- Before adjusting?*
9	Stephanie:	*Yeah, that's it. After [number] four it would be like a little*
10		*sub-box that says there's not a new number, but it's just*
11		*"+1." So, [the shared tool] goes, 1, 2, 3, 4, "+1", 5,*
12		*Rapport/other.*
13	Jessica:	*I like that…. What do you guys think? I'm open.*
14	Stephanie:	*I like that because that really cues in that "+1" goes with the*
15		*[opportunities for] discourse, which came from the*
16		*questioning. Questioning guided the discourse, then you are*
17		*going to come back and you might ask more guiding*
18		*questions or clear misconceptions.*
19	Justine:	*Do you want me to actually put "+1" [on the shared tool]?*
20	Margaret:	*I like it…. As long as everyone knows what it means.*

Based on these discussions in Phase 3 meetings, Justine then created a final version of the shared tool, "The Five High-Leverage Math Practices +1" protocol tool (see Figure 7.2 below and Appendix F for the full-size copy of the final version). Consistent with the agreements reached in Meetings 6 and 7, the protocol included a section for *"*Learning Objective*"* at the top,

the "+1" between numbers three and four, and a section called *"*Other*"* at the end that directed attention to classroom management. In addition, Justine chose to include a section for *"*Next Steps*"* and created columns for frequency of observed practices, descriptions of observed practices, and comments. Note that these additional features were not discussed by the group in meetings, and therefore reflect Justine's understanding of the purpose and use of the tool in practice.



Teacher Observed: _____ Mentor Teacher: _____ Date: _____

The Five High-Leverage Math Practice

Learning Objective:

Math Practice	Frequency	Description of Observed Math Practice	Comments
1. Students construct their own understanding of: • mathematical concepts • procedural knowledge • problem solving,/mathematical reasoning (rich task)			
2. Students use representations to: • deepen their understanding of concepts • make connections to procedural knowledge/skills			
3. a. Teacher uses questioning to elicit and build on student responses to clarify/understand student thinking about mathematical understandings and to uncover misconceptions.			
3. b. Teacher responds to students' thinking and addresses students' misconceptions			
4. Teacher provides opportunities for students to engage in mathematical discourse-including academic language scaffolding supports.			
5. Teacher makes adjustments to the lesson and lesson sequence based on evidence of student learning, including differentiating for struggling and advance students.			

Teacher Observed: _____ Mentor Teacher: _____ Date: _____

Other: Management: pacing, behaviors, rapport (EdTPa), student engagement • What evidence do you have that… • Connections between learning activities and learning objectives • general			

Next Steps:

Figure 7.2: The Five High-Leverage Math Practices +1 protocol

Field-based pedagogical practices: "I've said that before, but not really with any purpose behind it…." Although modification of the shared tool itself was the main focus throughout Phase 3, the group did address related field-based pedagogical practices at points. Consistent with group's interest in helping pre-service teachers become more responsive in their teaching, most of these discussions centered on the idea of mentor teacher Think Alouds to better model the process through which teachers make decisions in relation to student learning and developing conceptions. Recall from Chapter 6 that the key work disturbance identified for Phase 3 was that the System Prepares Pre-Service Teachers for "Formula Lessons" (see Table 6.1). In an effort to demonstrate how teachers move beyond "formulas" to address students' dynamic learning needs over time, mentor teachers suggested that from the beginning of field experience they should be more explicit in describing the reasoning behind their choices in planning and teaching. In the excerpt below, several mentor teachers agreed that pre-service teachers seem to develop a general misconception that teaching can be fully planned out and enacted independent of attention to students' developing conceptions, and they suggest making clear how attention to student thinking and learning drives the process of ongoing planning for ambitious teaching:

Segment 10

1	Justine:	*…A lot of us [mentor teachers] will plan [only] a couple of*
2		*days at a time. [Maybe we should start] talking a little bit*
3		*more about why we're doing that, too, I think, in the Fall.*
4		*"Because we're going to look at the [students'] work and*
5		*really analyze-…"*
6	Angela:	*-and really see what we need to do and move [plans] around.*
7	Jessica:	*I see what you're saying. To kind of set [pre-service*
8		*teachers] up [to make adjustments in teaching].*
9	Angela:	*Yeah… cause, like, I'll really plan Monday through*
10		*Wednesday, then kind of sketch out Thursday and Friday.*
11		*Knowing that, well, I'm going to do math but we need to see*
12		*what happens on Monday and Tuesday before I plan. I've*
13		*said that before, but not really with any purpose behind it*

other than just thinking out loud. So, I think I agree with you in the fall that when we're explaining, explain the reason why I only have time blocks here and not page numbers and objectives….

Diana: *I've been questioned by a student teacher as to why my plan book isn't filled out for the week. And I always say I plan every night. [And they say,] "Well, you've been teaching a long time! Why do you plan every night?" And, so I think they were kind of taken aback, you know? So, I think it's interesting the perception they have going into the profession that, you know, everything will be ready to rock and roll.*

Although the field-based pedagogical practice of mentor teacher Think Alouds was raised in all three phases of the intervention, the example above marks a new awareness of the importance of drawing more attention to the ways expert teachers plan and make instructional decisions on an ongoing basis in direct response to students' dynamic and developing learning needs. In suggesting that mentor teachers make this more clear to pre-service teacher candidates from the beginning of the fall observation phase, participants sought to intercept the development of a fundamental misconception that teaching can be planned for independent of considerations of students and the particulars of student learning day to day. Moreover, by calling for mentor teachers to introduce this idea through Think Alouds in fall, mentor teachers contributed to additional specification of a field-based pedagogy developed by the Mentoring Study Group, as the university program at that time did not provide guidelines for mentor teachers regarding the particular instructional practices or features of classroom teaching to highlight and model for candidates in the classroom. Thus, participants themselves developed concepts for concrete learning and change in practice, a key learning outcome indicating expansive learning and agency for practitioners in the group (Engeström & Sannino, 2010).

Accounting for Separate University and Field Site Systems of Activity: Identifying Subgroup Differences in Learning and Practice

Because the Mentoring Study Group intervention brought together practitioners from two separate systems of activity (i.e. the university and the school site), to understand how participants connected the concrete learning outcomes described in this chapter to practice, it is important to acknowledge and account for differences between the roles and responsibilities of supervisors and mentor teachers as related to pre-service teacher learning in the field. Therefore, in this section I present themes that emerged through analysis of final interview data to describe how supervisors and mentor teacher subgroups took up the shared tool in practice during the study, and to understand how these subgroups conceived of their work as field-based practitioners at the end of the study. In addition, in this section I describe the obstacles participants identified to illuminate ways the existing structural relationship between the university and the field may constrain and complicate participants' efforts to bring the vision of field-based learning developed in the Mentoring Study Group to life in practice moving forward.

Table 7.2 below presents a role-ordered matrix (Miles, Huberman & Saldaña, 2013) that describes participant responses to final interview questions focused on new learning and actions resulting from the study. The first two columns of the table below draw primarily upon participant responses to the following final interview questions (see Appendix B): "Is there anything new that you do in your work or any new ways of thinking that you attribute to your participation in this study?" and "What is your big 'takeaway' from this study? What have you found to be most useful – new knowledge, new ways of thinking, new practice?" In addition, Table 7.2 presents ideas for the future raised by participants in final interviews as well as the obstacles they pointed to as potential problems for their work. In the paragraphs below, I

describe the main themes of participant responses according to mentor teacher and supervisor subgroups based upon the evidence presented in this table. These themes offer confirmation for the learning outcomes developed by the whole group in meetings described earlier in this chapter, and also reveal additional themes specific to the distinct roles of supervisors and mentor teachers as field-based practitioners.

Table 7.2
Role-ordered Matrix of New Tools and Concepts for Practice

	New Actions	New Thinking	Ideas for the Future	Obstacles
Justine (MT)	Co-planning guided by shared tool Selecting topics to focus on guided by shared tool Focus on opportunities for discourse	Reflecting on teaching – makes me a better teacher Importance of planning for questioning Importance of a range of voices – learning with university-based teacher educators	Continue to meet Use video to analyze teaching Adapt the shared tool for other content areas Supervisors should observe mentor teachers in fall	Not enough time for supervisors and mentor teachers to meet
Diana (MT)	Intentional modeling for pre-service teachers Using questioning to guide pre-service teacher learning	Importance of connecting to discuss pre-service teacher progress Importance of a range of voices -- coming together with colleagues for a similar purpose	Continue to meet More guidance for fall Add "rapport" and "learning objective" to the shared tool	Not enough structure in fall Not sure how to teach pre-service teachers to develop rapport with students
Lauren (MT)	DK	Reflecting on teaching – rich tasks Importance of a shared vision More work to be done to address learning in the field	Continue to meet Use "five high-leverage math practices" as a guide for fall	No guidance for fall Not enough time for supervisors and mentor teachers to meet Anything "left undone" is left to mentor teacher
Marie (MT)	Co-planning, observations, and feedback guided by the "five high-leverage math practices" Focus on questioning	Importance of connecting with supervisors -- to learn what is happening at the university Reflecting on teaching – through focus on mentoring	Adapt the shared tool for other content areas Supervisors should spend more time observing in the classroom Address connection between "learning objectives" and "learning activities" on shared tool	Supervisor feedback is not always useful because they do not spend enough time in the classroom

Angela (MT)	Co-planning guided by the "five high-leverage math practices" Focus on rich tasks Reflective conversations guided by the "five high-leverage math practices"	Importance of rich tasks Reflecting on teaching – mentoring raises consciousness of instructional choices There is a lot more work to be done to support pre-service teacher learning in the field	Use "five high-leverage math practices" as a guide for fall Supervisors should spend more time observing in the classroom	Not enough structure for fall Mentor teachers are not a cohesive group Shared tool is more useful for planning than as a guide for feedback – there are too many other aspects of teaching to address with pre-service teachers
Stephanie (MT)	Focus on rich tasks	Importance of connecting with supervisors Reflecting on teaching – rich tasks	Shared tool to guide fall Bring shared tool to grade-level meetings at school Supervisors should observe mentor teachers	Not enough time for supervisors and mentor teachers to meet
Margaret (S)	Shared tool in addition to general reflective protocol for feedback conferences Shared tool to guide practices highlighted in lesson plans	Discovery of how passionate mentor teachers are about teaching Shared tool guides thinking during observations Importance of shared vision Importance of the "+1"	Provide shared tool to all mentor teachers in fall Continue to meet	Supervisors are not allowed to depart from UCI general reflective protocol
John (S)	Shared tool to guide practices highlighted in lesson plans	Importance of shared vision for mentor teachers and supervisors Importance of mentor teachers understanding requirements of edTPA Importance of providing more support for mentor teachers Discovery of how knowledgeable mentor teachers are	Provide shared tool to all mentor teachers in fall Mentor teachers experienced with the shared tool could "train" other mentor teachers at orientation in the fall Provide more support to mentor teachers Supervisors can use the shared tool to communicate with mentor teachers and coordinate topics of focus Add "evidence of learning" to the shared tool	Mentor teachers do not know what university promotes and model misaligned practices Supervisors do not know content of methods classes Supervisors do not visit classrooms often enough to be really helpful University is too "ivory tower" -- not useful for practice

Linda (S)	Using language of the "five high-leverage math practices" in feedback conferences – a way to "dive in" to lessons	Importance of mentor teachers having a shared vision and shared language with the university	Provide more guidance to mentor teachers Provide shared tool to all mentor teachers for modeling practices Supervisors and mentor teachers should use the language of the shared tool	Inconsistency among mentor teachers Lack of shared language between university and field

DK = Don't know (participant did not answer the question); MT = Mentor teacher; S = Supervisor

Mentor Teachers

As described in both Chapter 6 and in this chapter, final interviews demonstrate that mentor teachers sought additional structure and guidance for their direct work with pre-service teachers throughout field experience in general, and in particular pointed to the fall observation phase as problematic due to the lack of specification regarding topics of focus and expectations for learning. The "Obstacles" column of Table 7.2 offers evidence consistent with these findings, and a review of the full table suggests that mentor teachers looked to The Five High-Leverage Math Practices +1 protocol as a tool to address this problem. Mentor teachers described using the shared tool to ground co-planning with pre-service teachers as well as a guide for observation and feedback (see "New Actions"), and they described a clear intention to use the shared tool the following fall to guide the practices mentor teachers would model and discuss with pre-service teachers during the observation phase (see "Ideas for the Future").

However, beyond confirming the new actions and intentions for work with pre-service teachers as a result of participation in the Mentoring Study Group intervention, Table 7.2 reveals that mentor teachers viewed mentoring as contributing to their *own* professional learning as practicing teachers. The "New Thinking" column shows that four of the six mentor teachers explicitly mentioned that reflecting on teaching through participation in the study supported their development and learning as classroom teachers. In particular, mentor teachers noted that

collectively discussing planning for and analyzing lessons through the lens of the "five high-leverage math practices" directed them to reflect on their day-to-day teaching. According to Justine, "We all talked about how, 'Oh, yeah, this is making me a better teacher' [because the intervention] makes us think about things we're doing in our own classroom because we watch lessons and then talk about it as a group." Pointing out the professional learning benefits for classroom teaching is important to note here, as it suggests that attention to mentoring can function as both professional development for practicing teachers and preparation for new teachers to enter the field. Furthermore, the theme of professional learning offers insight into mentor teachers' interest in continuing to meet following the study, as shown in "Ideas for the Future" column of Table 7.2. In explaining her desire to continue meeting, Diana stated, "We might all have different thoughts and…philosophies but [when] we come together for the same purpose it works really nicely. It's great to hear someone's viewpoint that I may not have thought before, and I think that's why I've changed some thoughts that I had coming in. And I would like for that to keep going."

In addition, the "New Thinking" column of Table 7.2 reveals that almost all mentor teachers spoke directly to the importance of a shared vision of teaching shared for mentor teachers and supervisors, and they suggested connecting more directly with university supervisors to make this happen. In addition to continuing to meet to discuss mentoring and pre-service teacher learning in the field, several mentor teachers also suggested that supervisors should spend more time observing in their classrooms to better understand the field setting (see "Ideas for the Future"). However, it is important to note that mentor teachers also highlighted the structural challenges related to the university system of activity that limit efforts to connect, such as the lack of time for supervisors and mentor teachers to meet, the limited visits supervisors

were required to make to the classroom, and the total lack of supervisor involvement throughout the fall quarter. Thus, as the scope of supervisors' work in the field was subject to the role as described (and compensated) by the university, mentor teachers' descriptions of the concrete changes in action they planned to take as a result of the study focused primarily on their direct experiences with pre-service teachers in the classroom.

Supervisors

Supervisors' final interviews also offer confirmation of the concrete and conceptual learning outcomes presented earlier in this chapter, as the "New Actions" column of Table 7.2 shows that supervisors incorporated the shared tool into their work activity through requirements that pre-service teachers highlight the "five high-leverage math practices" in observation lesson plans and through use of the shared tool to guide classroom observations and feedback conferences. Like mentor teachers, supervisors also pointed to the importance of a shared vision of teaching for practitioners working directly with pre-service teachers in the field (see "New Thinking" column). However, only Margaret suggested the group continue to meet following the study. All three supervisors suggested providing the shared tool to mentor teachers across UC Irvine partner school sites as a means through which to communicate the vision of teaching promoted at the university and to offer a potential structure for the fall observation phase. Although the suggestion to provide the shared tool does not address other aspects of the Mentoring Study Group intervention that supported the development of a shared vision (e.g. engaging in multi-voiced discussions with mentor teachers), because supervisors are assigned to pre-service teachers at multiple school sites throughout student teaching, this suggestion does indicate that supervisors viewed the shared tool as an instrument to coordinate work activity consistent with their roles and responsibilities as field-based teacher educators.

Beyond the new actions and ideas for the future described above, in final interviews supervisors raised multiple tensions embedded within the structure of the university program that constrained their activity. For example, Margaret stated that she "infused" aspects of the shared tool into her feedback conferences with pre-service teachers rather than basing conferences around the shared tool because "we're required to use the [general reflective] protocol for UCI. And I don't mean to sound like I'm so straight about the rules, but you have to be if you're at the university. I really cannot deviate at all from any of that." This comment presents a stark contrast to the theme of the *lack* of specification and guidance for mentor teachers received, and suggests that supervisors may have fewer opportunities to take up use of the shared tool in practice moving forward due job requirements and prescribed roles. John was particularly critical of the university in his final interview, pointing out both obstacles directly related to supervision and those related to the university program overall. In terms of his own work, John said that supervisors are not able to offer helpful feedback to pre-service teachers because of their limited knowledge of the classroom context. John's frustration was evident as he stated, "Is that, was that our job? To watch three lessons and make comments? I mean, that is a meaningless job." Instead, John suggested that, "Our job should be more in terms of helping the [mentor] teacher understand what their job is in terms of supporting, and coming alongside [the pre-service teacher] and modeling." John further noted that because he was not a methods instructor, he himself was not aware of what pre-service teachers were learning in coursework, and therefore he was not able to help pre-service teachers connect content and theories across settings.

The tensions with the university raised by supervisors is important to highlight here, as it illuminates potential contradictions embedded within the university activity system itself in regards to the *division of labor* for university supervisors. Supervisors' final interviews

illuminate structural constraints on their ability to take up new learning and changes in practice within the university system of activity, and highlight the field site setting as a space of intersection that occurs differently and offers distinct opportunities to university supervisors and classroom mentor teachers. These distinctions are important for understanding the perspectives and suggestions of participants in the group, and furthermore bear implications for learning outcomes for the Mentoring Study Group as a whole. In the next chapter, I address the model of intervention as related to the learning outcomes described in Chapters 6 and 7, and in Chapter 8 I describe the limitations on expansion towards the stable forms of concrete practice described by the cycle model (see Figure 2.4) may have been unavailable to participants in this group in light of the broader framing of the university and field as two interacting systems of activity.

CHAPTER 8

A Model for Structured Collaboration

This research approaches historical problems of field-based learning through their practical manifestations, and seeks to contribute a model of professional development that can support university-school partnership efforts aimed at bringing to life the vision of rich and rigorous practice-based teacher education long called for by research (Ball & Forzani, 2009; Darling-Hammond, 2010; Feiman-Nemser, 2001; Grossman, 2011; Zeichner, 2012). CHAT offers a useful theoretical foundation for this endeavor, as its interventionist history and attention to the intersections between systems of activity (Sannino, 2010) provide both a frame for understanding the problems of field-based learning and a set of tools through which to organize professional development oriented towards practical change. The purpose of this chapter is to understand the affordances and limitations of a CHAT approach for addressing persistent problems in teacher education. Thus, the chapter incorporates results presented in Chapter 6 and 7 to examine the CHAT model design in relation to the learning that occurred. By drawing on findings presented previously, my goal is to illuminate connections between the goals and outcomes of the study, and also to describe how an emergent model of professional development can be taken up in practice. It is my hope that highlighting the features of the model of intervention that supported the Mentoring Study Group participants, this study is able to contribute an enriched understanding of the issues that complicate and problematize field-based learning and can offer a potential means for constructing local solutions through a model of professional development that supports collaboration, coordination, and change.

Chapter Organization: Mentoring Study Group Explanatory Effects Matrix

This chapter is organized by an explanatory effects matrix (Miles, Huberman, & Saldaña, 2013) created to make visible how the model of professional development afforded the new learning and concrete outcomes described in Chapters 5 - 7. Presented in Table 8.1, the matrix illuminates how the design created prior to the study (see Table 3.3) was instantiated through meeting activities and ongoing facilitation choices within and between meetings, and thus enables examination of the ways the process of learning and the unique outcomes that emerged were negotiated and developed by participants over the course of the intervention. The matrix presents each meeting separately in terms of the four key distinguishing features of formative interventions presented in Chapter 2 (see Table 2.1): Starting Point, Process, Outcomes, and Researcher's Role. A detailed description of methods used to construct the table can be found in Chapter 4. Below, I briefly revisit these key features to provide a general overview of the purpose and goals of the intervention meetings.

Table 8.1
Explanatory Effects Matrix for the Mentoring Study Group Intervention

	Facilitation	Process	Starting Point	Outcome
Meeting 1	Described historical challenges of field experience Presented practical goal of intervention - to make something useful for direct work with student teachers Promoted multi-voiced discussion: video-based observation feedback activity	Identify persistent challenges for mentoring (MT, S) Identify common challenges for pre-service teachers in field experience (MT, S) Suggest potential solutions (MT, S) Request information on university expectations for pre-service teacher practices (MT) Expansive actions: *Questioning, Analyzing, Modeling*	What is the vision of math teaching for field experience?	Concepts and tools for practice: Suggestion for a "common rubric" to coordinate MT and S topics of focus (MT, S) Suggestion for structure for fall observations (MT) Understanding of shared object: Unspecified expectations and vision for field-based learning (MT), DK (S)

Meeting 2	Introduced CHAT models of interacting activity systems and expansive learning Shared CCSS standards for mathematical practice as potential language for shared tool Promoted multi-voiced discussion: video-based observation feedback activity	Identify challenges of disconnection between university and school systems (MT, S) Identify differential roles of S and MT for field-based learning (MT, S) Request information on math methods course content to develop shared tool (MT) Expansive actions: *Analyzing*, *Modeling*	Concepts and tools for practice: Suggestion for shared topics of focus for field experience (MT, S) Suggestion for shared tool to coordinate intentional modeling, observation feedback, and topics of focus (MT) Suggestion for shared tool to coordinate shared vision with all UC Irvine partner MT's (S)
Meeting 3	Invited math methods instructors to share "five high-leverage math practices" emphasized in math methods course Opened discussion to participants for sense-making of "five high-leverage math practices" and consideration as potential basis for shared tool	Make sense of the "five high-leverage math practices" (MT, S) Gather specifics on structure and focus of math methods course (MT) Identify challenges of enacting ambitious instruction (MT, S) Identify challenges pre-service teachers face in preparing the edTPA video (MT) Expansive actions: *Analyzing, Modeling, Examining*	Concepts and tools for practice: Suggestion to adapt "five high-leverage math practices" to other content areas (MT) Suggestion for pre-service teachers to address "five high-leverage math practices" in lesson plans (MT, S) Understanding of shared object: Preparation for edTPA constrains learning to enact ambitious teaching (MT), DK (S)

Meeting 4	Promoted multi-voiced discussion: Building the shared tool – What is missing from the tool that is important to add? How could the tool support direct work with pre-service teachers? Suggested that participants bring potential shared tool into practice for discussion in later meetings	Consider ways the shared tool can coordinate MT and S feedback (MT, S) Identify limitations of the "five high-leverage math practices" for learning to lead ambitious instruction (MT, S) Identify challenges for pre-service teachers in enacting ambitious instruction (MT, S) Identify problems with UC Irvine program structure – teaching "isolated" lessons, taking over math before other content areas (MT) Expansive actions: *Questioning, Analyzing, Modeling, Examining, Implementing*	Are pre-service teachers learning to teach lessons "in isolation" rather than learning to enact ambitious instruction in field experience?	Concepts and tools for practice: Suggestion to use shared tool to guide lesson planning, intentional modeling, Think Alouds, and observation/ feedback (MT, S) Suggestion to use shared tool to guide fall observation (MT, S) Suggestion for MT's to use language of the shared tool to connect learning across settings (MT, S) Suggestion for a sequence of topics of focus for field experience (MT) Understanding of shared object: Pre-service teachers can plan for but not enact ambitious instruction (MT, S)
Meeting 5	Promoted multi-voiced discussion: use of tool in practice - adaptations and tensions	Share experiences with shared tool in practice (MT, S) Identify adaptations to the tool made in practice (MT, S) Consider challenges of in-the-moment questioning to guide student learning (MT, S) Expansive actions: *Analyzing, Modeling, Examining, Implementing*		Concepts and tools for practice: Use of shared tool for co-planning (MT) Use of shared tool to highlight practices in lesson plans (S) Adaptation of shared tool for Language Arts (MT, S)

Meeting 6	Promoted multi-voiced discussion: video-based observation feedback activity Structure to modify the shared tool: 3 charts activity (Ways you have incorporated the protocol into your work, Suggestions for changes to the protocol, Potluck)	Consider how shared tool coordinates feedback on video (MT, S) Consider challenges of in-the-moment questioning to guide student learning (MT, S) Expansive actions: *Analyzing, Modeling, Examining, Implementing*		Concepts and tools for practice: Use of common language of shared tool in feedback (MT, S) Use of shared tool for co-planning (MT) Suggestion to modify format of shared tool for observations (MT, S) Suggestion to add "management" to shared tool (MT) Suggestion to adapt shared tool for all content areas (MT, S)
Meeting 7	Promoted multi-voiced discussion: video-based observation feedback activity Promoted multi-voiced discussion: use of shared tool in practice, modifications, next steps	Consider how shared tool coordinates feedback on video (MT, S) Identify ways the university program and edTPA requirements encourage "formula lessons" (MT, S) Consider challenges of learning to move beyond "formula lessons" to enact ambitious instruction (MT, S) Expansive actions *Questioning, Analyzing, Modeling, Examining, Implementing*	How can field experience help pre-service teachers learn to move beyond the formula to enact ambitious instruction?	Concepts and tools for practice: Add "+1" – responding to students while teaching (MT, S) Suggestion that MT's focus on how to plan for and enact ambitious instruction throughout the year (MT, S) Suggestion to offer direct feedback on making adjustments in conferences with pre-service teachers (S) Understanding of shared object: Contradictory goals of learning to enact ambitious teaching and preparing "formula lessons" for observations and edTPA (MT, S)

DK = Don't know (unclear) MT = Mentor Teacher, S = Supervisor

As described earlier, the researcher's role in formative interventions is to provoke and sustain the process of expansive learning by introducing tasks and activities that call for expansive action, highlighting underlying tensions and contradictions embedded within system(s) of work activity, and supporting groups in confronting those contradictions to drive new learning and change (Engeström, 2001;Virkkunen & Newnham, 2013). Thus, the

"Facilitation" column of Table 8.1 describes the activities I introduced in meetings with these goals in mind. Because the purpose of the explanatory matrix is to represent the trajectory of learning as it *actually* occurred for the Mentoring Study Group, note that the "Facilitation" column includes both activities that were planned prior to the study (e.g. "Introduced CHAT models of interacting activity systems and expansive learning," Meeting 2) and those activities introduced based upon emerging interests and requests made by participants within meetings (e.g. "Invited math methods instructors to share 'five high-leverage math practices' emphasized in math methods courses," Meeting 3). In addition, in the "Facilitation" column I draw attention to discussion topics and activities specifically intended to elicit multi-voiced participation, as discussions including multiple perspectives are theorized to be crucial for the process of expansive learning (Engeström, 2001). Finally, I note here that throughout this chapter I use the active voice tin describing my facilitation choices to emphasize my role as a designer and as an "insider-outsider" (Dwyer & Buckle, 2009) in this study. Through the active voice, I aim to highlight the ways being part of the system of teacher preparation through my work as a university supervisor enabled me to understand the particulars that the group discussed, and also the ways my role as a facilitator-researcher required that I account for and encourage a process of group learning for the purpose of developing new ideas and practical change.

The "Process" column of Table 8.1 presents the specific topics and themes of discussion that occurred in each meeting as participants engaged in learning activities or launched their own topics of talk. Importantly, this column can be considered in relation to the "Facilitation" column to illuminate connections between the design and group learning. For example, "Facilitation" in Meeting 5 reveals decisions that "Promoted multi-voiced discussion: use of tool in practice – adaptations and tensions" and the "Process" column identifies "Share experiences with shared

tool in practice," "Identify adaptations to the tool made in practice," and "Consider challenges of in-the-moment questioning to guide student learning" to describe what occurred. Note that the "Process" column also marks mentor teacher and supervisor subgroups, as this makes visible the ways participants drew upon learning activities and discussions for learning in similar and different ways. In addition, the "Process" column presents the key expansive learning actions described in the cycle model (Engeström, 1987; 2001) identified within each meeting to afford consideration of the unique learning trajectory that occurred for the Mentoring Study Group as it relates to the theorized sequence targeted in the initial model design (Table 3.3).

The "Starting Point" column of Table 8.1 identifies the problems the Mentoring Study Group sought to address through their collaboration. Recall that formative interventions aim to support practitioners *themselves* in articulating the key problems in their routine work activity to resolve through new ways of thinking and approaching work (Engeström, Sannino, & Virkkunen, 2014). Thus, the particular starting point for formative interventions is not fully specified prior to the study, as it is based upon the persistent problems and tensions practitioners present (Virkkunen & Newnham, 2013). Moreover, as it is common for CHAT interventions to include mini-cycles of expansive learning and to demonstrate unique trajectories (see Chapter 2), the starting point itself is understood as open to change over the course of intervention meetings. The "Starting Point" column of Table 8.1 marks the expansion of the group's understanding of the complexity and contradictions embedded within the *shared object* of activity (see Chapter 6), and therefore presents the development of the questions the group sought to address in the Mentoring Study Group intervention.

Finally, concrete learning outcomes of formative interventions are expected to be "locally appropriate" (Engeström, 2011a, p. 84) and embedded directly in practice. Thus, the "Outcomes"

column of Table 8.1 traces the development of the shared tool and new concepts for practice from initial suggestions and ideas to actual use. For example, the Meeting 5 outcome identified as "Use of shared tool to highlight practices in lesson plans" can be traced and connected to the Meeting 3 outcome identified as "Suggestion for pre-service teachers to highlight and address 'five high-leverage math practices' in lesson plans." In addition, a key outcome of expansive learning is a deeper and broader understanding of the *shared object* of activity (Engeström, Sannino, & Virkkunen, 2014), and for this reason I note outcomes related to developing conceptions of the complexity of mentoring and learning in field experience in addition to presenting the concrete outcomes as they emerged in meetings. Finally, note that the "Outcomes" column, like the "Process" column, identifies mentor teacher and supervisor subgroups. As described in Chapter 7, attending to these differences opens consideration of ways the interacting university and school site systems of activity constrain or afford new ways of thinking and changes in work activity in relation to the study.

In the sections below, I draw upon Table 8.1 to describe the intervention in terms of these key features of the design. I use this matrix to make visible the relations between these dimensions, the tensions that emerged when bringing these two activity systems together to build a shared vision of mentoring pre-service teachers, and the evolution of the work of the Mentor Study Group with respect to these design features over time. In addition, throughout this chapter I note and highlight events and activities that occurred outside of meetings but are important for understanding outcomes of the study (e.g. bringing the shared tool into practice between Meetings 4 and 5). Finally, I recognize that the group itself has a history that includes ideas and conceptions about teaching and learning individuals bring to the group as well as a *collective* history that began when the group convened and was further developed over the course of their

work together. In the sections below, I aim to account for these histories and variant perspectives through rich descriptions that attend to the range of voices represented in the group.

Phase 1: Seeking Structure and a Shared Vision

Central goals: launching a cycle of learning through collaboration. As described in Chapter 3, consistent with other CHAT interventions Phase 1 intended to provoke an expansive learning cycle by introducing tasks and activities that encouraged participants to engage in *questioning* existing practice and *analyzing* the historical and systemic sources of the problems of practice encountered day to day (Engeström, Sannino & Virkkunen, 2014). Therefore, the central goals of this phase and the related planned learning activities focused on making the practical knowledge and perspectives of participants public, identifying current and historical challenges, and considering the potential of new practices and learning to address these challenges. In addition, by drawing out the experiences and perspectives of all participants to understand the range of approaches represented within the group, an additional purpose of Phase 1 was to establish norms of multi-voiced discussions to prepare the group for collaborative work over the course of the study.

Facilitation: establishing group norms and purpose of the intervention. Table 8.1 presents the actions I took in meetings to address the central goals described above. As shown, in Meetings 1 and 2 I introduced the CHAT frame of the intervention, and described the overall purpose of the study as an opportunity for practitioners to collaborate in developing unique and practical solutions to the persistent challenges they identified in their direct work in the field. I described the historical challenges of field experience, and I made clear that my intention as a facilitator would be to highlight "tensions and conflicts and things that don't fit together [as they] emerge… and I'm going to pull those out...for the purpose of us talking about what [those

tensions] have to do with how we're supporting student teachers." Since confronting contradictions is theorized as the main driver of the expansive learning process (Engeström, 2011a), the central goal was to support participants in uncovering and addressing the tensions in their work that indicate underlying contradictions within or across the university and school site systems.

In addition, throughout this phase, I introduced activities that explicitly aimed for all members of the group to contribute ideas based on their unique sources of knowledge and practical experiences to encourage multi-voiced participation within the group. For example, in Meetings 1 and 2, the group viewed video clips from PACT portfolio submissions, and participants shared potential points of feedback they would want to share with the pre-service teacher candidates based on what they saw (see meeting graphs in Appendix C). Because all participants had experience as field-based practitioners, these activities were accessible to everyone in the group. Furthermore, by providing a shared artifact in the form of a video viewed together, the range of perspectives in the group was made visible. This allowed for consideration of how to coordinate a more shared vision of teaching through the approaches to mentoring participants took up in the field (Tunney & van Es, 2016). Within meeting discussions, I attended closely to the participation of individual members, and I made sure to include ideas from each participant in charts I created and in determining "group" decisions whenever possible.

Process: determining a starting point for collaboration. As indicated in the "Process" column of Table 8.1, participants engaged in *analyzing* the historical and systemic foundations of persistent challenges to field-based mentoring and learning in Phase 1 as they made their mentoring practices and problems public and considered their roles as practitioners within the intersecting university and school systems of activity. In these early meetings, participants raised

multiple issues related to underspecification regarding the vision of teaching and expectations for learning in the field (see Chapter 6), and they identified these problems as persistent over time. For example, in Meeting 2 Margaret (supervisor) pointed to the lack of course content information provided to mentor teachers as a main cause of frustration between mentor teachers and pre-service teachers "year after year after year" (see Chapter 6, Segment 3), and suggested that this resulted in missed opportunities to connect learning across settings. Participants also asserted that in the absence of guidance, pre-service teachers tended to miss opportunities for learning through observation because they "don't know what to look for….they don't know what they don't know" (Chapter 6, Segment 2).

To address the problems they raised, as described in Chapter 7 the group began *modeling* potential solutions in Phase 1 and mentor teachers requested specific information regarding university course content and expectations for pre-service teacher learning to connect the topics presented at the university to learning experiences in the field. Typically, mentor teachers coupled requests for information from the university with suggestions for ways they could use this information in mentoring pre-service teachers. For example, immediately following the question, "What are they learning *specifically* in their some of their classes?" in Meeting 2, Justine (mentor teacher) asserted that she sought this information to "make sure I [am] discussing" the "big ideas or…concepts" with pre-service teachers. Interest in such efforts to connect the university and field as sites for learning through shared topics of focus (and a shared tool) was consistent throughout Phase 1, and a more coordinated approach to mentoring pre-service teachers in the field guided by a shared vision or "lens" was suggested and discussed repeatedly by both mentor teachers and supervisors in the group. Thus, as a starting point for

collaboration, the Mentoring Study Group sought to identify a vision of math teaching to guide, support, and structure mentoring activities and learning in the field.

Outcomes: suggestions for tools and concepts to move towards specificity. As discussed in detail in Chapter 7, throughout Phase 1 participants made suggestions for field-based concepts and tools that would support a more coordinated approach to mentoring across the entire school year. As shown in the "Outcomes" column of Table 8.1, these suggestions included a shared tool for supervisors and mentor teachers, intentional modeling, and an established sequence of topics of focus for fall. Notably, suggestions in this phase focused on the structural aspects of coordinating a shared approach in field experience; participants did not name the *specific* mathematical practices or topics of focus to emphasize with pre-service teachers in the classroom. In this way, early suggestions for new tools and concepts reflect and illustrate the main Phase 1 work disturbance of Underspecified Goals and Pedagogies for Field Experience (see Table 6.1). For example, in Meeting 1, John (supervisor) asserted that both mentor teachers and supervisors should "be on the same page, and connect ourselves together so supervisors who are out here three times are doing the same thing as the teacher in the classroom." Although John asserted the importance of field-based practitioners "connect[ing] ourselves together," he did not further explicate what he meant by the "same page" or "doing the same thing" at this time. Instead, he spoke generally of his overall interest in coordinating work in light of participants' different roles of field based teacher educators.

Comments addressing the *shared object* of activity in Phase 1 also reflect an overall lack of specification for the work of mentoring in field experience, although mentor teachers' comments in particular reveal a clear interest in gaining better definition of the goals and expectations for pre-service teacher learning. For example, in Meeting 1 mentor teachers sought

information from supervisors to understand typical learning trajectories of pre-service teachers. As discussed in Chapter 6, following the video-based learning activity featuring a pre-service teacher's PACT video submission from the prior year the whole group agreed that the lesson did not adequately address the stated learning objective. Angela (mentor teacher) asked supervisors, "I'm looking at this [video], and I'm thinking, to me, I don't think he would have passed. Because, did he really meet the [learning] objective? Were these things done? So, I guess my question is, how is he being evaluated to have passed?" Margaret (supervisor) responded by describing the rubrics upon which the video clip was scored: "It goes along with two things, 'engaging all students' and 'monitoring students during instruction.'" Justine (mentor teacher) then followed up on Angela's initial question as she returned to inquire into what to expect from pre-service teachers in the classroom. She asked, "But, is this typical of what [supervisors] have seen so far [this quarter]? I'm just trying to reflect, is this higher? Lower?" Supervisors responded that the teaching in the video was generally typical of pre-service teachers in winter quarter, but they did not speak further to the expectations for learning and instructional skills developed in the field.

Importantly, in addition to illustrating the general lack of specification for field experience, this exchange also highlights a key subgroup difference that was apparent from the beginning of the intervention: mentor teachers drew upon their own knowledge of experience when viewing pre-service teachers (e.g. "I'm thinking, to me, I don't think he would have passed") yet looked for specification and guidance from the university for mentoring (e.g. "What are they learning *specifically* in some of their classes?"). On the other hand, supervisors invoked the requirements of the credential portfolio (through reference to the rubrics) to interpret and

evaluate pre-service teacher candidates' skills in teaching (e.g. "It goes along with two things, 'engaging all students' and 'monitoring students during instruction').

Departures from the plan: *modeling* a vision of connecting course content to the field. Although the expansive learning action of *modeling* was not targeted in the Phase 1 design for the study (see Table 3.3), as described and in Chapter 7, the group engaged in *modeling* right away as they began making suggestions in Meetings 1 and 2 for a shared tool (i.e. a "common rubric") and for field-based pedagogical practices to support pre-service teacher learning throughout the school year. Importantly, both supervisors and mentor teachers made explicit suggestions for ways to coordinate their work, and participants' comments suggested that several members of the group had given thought to ways to improve field-based mentoring and learning prior to the study. For example, Angela's comment in Meeting 1 that, "Something I'm always troubled with is fall observation hours…. One thing I've always wanted in something more structured" reflects a longstanding interest in introducing more structure into mentoring in the classroom.

Beyond a general interest in coordinating the work of university-based and school-based teacher education practitioners through a shared tool and shared topics of focus, mentor teachers' repeated requests for more information regarding the particulars of the university math methods course content was unanticipated. As shown in Table 8.1, in Meeting 2, the Common Core Standards for mathematical practice with the group for the purpose of offering a potential shared language to frame the construction of a shared tool. However, participants continued to seek information about the university course in meetings, and mentor teachers in particular voiced interest in using the topics – and language – of the course to guide their work with pre-service teachers in the field. Consistent with the overall goal to "follow up on participants suggestions

and ideas for solutions" (see Table 3.2), I therefore invited the math methods instructors to Meeting 3 to share the main topics of emphasis presented in the university course.

CHAT model consideration: accounting for two systems. As noted above and in Chapter 7, mentor teacher and supervisor subgroup differences were apparent from the beginning of the intervention, both in terms of the sources of knowledge and experience participants drew upon in meetings and in regards to the particular suggestions they made for their work. These differences were made visible in Phase 1 in the ways participants approached connecting more closely across the university and school site systems, even with overall agreement that disconnection between the university and school constrained coordinated learning experiences for pre-service teachers and a shared interest in coordinating their work. For example, consistent with their roles as practicing teachers, mentor teachers discussed shared topics of focus in terms of classroom use: instructional modeling, reflections on teaching, and as a structure for observations throughout fall. Supervisors, on the other hand, spoke of a shared tool as a means for communication with mentor teachers across all of UC Irvine's partner school sites (see Table 8.1), thereby taking on a more programmatic perspective that reflects their roles as practitioners who work in multiple settings. Thus, although the group agreed on the overall goal of a "shared" vision of coordination for field experience, they sought that vision for distinct purposes and in different ways. In terms of the CHAT model that framed the Mentoring Study Group intervention, it is important to note here that bringing together practitioners from both the university and school site systems allowed these differences to emerge and made them available to be accounted for and addressed in practice. In the next section, I describe how participants in the Mentoring Study Group intervention drew upon topics raised in the first meetings to

construct the shared tool to guide mentor practice, and how they confronted the unique challenges of learning to enact ambitious instruction that emerge and occur in the field.

Phase 2: Building a Shared Tool

Central goals: building a potential tool to try out in practice. Phase 2 was intended for participants to develop a shared tool (i.e. a protocol) and then examine and collectively consider new challenges and tensions that emerged upon introducing the tool into their direct work in the field. Thus, the central goals and planned learning activities for Phase 2 focused on the construction, consideration, and implementation of a shared protocol into practice, followed by reflection on the particular adaptations participants made for the purpose of modifying the shared tool to make it useful for work activity. Note that I did *not* specify the sources of information that would be used to create a shared tool ahead of time, as my main goal was for participants themselves to determine the content through a process of collaboration. Table 8.1 indicates that the Phase 2 targeted expansive learning actions were *modeling, examining,* and *implementing.* In the initial study design, the main purpose of Phase 2 was to support the group in creating and implementing a tool into practice based upon the main challenges they identified in their work and the potential solutions they sought.

Facilitation: structured support to construct, implement, and adapt the shared tool. As noted above and described in previous chapters, participants themselves suggested a "common rubric" as a potential solution for their work in Phase 1, and they expressed clear interest in drawing upon the specifics of the math methods course content to create a tool that would connect the university and field site settings (e.g. "What are the strategies and [topics] being taught?"). Highlighting this, the Phase 1 meeting reflections and researcher journal entries include notes such as "mentor teachers want to know more about what student teachers are

learning in coursework" and "for the next meeting, I should talk to Liz and Sally to find out the specific emphases of the math methods course." Therefore, as noted above I invited the math methods instructors, Liz and Sally, to Meeting 3 to provide information on the university course. With Liz and Sally present, I intentionally opened the conversational floor to participants to investigate the "five high-leverage math practices" through discussion with the course instructors. For example, in Meeting 3, I provided copies of the "five high-leverage math practices" (see Figure 3.2) to all participants, then suggested that the group "take a couple of minutes to look over [the 'five high-leverage math practices'], and then we can talk to Liz and Sally about what the student teachers are doing with that and how that's going." My goal here was to follow up on mentor teachers' requests to gather information about course content by offering an opportunity for them to speak directly to the instructors who designed and taught the course.

In addition to offering opportunities to make sense of the "five high-leverage math practices" themselves, in this meeting and throughout Phase 2, I explicitly encouraged participants to maintain attention to the complicated realities of classroom teaching to make sure the group constructed a tool that would be useful in actual practice. I emphasized that the "five high-leverage math practices" represented the vision offered by the university system of activity that may not account for the demands and complexity of the classroom context. As an example of how I sought to draw out the knowledge of practice inhered by members of the group, in Meeting 5 I asked participants to describe their experiences after implementing the "five high-leverage math practices" into practice as a potential shared tool. I requested in particular that they highlight adaptations they made for use and any new problems or tensions that arose, and as participants contributed to the discussion I took notes on their ideas and made comments such as,

"I'm trying to make a list here of the things that are *not* addressed through the [five high-leverage math practices] but that emerged in the classroom as something we want to talk to student teachers about. That's kind of where I'm hoping to go [in constructing the shared tool]." These kinds of facilitation questions and comments maintained dual goals related to the overall goals of the intervention: 1) making the expertise and knowledge inherent within the group available as a resource to develop a shared tool most useful for to coordinating mentoring and learning in the field; and 2) attending to the complex dynamics of bringing the university and school site systems of activity together for collaborative work.

Process: uncovering new tensions and deeper questions through experience in practice. A review of the "Process" column of Table 8.1 indicates that participants engaged in the targeted expansive actions of *modeling, examining,* and *implementing* in Phase 2, and they returned to the non-targeted actions of *analyzing* and *questioning* as well. Distinctions between *analyzing* and *questioning* in Phases 1 and 2 reflect an expanding conception of the complexity of field-based learning and awareness of the difficulty of enacting ambitious instruction (described in detail in Chapter 6), and indicate that the process of constructing and implementing a potential shared tool into practice supported the group in generating new and deeper questions about the (complex) *shared object* of their work. In this section, I first describe group actions of *modeling, examining,* and *implementing* as they constructed the potential shared tool and implemented it into practice, and then I revisit *analyzing* and *questioning* to describe the new ways of thinking about mentoring and learning in the field that emerged.

Modeling was evident throughout Mentoring Study Group discussions focused on constructing the "five high-leverage math practices" potential shared tool and specifying related field-based pedagogical practices (e.g. co-planning using the "five high-leverage math practices"

as a guide). These discussions are presented and described in detail in Chapter 7, as the development of the concrete and conceptual learning outcomes occurred largely through *modeling* new ways of approaching the work of supporting pre-service teacher learning in field experience through the introduction of a shared tool and coordinated practices. Participants engaged in *examining* as well in these discussions as they considered the potential uses, usefulness, and limitations of a shared tool based on the "five high-leverage math practices," including ways it could coordinate mentor teacher and supervisor feedback on teaching. For example, in Meeting 4 Linda (supervisor) considered how supervisors could bring the shared tool into their work with pre-service teachers beyond using it to inform observations and feedback on teaching. Linda raised the idea that supervisors could ask pre-service teachers to highlight the "five high-leverage math practices" in lesson plans submitted prior to observations, and that "[the shared tool would] allow us to take that lesson plan and do a comment section specific to [the "five high-leverage math practices]."

Implementing was featured in Meeting 5 as participants discussed their experiences bringing the shared tool into practice and considered potential additions or changes based on experience. For example, when asked if the shared tool offered guidance for Marie to address the topics of most importance when conferring with her student teacher, Marie asserted, "[The shared tool] did support me in the things I need to talk to her about. But I think we could add some additional pieces to it…" Marie's comment was typical of those shared by participants in meetings following implementation of the shared tool; although participants agreed that the "five high-leverage math practices" represented a desired (and ambitious) vision of math teaching, they also shared reflections that the practices themselves did not fully address pre-service teachers' learning needs in the field.

As mentioned above and represented in Table 8.1, the group process in Phase 2 also included a return to *analyzing* and *questioning* as participants identified challenges pre-service teachers faced in enacting ambitious instruction. In particular, based upon their experiences bringing the potential shared tool into practice, participants pointed to pre-service teachers' limited base of practical knowledge as an obstacle to generating in in-the-moment questioning aimed at guiding student learning (see "Process" column for Meetings 4 and 5, Table 8.1). As the group considered the difficulties of learning to teach ambitiously, in Meeting 4 Angela began to question whether or not the university program overall was adequately preparing pre-service teachers to be able to take on a full day of teaching:

> I think the one thing that I think my student teacher learned was that she got really good at doing lessons in isolation…You go from being very successful in all of these things for an hour and a half lesson, and then you get to sit back and reflect on it. But then when she was in full take over and maybe, you know, her task wasn't working ... And number 5 [on the "five high-leverage math practices" protocol], all of a sudden trying to make those adjustments in the middle of it or knowing when to change, all of a sudden it was different.

The vocabulary of the "five high-leverage math practices" connected to classroom practice is noteworthy here, as Angela referred directly to the potential shared tool (e.g. "and number 5….") to re-consider and expand her understanding of the challenges pre-service teachers face in learning to teach (i.e. the distinction between "doing lesson in isolation" and taking over teaching for a full day). Thus, the process of developing and introducing the shared tool provoked deeper considerations of the complexity of the *shared object* of pre-service teacher learning in field experience in Phase 2. The "Starting Point" column of Table 8.1. reflects this expansion, and also speaks to the potential fundamental contradiction participants uncovered between features of the system of teacher preparation itself that encourage "isolated" lessons and

teaching and making progress towards learning to teach ambitiously in connection to the ongoing dynamics of student learning and classroom experience (see Chapter 6).

Outcomes: expanding the *shared object* and coordinating work through a shared tool. Phase 2 marks a shift from *suggestions* for use of new tools and concepts in practice to *use* of new tools and concepts for practice. As mentioned previously, following Meeting 4 participants agreed to bring the "five high-leverage math practices" into their direct work with pre-service teachers, and they discussed their experiences and adaptations in Meeting 5 and throughout Phase 3. The "Outcomes" column of Table 8.1 marks this distinction, and Meetings 5, 6 and 7 include both references to "suggestions" for practice and the actual actions participants took up during the study (e.g. "use of shared tool for co-planning"). Consistent with the suggestions made in Phase 1 and early Phase 2 meetings, outcomes for Phase 2 include increased specification of the ways participants could bring a shared tool into practice, such as using a shared tool as a guide for a sequence of topics in field experience (including fall), use of the language of a shared tool to connect learning across university and field site settings, and as a guide for lesson planning. Outcomes thus reflect the practical emphasis of Phase 2 meetings, as both mentor teachers and supervisors identified the particular ways the shared tool could coordinate their work day to day.

However, the practice-oriented interest in Phase 2 also supported the group in expanding their understanding of the *shared object* of pre-service teacher learning in field experience. In doing so, participants spoke to the persistent difficulties pre-service teachers face in learning to enact ambitious instruction, such as responding to students in-the-moment and using questioning to guide student learning within discussions of the shared tool in practice, which raised new and deeper questions regarding the goals and purposes of field-based learning overall. As described

in Chapter 6, Challenges of Learning to Enact Ambitious Instruction was the main work disturbance identified for Phase 2. This disturbance reflects the developing understanding of an increasingly complex *shared object*, which participants agreed was complicated by the disparity between skills pre-service teachers developed in planning for ambitious teaching through the university program and skills in being to enact ambitious teaching in the classroom.

Departures from the plan: going deeper through *analyzing* and *questioning.* The process described above indicates that in Phase 2 the Mentoring Study Group learning trajectory did not neatly align with the sequential order of learning actions offered in the expansive learning cycle model (Figure 8.1), as participants opened new inquiries into supporting pre-service teacher learning in field experience rather moving towards consolidation of a "stable form of practice" (Engeström, 1987; 2001) to take up in Phase 3. Instead, as described above, the group drew upon practical experience *implementing* in Phase 2 to launch a deeper investigation into a system that prepares pre-service teachers through "isolated lessons" that may constrain rather than support the development of skills in ambitious teaching. For this reason, the continued focus on *analyzing* and *questioning* in Phase 2 can be understood as part of the process of expansive learning, as it both broadened and deepened understanding of the complexities and challenges inherent in mentoring pre-service teachers in the field. Below, I describe the continued development of concrete learning outcomes and expansion of the *shared object* in Phase 3 as the group more deeply explored the challenges of pre-service teacher learning in the field and ultimately uncovered the potential fundamental contradiction between a vision of preparing pre-service teachers for ambitious instruction and a system that prepares them for "formula lessons."

CHAT model consideration: practical experience for deeper understanding. As described in the sections above, in Phase 2 the group moved beyond a focus on constructing a tool to connect coursework and field experience to more deeply investigate the content of coursework itself in light of the developing skills and limited knowledge of novice teachers. Importantly, it was through practical experience with bringing the "five high-leverage math practices" into direct work in the classroom and structured multi-voiced discussions in meetings that these new questions about goals of ambitious teaching for pre-service teachers emerged. Thus, the guiding principles (e.g. ascending to the concrete, multi-voiced discussions) and practical orientation of CHAT interventions that called for implementation of the potential shared tool provoked deeper investigations of the overall goals of field experience and the conceptual tools (e.g. the practices promoted at the university) used for learning. In the sections below, I next describe how the group continued to pursue questions related to a vision of ambitious teaching to guide field experience as they worked to modify the shared tool and develop field-based pedagogical practices to guide their work moving forward.

Phase 3: Reflecting on Experience to Improve and Expand

Central goals: arriving at a starting point for future collaboration. According to the Mentoring Study Group design created prior to the study, Phase 3 meetings were intended to support the group in agreeing upon a shared vision of math teaching and mentoring in field experience through engagement in expansive learning actions of *reflecting* on learning in the intervention and *consolidating* new learning through concrete action (see Table 3.3). Pre-planned central goals for Meetings 6 and 7 included modifying the shared tool based on use in practice and finalizing it to represent and coordinate a shared vision for mentoring and learning in the field. However, as described above, the group expanded understanding of the complexity of their

work in Phases 1 and 2, and they uncovered increasingly broad systemic contradictions (e.g. ambitious instructional goals for novice teacher candidates, see Figure 6.2) that could not be fully addressed within the timeframe and scope of the intervention. Therefore, rather than seeking to direct participants to consolidate and finalize their work in Phase 3, I aimed instead to continue highlighting the tensions and contradictions participants identified within the interacting university and school site systems of activity to better understand problems and potentials of field experience as a space of intersection. Therefore, in a departure from the plan created prior to the study, in Phase 3 central goal were for the group to deepen understanding of the (complex and problematic) *shared object,* and to consider actions that could – or could *not* – be taken up in practice once meetings concluded. Below, I describe the facilitation choices I made as I adjusted plans for Phase 3 meetings to accommodate the emergence of these new questions and the development of a new starting point for inquiry at the end of the intervention (see Table 8.1).

Facilitation: guiding the group to end with a new starting point for future work. The main facilitation goal in Phase 3 was to offer opportunities for participants to continue pursuing understanding of the challenges and complexity of an ambitious vision of math teaching as a guide for field-based learning, and to develop new ideas and practical concepts that could support pre-service teachers in moving beyond "formula lessons." Because participants were subject to the constraints and dictates of the university and school site systems in which their work activity was embedded, facilitation aimed to highlight the features of these systems participants identified as problematic in meeting discussions and activities to illuminate dimensions that may be important to address moving forward. For example, upon revisiting the idea of supervisors spending time observing mentor teachers in fall to gain a better understanding of the classroom context in Meeting 7, Stephanie (mentor teacher) pointed to a potential problem

with this plan because supervisors were typically assigned to different mentor teachers and pre-service teacher candidates each quarter. Following up Stephanie's comment that "[Supervisors] would have to [observe] every quarter because [they] don't keep the same student teachers," I highlighted and confirmed this as problematic given the university program structure for field experience as I noted, "And we don't know ahead of time [which mentor teachers] we are going to have."

In addition, throughout Phase 3 activities and discussions I remained attentive to multi-voiced participation, both to address the main intervention goal of supporting and encouraging practitioner agency (Engeström & Sannino, 2010; Virkkunen & Newnham, 2013) and to draw out the range of knowledge and perspectives represented in the group as resources for new thinking and activity. Meeting reflections for Phase 3 reflect these goals in notations such as, "I want to make sure to get the PARTICIPANTS to work on reformatting the new protocol [as opposed to completing this for the group]" following Meeting 6 and, "Once again, I had some difficulty reining everyone in!...people seemed to want to talk about all kinds of issues." Beyond demonstrating my thinking process in these final meetings, these notes indicate that I maintained space for participants to lead the process of modifying the shared tool for (their own) use in practice and negotiating the direction of a potential future collaborative work among members of the group.

Process: articulating challenges and goals for ambitious teaching in the field. Similar to Phase 2, in Phase 3 participants drew upon their experiences using the shared tool during the intervention (through *modeling, examining,* and *implementing*) to more deeply explore and consider the complex *shared object* of pre-service teacher learning in field experience through *analyzing* and *questioning.* In addition, similar to the analysis of expansive learning actions

described for Phase 2 above, the learning trajectory for the group in Phase 3 reflects the findings in Chapters 6 and 7 that demonstrate an expanded – and expanding – understanding of the key disturbances and underlying contradictions that complicate efforts to mentor pre-service teachers into a shared vision of ambitious instruction through field-based learning. However, in Phase 3 participants demonstrated a renewed emphasis on *modeling*, which reflects their efforts to make clear to pre-service teachers from early on that ambitious teaching occurs in direct relation to student thinking and developing conceptions.

As they considered how the shared tool could coordinate feedback through video-based activities in Phase 3, participants in the group tied their suggestions for particular field-based pedagogical practices or modifications to the shared tool directly to the challenges for pre-service teacher learning raised in meeting discussions. For example, in Meeting 6 the group watched the same PACT video shown in Meeting 1, but they were asked to use the shared tool as they viewed the lesson to see in what ways it did or did not coordinate a shared approach to feedback. Although the group once again discussed the procedural emphasis of the lesson shown in the clip, this time participants also considered in what ways the pre-service teacher may have been guided into the teaching shown in the video through his experiences in the program, and discussed options for how to help pre-service teachers move beyond the kind of procedural lesson they saw. Stephanie (mentor teacher) began by asserting that the pre-service teacher "might not be showing his true potential…he might just be parroting the way the lesson is written." Angela (mentor teacher) responded by confirming, "I think [the procedural approach] has been modeled at some point. That was learned." In connecting back to their own experiences with pre-service teachers in the classroom, participants then began discussing *how* to mentor pre-service teachers into a more ambitious approach to instruction. As Stephanie then suggested, "I

think it's really important to use [the "five high-leverage math practices" shared tool] for planning if you're going to use it for observing. So, that way your student teacher knows what the expectations are. We're not trying to trick our student teachers, we're trying to prepare our student teachers to be successful."

In addition, in Phase 3 the group uncovered the underlying contradiction of a system that aims for ambitious teaching but prepares pre-service teachers for "formula lessons" (see Chapter 6); this emerged in the final meeting of the intervention as a potential new starting point for collaboration. Importantly, participants drew upon the language of the "five high-leverage math practices" as they discussed the possibility that field experience was subject to opposing forces of responsive teaching and "formula lessons." For example, the vocabulary of "making adjustments" to instruction (as presented in the "five high-leverage math practices") is visible in Angela's (mentor teacher) Meeting 7 comment in which she conjectures that perhaps pre-service teachers are implicitly guided *not* move beyond "formula lessons" when preparing to video record their "teaching event" for the portfolio submission. Angela wondered:

> Do you think that it's part of the teaching event? Because it is so outlined with the steps they write down, do you feel that [pre-service teachers] are less willing to be flexible or make adjustments because they're worried they might not pass? Because [adjustments] are not coinciding with what they turned in….

In responding to Angela, Linda (supervisor) then articulated a new potential starting point for the group as she questioned whether "we are maybe training them, hopefully not, but maybe to give a formula lesson…," (see Chapter 6). With this notion of "formula lessons" in mind, in Meeting 7 the group began to identify the field-based pedagogical practices and modifications to the shared tool, such as teacher Think Alouds related to in-the-moment decision-making and the addition of the "+1" (see Chapter 7), that could help pre-service teachers develop skills in responding to students through an ambitious instructional approach.

Outcomes: mentoring for ambitious teaching. A review of the Meetings 6 and 7 "Outcomes" column in Table 8.1 reveals a combination of new concrete actions taken in meetings or brought into practice *during* the intervention (e.g. adding the "+1" to the shared tool, using common language of the shared tool) as well as continued suggestions for actions moving forward following the end of the study (e.g. focusing on planning for and enacting ambitious instruction throughout the school year). As described above, participants demonstrated a renewed emphasis on *modeling* in Phase 3 as they uncovered the key underlying contradiction of a system that seeks to prepare pre-service teachers for ambitious instructional practice through activities that actually encourage "formula lessons" (see Figure 6.2). Thus, several of the suggestions represented in Phase 3 "Outcomes" target a (new) starting point of identifying ways to help pre-service teachers move beyond the formula. For example, the Meeting 7 suggestion that mentor teachers focus on how they plan for and enact ambitious teaching throughout the school year represents an attempt to make clear to pre-service teachers that ambitious instruction involves ongoing planning and teaching *in response* to student thinking and developing conceptions day to day. Although supervisors do not work with pre-service teachers until winter quarter, both mentor teachers and supervisors agreed that pre-service teachers would benefit from mentor teachers making responsive decision-making explicit from the beginning of field experience.

However, although Table 8.1 suggests a more shared vision regarding field-based mentoring and pre-service teacher learning, outcomes for the final phase of the intervention also illuminate key differences in the roles and responsibilities of mentor teacher and supervisor as subgroups. In particular, outcomes highlight systemic constraints on supervisors' ability to take concrete action towards a more coordinated approach to mentoring. For example, as noted above,

student teaching begins in winter quarter, and therefore supervisors do not have access to partner with pre-service teachers and mentor teachers as they seek to make dynamic aspects of ambitious instruction more obvious to pre-service teachers throughout the fall observation phase. Thus, suggestions for supervisors to offer feedback on making adjustments while teaching (as presented in the Five High-Leverage Math Practices protocol) target only observation conferences in winter and spring quarters.

Departure from the plan: ending with a starting point for collaboration. As described above, goals and expectations for the Mentoring Study Group were adjusted at the start of Phase 3 based upon the unique trajectory of learning in the group. As the group expanded understanding of the complexity and broad systemic sources of problems over Phases 1 and 2, new goals of deepening conceptions of the *shared object* of activity to understand the unique tensions and challenges of field-based learning in mind emerged for Phase 3. With this in mind, although the Phase 3 process and outcomes did not align neatly with the plan created prior to the study (see Table 3.3), the new starting point at which the group arrived at the end of the intervention can be understood as an instantiation of the learning trajectory negotiated by participants *themselves* as they engaged in collaboration to more deeply investigate the goals, purposes, and constraints of their work as field-based teacher education practitioners.

CHAT model consideration: systemic constraints and practitioner knowledge resources. As described above, participants uncovered a fundamental contradiction in the goals of field experience to arrive at a new starting point at the end of Phase 3, and the Mentoring Study Group revealed learning in field experience as a highly complex endeavor that is subject to a range of disjointed and potentially conflicting sources of influence embedded within the surrounding systems of activity. Although the practical emphasis of the CHAT intervention

model encouraged participants in the group to attempt to address the need for pre-service teachers to move beyond the formula to enact ambitious teaching in the field through concrete tools and new practices (e.g. adding the "+1," suggestions for mentor teachers to model planning for ambitious teaching throughout the school year), the multiple constraints of the surrounding systems of activity could not be fully addressed within the designed collaboration. For example, the program structures for assigning supervisors to pre-service teachers at the start of winter quarter prevents the development of partnerships between mentor teachers and supervisors who "share" a pre-service teacher throughout the school year, thereby limiting the potential for members of the group to take up suggestions to communicate regarding pre-service teacher progress in learning (see "Outcomes" in Table 8.1). Adjusting the roles (and compensation structures) for supervisors to enable closer partnerships with mentor teachers would require changes in both the university and school site systems of activity that were beyond the scope and institutional capacity of participants in the group. Thus, by bringing together practitioners from both the university and school sites for the purpose of addressing problems of practice, the Mentoring Study Group was able to uncover broader systemic issues at the root of the manifest problems they encountered in their work day to day, but they were not positioned to develop and offer a full resolution.

However, through a structured collaboration rooted in a CHAT intervention approach, the group was able to draw upon their practical knowledge to identify the unique tensions and problems that arise from ambitious instructional goals for pre-service teachers in field experience. In line with the CHAT principle of following up on participant suggestions in an emergent intervention approach, as described above I provided the group with access to information about the university math methods course by inviting the math methods instructors

to Meeting 3. Through participants' efforts to connect coursework to practice through a shared tool based upon the "five high-leverage math practices," mentor teachers in particular were able to hone in on the specific challenges that emerged in practice that are less visible (or even *invisible*) in the university setting, such as learning to plan for but not enact ambitious instruction. This is important to highlight here, as the CHAT model of intervention provided a purpose and structure for supporting practitioners in negotiating the outcomes of their collaboration, and it was through *their* requests for information from the university and their efforts to bring university approaches into practice that the larger systemic problems related to an ambitious vision of instruction emerged. Furthermore, it was through close attention to experience and problems that emerged in *actual practice* that the Mentoring Study Group uncovered contradictions between the goals (i.e. ambitious instruction) and tools (i.e. edTPA and "formula lessons") of the systems of teacher education. Thus, consistent with a CHAT frame, problems of practice themselves are seen as a starting point for investigation into systemic tensions and contradictions. In the final chapter that follows, I situate findings for the Mentoring Study Group in terms of broader issues in teacher education, and I consider ways a CHAT approach can support and encourage progress in the field.

CHAPTER 9

Involving Practitioners to Advance Theory and Practice

In this chapter, I situate the Mentoring Study Group intervention and outcomes of learning within current and historical research on learning to teach, and I also consider what CHAT concepts and intervention models offer for designing and leading emergent professional development that brings together practitioners from interacting systems of activity for the purpose of new learning and change. My overall goal is to describe how the three research questions address the main question that framed this study: In what ways did a professional development model designed for expansive learning support teacher education practitioners in identifying and addressing key problems of pre-service teacher learning in field experience? Taken together, I consider the affordances and constraints of drawing upon a CHAT intervention model as a means for addressing historical and systemic problems in practice-based teacher education. In addition, I attend to mentor teacher and supervisor subgroup differences to understand how the intervention accounted for historical hierarchies between universities and schools that have complicated efforts to coordinate a shared vision of teaching across settings. Furthermore, I consider ways that key differences in the job descriptions, roles, and responsibilities of field-based teacher educators from universities and schools contribute to persistent challenges and tensions in the field. Thus, in this final chapter, I highlight and discuss these issues to demonstrate the potential of this study to support research and practice in teacher education, and I argue for the importance of bringing field-based practitioners more closely into conversations about the challenges and possibilities of practice-based approaches to learning to teach.

A Systems Perspective for Improving Field Experience in Teacher Education

I begin by addressing two main claims that emerge from these findings: 1) that the problems that occur in field experience are rooted in broader systemic issues in teacher education, and therefore must be approached with a systemic perspective in mind; and 2) that the distinct roles of mentor teachers and university supervisors, in light of the different institutional forces they are subject to, must be accounted for in efforts to develop and offer a shared vision of teaching in field experience. In the sections that follow, I address these two claims together because a systems perspective understands that the roles and responsibilities of practitioners within a system (i.e. the *division of labor*) are inextricably linked to the institutional objectives and goals that define and organize systems of activity (Engeström, 1987, 2001; Sannino, 2011). Thus, efforts to address the complex object of supporting pre-service teacher learning in field experience must include attention to the organization of practitioners' work activities and requirements that support or inhibit changes in practice.

I begin below by briefly revisiting the progression of work disturbances the group identified over the course of the intervention, and I highlight connections between field-based problems and the surrounding systems of activity with attention to the distinct ways these problems complicate and challenge work activity for mentor teachers and university supervisor subgroups. The purpose of drawing these connections is not only to demonstrate that field-based learning is constrained and challenged by forces beyond the classroom, but also to illuminate the particular features and goals for learning that warrant attention in efforts to improve field-based mentoring and learning moving forward. Furthermore, I aim to explicate ways these dimensions have differential implications for mentor teachers and university supervisors to highlight the

need for a consideration of the distinct means through which these field-based practitioners can be supporting in approaching the "shared" object of activity.

Connecting practical problems to surrounding systems of activity. Broadly, results for Chapter 6 demonstrate that as participants in the Mentoring Study Group identified the key tensions and problems of practice that emerged over the course of the intervention, they uncovered increasingly broad contradictions embedded within the overlapping systems of activity that surrounded their work. These contradictions reveal field experience as a contested and highly complex space for learning, and offer insight into *why* the field component of teacher education has remained a problematic space that historically has resisted reform and improvement (Anderson & Stillman, 2013; Darling-Hammond, 2006; Valencia, et al., 2009). As described in Chapter 6, in Phase 1 the group identified multiple problems related to Underspecified Goals and Pedagogies for Learning in Field Experience, such as "wasted" observation hours in fall and mentor teachers' uncertainty regarding the particular features of classroom teaching to model and emphasize in direct work with pre-service teachers in the field. Importantly, the lack of specification for field-based instructional modeling in the observation and throughout the school year functioned to constrain mentor teachers' direct work with pre-service teachers, but had less bearing on supervisors' work activity given that supervisors are not tasked with modeling teaching and they do not begin working with pre-service teachers until student teaching begins in winter quarter. Although supervisors agreed that a shared vision of teaching would support mentoring and learning experience in fall quarter and throughout the school year, the problem of underspecification was identified as a key source of frustration only for mentor teachers in the group (see Chapter 6, Segment 4).

Early on, participants approached these problems through attention to the (dis)connection between the university and school site systems, and therefore sought specifics of the university math methods course as a solution. However, following the introduction of the "five high-leverage math practices" into practice in Phase 2, participants expanded the scope of interest as they raised problems more broadly related to Challenges of Learning to Enact Ambitious Instruction. In particular, participants emphasized that pre-service teachers developed skills in planning for ambitious instruction, but struggled to *enact* ambitious teaching in practice (see Chapter 6, Segment 7). Moreover, participants questioned whether ambitious teaching - an expert practice mentor teachers were still working to develop (see Chapter 6, Segment 6) - was a realistic goal for pre-service teachers in light of their novice knowledge and developing skills for teaching. In raising these challenges and questions, the goals for pre-service teacher learning advanced at the university (i.e. a vision of ambitious instruction in field experience) themselves were called into question. This is important to highlight here, for in problematizing a vision of instruction widely promoted in research on teaching and teacher education (Grossman, et al., 2009), participants in the Mentoring Study Group connected problems that emerged in the field to the broader systems involved in field-based mentoring and learning. Moreover, as the group approached problems for field-based mentoring and learning related to the fundamental contradiction inherent in efforts to mentor pre-service teachers towards ambitious instruction through a System That Prepares Pre-service Teachers for "Formula Lessons," the tools and structures of teacher credentialing to which the university is held accountable and with which the coursework is intentionally aligned (see Chapter 3) were implicated as potential sources of challenge and constraint.

Thus, over the course of the intervention, participants uncovered increasingly broad, diffuse, and conflicting forces embedded within the surrounding system(s) of activity, and they connected these issues to the tensions and problems that emerged and occurred in practice day to day. Moreover, approaching practical challenges through the relatively limited scope of connecting coursework to the field (i.e. the "five high-leverage math practices" shared tool) did not provide a solution for participants in the group, and instead provoked deeper inquiry into the problems and underlying sources themselves. Thus, the Mentoring Study Group intervention suggests that the systemic causes of problems encountered in practice must be attended to in devising local solutions to historical problems and challenges of field-based learning.

Situating problems and systemic connections within the literature. The persistent problems of disconnection between universities and schools are well-documented within the literature on teacher education (Darling-Hammond, 2006; 2009; Feiman-Nemser, 2001). Findings from the Mentoring Study Group intervention reflect this research, and confirm the persistence of issues related to the "divide" between universities and schools over time. For example, the pervasive lack of guidance, support for, and specification of the work of mentoring in the field described in research literature (Hatch & Grossman, 2009; Zeichner, 2002) connects directly to the Phase 1 disturbance of Underspecified Goals and Pedagogies for Field Experience, and participants furthermore confirmed the frustration this caused mentor teachers and pre-service teachers (see Chapter 2, Segment 4) and the missed opportunities for learning as a result (see Chapter 2, Segment 2). In addition, the Mentoring Study Group participants confirmed that limited opportunities for university supervisors and classroom mentor teachers to meet to discuss individual pre-service teacher progress and goals for learning contributed to disconnection and a lack of coordination in their work (Levine, 2011), such as when Linda (supervisors) asserted in

Meeting 4 that "this work [to improve mentoring] involves conversations, and that's what we don't have time to do."

However, results of the Mentoring Study Group intervention call into question the common positioning of schools and universities in binary opposition in research on teacher education (e.g. Cook, et al. 2002; Martin, et al., 2011; Valencia, et al., 2009), and challenge the assumption that "student [teachers] have few opportunities to actually try out [core practices] in their roles as teachers" (Grossman, et al., 2009; p. 279). Instead, findings from Mentoring Study Group reveal that mentor teachers actively sought to connect the practices they modeled and emphasized in the classroom to those promoted at the university (e.g. "even if it's just like the big ideas or concepts, I would make sure I was discussing those things….") and results from final interviews demonstrate a clear interest in continuing to meet following the study to continue movement towards a shared vision and approach to mentoring (see Table 7.2). Moreover, rather than seeking to "protect student teachers from 'impractical' ideas promoted by education professors" (Feiman-Nemser, 2001; p. 1020), mentor teachers sought the "same lens" with a "common vocabulary" (see Chapter 7, Segment 1) to better connect the university methods and instructional approaches more closely into their work in their classroom. Considered in light of the connections to the surrounding systems of teacher education described above, the findings reported here suggest that the disconnection between the university and field sites can be attributed more to the institutional structures that constrain communication and coordination (e.g. limited time to meet, lack of shared tools) among practitioners rather than to the intentions (e.g. "protecting student teachers") of classroom mentor teachers or other school-based teacher educators.

Beyond these connections to prior research, findings from this study offer new insight into current research focused on core practices for teacher education. As discussed earlier, there is a current and growing interest in core practices for teaching to center teacher education programs to better connect theory to practice in teacher preparation, and there is a growing body of work by Grossman and colleagues (e.g. Grossman, 2011; Grossman, et al., 2009; Grossman & McDonald, 2008) that aims to specify the meaning of "core practices" for the purpose of developing teacher education pedagogies that support practice-based approaches. McDonald, Kazemi, and Kavanagh (2013) have made important contributions to work on core practices in teacher education by presenting distinguishing features of "core practices," and by providing examples of core practices in mathematics that have been promoted in university courses and with partner school sites. Importantly, this work argues *against* development of a fixed set of core practices for teaching, and calls instead for a "dialog" between researchers and practitioners to "wrestle with the [field-based] choices they have made and the ways those choices influence teacher learning and development" (p. 4). However, although it may be (and perhaps is likely) that these researchers partner closely with field –based teacher education practitioners to collaboratively examine and address how to promote and support learning around core practices in the field, the contributions and structures for ongoing dialog and communication with these practitioners is not made visible in the literature. Instead, the efforts of university-based teacher educators in coursework and in field experience are more typically featured and described. By featuring the voices of both supervisors and mentor teachers throughout this study, this research offers a richer explication of *how* partnerships between universities and schools can support improvements in field-based learning, as the particular ways practitioners problematized use of the "five high-leverage math practices" as a tool to guide learning in practice (e.g. "I found it

useful, but I think there is more we could add to it….") holds potential for improvement moving forward. Moreover, the particular points of interest mentor teachers raised regarding the ways pre-service teachers demonstrate *less* responsive teaching when being observed by supervisors or when recording video for the edTPA suggest that research on practice-based teacher education must account for the hierarchical dynamics that result in more "formulaic" teaching for university assignments (e.g. field observations) and credential exams.

Constraints on practitioner roles within overlapping systems. Bringing together teacher education practitioners from two systems of activity offers new insights into the institutional constraints and challenges that pervade and complicate learning in the field, and also opens new potentials for changes in activity that may support improvements to field-based mentoring and learning. As noted above and described in Chapter 7, mentor teacher and supervisor subgroups are important to consider in light of distinctions between their roles, responsibilities, and time spent with pre-service teachers in the field (Slick, 1998). Of particular note is the limitations supervisors face in being able to take up suggestions for introducing structure in fall - since they do not work with pre-service teachers until winter quarter - and gaining a better understanding of the classroom contexts - since they visit classrooms only three times per quarter. Mentor teachers, on the other hand, are uniquely positioned to the make changes in practice suggested by the group, such as intentional modeling of ambitious instructional practices throughout the fall quarter using a shared language to make instructional intent and purpose clear. Thus, in light of the primary role mentor teachers play in guiding field-based learning experiences as compared to supervisors, this study suggests that it is imperative to involve classroom-based practitioners (i.e. mentor teachers) more closely in efforts to devise both the tools and the field-based pedagogical practices that support ambitious teaching.

Practical implications of a systems perspective for teacher education. Ambitious teaching is notoriously difficult to learn to enact; according to Lampert and Graziani (2009), "even experienced teachers can be considered 'novices' when it comes to learning to practice ambitious teaching" (p. 492). Indeed, participating teachers in the Mentoring Study Group echoed this sentiment as they spoke to their own continued learning related to responding to students through questioning to guide learning (e.g. "This is definitely a challenge even for teachers that are well-seasoned. I just wanted to say that.").As noted above, in recent years the field of teacher education research has made noteworthy progress towards preparing teachers for ambitious teaching by specifying core practices and "pedagogies of enactment" for teacher education (Grossman, et al., 1999; Grossman, et al., 2009; Kazemi, Franke, & Lampert, 2009; McDonald, et al., 2013). This growing body of research has helped advance the field of teacher education by offering a common vocabulary for teaching, and has helped the field move beyond a primary focus on developing knowledge for teaching to address instead the ways teachers *draw upon* knowledge to support students in thinking deeply and constructing new understandings.

However, while attention to the component features of core practices may be necessary for learning to enact ambitious instruction, new research points to the challenges pre-service teachers face when attempting to take up core practices in field experience. In particular, novices are found to struggle with understanding the instructional *purposes* of core practices in classroom practice, and have difficulty understanding how core practices function within the broader framing of a classroom lesson, unit of study, or school context (Ghousseini, 2015). Because of this, Kennedy (2016) argues that what novices need to know is not just how the core practices of teaching are defined, but *why* ambitious teachers use these practices in the classroom.

Field experience offers a unique and crucial opportunity to develop this understanding of core practices in action, and field experience may indeed be the *only* space in which pre-service teachers are able to "cope with real situations and with the help of their instructors start noting the consequences of their actions" (Ghousseini, 2015; p. 338) in teacher preparation. Thus, a focus on core practices in teaching demands closer attention to field experience and the ways practicing teachers respond to students and adjust instruction while teaching for the purpose of guiding student learning. By taking on a more systemic view in approaching the work of supporting pre-service teacher learning in the field, efforts to support ambitious instruction through a focus on core practices can make use of the unique and crucial knowledge of practice and students made available only in the field. The suggestions made by the Mentoring Study Group hold potential to draw upon the rich knowledge and practical resources inhered by practicing classroom teachers, such as making visible how teachers take up ambitious instruction through ongoing planning in relation to students learning, responsiveness while teaching, and the knowledge of students more explicitly throughout the year. Further, supervisors' suggestions to provide feedback directly on decision-making and departures from the lesson (see Linda's comment in Meeting 7) addresses ways university-based teacher educators can highlight crucial features of ambitious teaching in their direct work with pre-service teachers in the field. Taken together – and understood as distinct according to different the roles and responsibilities of supervisors and mentor teachers – the suggestions for practice developed by participants in the Mentoring Study Group can contribute to making a vision of teacher preparation for ambitious teaching a reality.

Additionally, findings from this study suggest that mentoring pre-service teachers can function as professional development classroom teachers. Several mentor teachers connected their participation in the Mentoring Study Group to new ways of thinking about their own classroom teaching, especially in terms of how they use questioning to guide student learning (see Chapter 7). It may be that by focusing on mentoring pre-service teachers into ambitious teaching in field experience, mentor teachers *themselves* are afforded unique and important opportunities for professional learning and growth. Research has long advocated for professional development that is sustained over time, connected to practice, and organized such that teachers can share expertise and learn through collegial exchanges (e.g. Garet, Porter, Desimone, Birman & Yoon, 2001; Hawley & Valli, 1999). The structure of the Mentoring Study Group aligns with these recommendations, and therefore may hold promise as a tool for teacher learning in addition to teacher educator development. This is appealing in light of the concrete realities that complicate many professional development efforts that target education reform, such as chronic limitations of available time, school and district budgets, and teacher interest.

A CHAT Model for Teacher Educator Professional Development

My final claim is related to CHAT frame that guided the professional development model design. Though the Mentoring Study Group demonstrates that a formative intervention approach shows promise in empowering participants in practice to identify, develop, and collaborate around shared problems of practice, this study also reveals two key limitations of the model when bringing together two communities who are part of broader systems of activity. First, as described above, although the study brought together the practitioners who faced challenges related to an apparently *shared object* of work activity, due to institutional constraints and dictates these practitioners were limited in their capacity to take on the new solutions for practice

they developed. It may be that for an issue as complex as coordinating field-based learning opportunities for pre-service teachers, university-based representatives able to make changes in the program structure itself would need to be involved to ensure that new learning could be take hold through the changes to the system(s) required. In addition, although *Change Laboratory* interventions are most typically structured as a series of five to ten meetings, and are thus short-lived endeavors (Engeström & Sannino, 2010), the Mentoring Study Group intervention findings revealed that the group required seven meetings to *arrive* at a starting point for collaboration. It may be that the special and problematic history of disconnection and hierarchical positioning of universities and schools (Slick, 1998; Zeichner, 2010) demands more time and careful facilitation to uncover the sources of practice-based problems and to create the conditions for multi-voiced discussions that can help groups devise and implement new solutions through collaboration.

CHAT theory and intervention research. As a living theory, CHAT and related interventions are continually enriched through research and new insights into learning. For example, in response to Penuel's (2014) attempt to "renew a dialogue between CHAT researchers and learning scientists about intervention research" (p. 97) by connecting the key features of formative interventions to design-based research, Engeström and colleagues themselves acknowledged the need to identify, better specify, and communicate the principles and actions of CHAT interventions. According to Engeström, Sannino, and Virkkunen (2014), to advance research and continue to develop theory, CHAT researchers must take on a goal of "sharpen[ing] the key ideas of formative intervention research while at the same time nourishing its open-ended and developing character" (p. 118). Furthermore, Engeström and colleagues point to the need to address methods of formative interventions in light of the "emerging focus on

multi-activity constellations" (p. 126) that look beyond the scope of individual organizations to take on the spaces of intersection between systems of activity. Virkkunen and Newnham (2013) have contributed greatly to this effort in offering a valuable and practical text that provides details regarding planning for, enacting, and researching *Change Laboratory* interventions. For CHAT interventions seeking to address the enormously complex issues related to teacher preparation and teacher education, efforts such as this and others that help to gain clarity around the key principles of designing for and facilitating an emergent approach to intervention is especially important. This study supports these helps to illuminate the need to better understand how to design and enact emergent interventions to achieve expansive learning and outcomes that are not pre-determined by researchers.

Limitations

Although the contributions of this study hold potential for both research and practice in teacher education, the study also bears limitations worthy of note. First, because the study focused on the intervention itself, I am not able to make claims about changes in practice in direct work with pre-service teachers as a result of participation in the intervention. Understanding how practitioners take new actions in their work is an important next step for this research. Next, the scope of the study was limited to the practitioners in the group, and therefore does not include analysis of changes in the surrounding university or school site systems that may enable or constrain changes in practice. In particular, university supervisors were limited in their ability to take up many of the suggested changes by virtue of their workload and job role descriptions. Because university supervisors typically oversee pre-service teachers at multiple school sites and are compensated only for three observation visits each quarter, there are structural barriers that may constrain regular opportunities for communication and continued

work to connect university-based learning to classroom experience. Finally, to move forward with this research it would be important to closely analyze facilitation of emergent professional development, including the sources of knowledge a facilitator-researcher needs to be able to respond to participants and take up unanticipated ideas as required in an emergent model of intervention. For this approach to addressing field-based learning to support university-school partnership efforts more broadly, it will be crucial that facilitator-researchers understand the unique demands of a CHAT intervention approach, including the ways facilitators can ensure multi-voiced participation and accommodate group-initiated learning trajectories while keeping the central goals of the intervention in mind. This demands expertise and skill in guiding adult learning, and therefore future studies must account for this to be able to contribute a useful model for research and practice.

Conclusion

CHAT is a useful frame for research on teacher education, as it provides conceptual tools through which to understand and address the incredibly complex landscape of policies, historical practices, and classroom contexts in which the field component of teacher preparation occurs. Moreover, because CHAT interventions *by design* draw upon the voices of practitioners to develop agency and offer local, unique solutions to the problems that emerge in practice, CHAT offers a model through which universities and schools can structure collaborative efforts to improve pre-service teacher learning, education research, and teacher preparation programming. Although complicated, often problematic, and highly dependent on local issues and details, it is urgent and vital to find a way to organize practice-based teacher preparation such that pre-service teachers can learn to enact ambitious instruction and continue to grow throughout their professional careers. It is my hope that by involving the voices of teacher education practitioners

themselves more closely in the work of developing pedagogies for field-based learning, the field will benefit from the knowledge and expertise developed in and for practice.

The Mentoring Study Group was itself an ambitious endeavor, as the intervention explicitly aimed for transformation, innovation, new learning and practical change in an area of teacher education that has proven remarkably resistant to reform and improvement over time (Darling-Hammond, 2006; Levine, 2011; Valencia, Martin, Place & Grossman, 2009; Zeichner, 2012). In light of this history, it is perhaps not surprising that as participants collaboratively explored problems related to the *shared object* of their work, they expanded their understanding of the complexity of field-based teacher preparation and learning in field experience rather than consolidating a stable solution to guide work activity moving forward (see Chapter 8). However, although the group did not arrive at a clear solution to persistent problems of practice through their collaboration, Mentoring Study Group participants uncovered contradictions within and across their particular university and school site systems that speak to historical problems in the field and illuminate key obstacles to making meaningful improvements in field-based teaching and learning. These contradictions point to dimensions of the surrounding system(s) of teacher education that will be crucial to address in future research and practical work around teacher preparation, and therefore findings from this study support and encourage progress in the field.

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Appendix A
UC Irvine Math Methods Syllabus

EDUCATION 322B
Teaching Mathematics in Elementary School

Fridays, 9:00-11:50
Education 2001 (Cohort A)/Education 2010 (Cohort B)
Course URL:

Instructor: Phone: Office: E-Mail: Office Hours:	Instructor: Phone: Office: E-Mail: Office Hours:

COURSE PHILOSOPHY:
This course takes a "learn-by-doing" approach to mathematics education. Students will learn the interrelated components of a balanced program of mathematics instruction: conceptual understanding, computational and procedural skills, and problem-solving/math reasoning skills. Using the state-adopted Mathematics Academic Content Standards, students will recognize and teach logical connections across major concepts and principles using a variety of instructional strategies.

COURSE GOALS:
Upon completing this course, students will be able to:

- Observe and analyze instruction during fieldwork in productive ways with a focus on the relationship between teacher moves and student learning (TPE 2, 3, 9, 13)
- Plan, enact, and reflect on teaching in ways that generate knowledge for future improvement (TPE 2, 3, 9, 13)
- Plan and enact instruction that is responsive to students' thinking and learning (TPE 2, 3, 9, 13)
- Understand and teach the progression of Common Core mathematics standards as adopted by the State of California. (TPE 1A)
- Interrelate mathematical ideas across the curriculum and integrate literacy into mathematics through literature, discourse, reading, and writing. (TPEs 1A; CCSS-ELA; California ELD Standards 2012; RICA Content Area 9)

- Create a classroom environment that celebrates what students can do, promotes mathematical curiosity, flexibility, persistence, and productive disposition, and provides appropriate reinforcement and feedback. (TPEs 1A, 5, 6, 7, 11)
- Assess students' prior knowledge; set appropriate instructional objectives; anticipate, recognize, and clarify mathematical misunderstanding that are common among elementary students; and evaluate the students' achievement and needs. (TPEs 1A, 3, 6, 7, 8)
- Select, evaluate, and plan to implement a variety of technology for use in the math classroom. (TPEs 1A, 4, 5, 6, 9)
- Write lesson plans and units of instruction that demonstrate a balance across the strands of mathematical proficiency and that incorporate the skills and knowledge to engage with the Common Core Mathematics Practice Standards. Lesson plans will include instructional objectives, teaching strategies, attention to academic language, and assessment plans. (TPEs 1A, 2, 4, 6, 7, 9, 10; CCSS-ELA; California ELD Standards 2012)
- Prepare and use instructional strategies, techniques, and materials that capitalize on students' prior knowledge, and learning styles while meeting the diverse needs of all students including English Language Learners, gifted and talented students, and special needs students. (TPEs 1A, 4, 6, 7, 8, 9; CCSS-ELA; California ELD Standards 2012)

REQUIRED TEXTS AND MATERIALS:

- *Elementary and Middle School Mathematics* by Van de Walle, Karp, and Bay-Williams, 2010 (7th edition)
- *Five Practices for Orchestrating Productive Mathematics Discussions* by Smith and Stein, 2011
- *Extending Children's Mathematics: Fractions & Decimals: Innovations in Cognitively Guided Instruction* by Empson and Levi, 2011
- NCTM Student Membership - information available at http://www.nctm.org/membership/content.aspx?id=7618. Please select *Teaching Children Mathematics* as the digital edition that you want to receive. Join online to receive benefits in a timely manner.
- California Common Core State Standards (CCSS) (Grades K – 6) from http://www.scoe.net/castandards/agenda/2010/math_ccs_recommendations.pdf
    - If you decide to print this for your notebook, print pages 1-44.
    - If you will ALWAYS have your laptop in class, you may access electronically.

- Ruler, colored pencils (or markers or crayons), glue stick, scissors, highlighters, fine-tip dry erase marker, and old sock (for dry marker eraser)
- Math binder (from fall quarter)

ADDITIONAL RESOURCES:

- Rational Number Project: Initial Fraction Ideas at http://www.cehd.umn.edu/rationalnumberproject/rnp1-09.html
- Rational Number Project: Fraction Operations and Initial Decimal Ideas at http://www.cehd.umn.edu/rationalnumberproject/rnp2.html
- Teaching and Learning about Decimals at http://extranet.edfac.unimelb.edu.au/DSME/decimals/slimversion/index.html

CLASS EXPECTATIONS:

Attendance: The UCI Multiple Subject Credential Program is designed to prepare you for the workplace conditions associated with a career in teaching. Our program-wide attendance policy is intended to reflect this purpose. Unless there are serious and unchangeable circumstances (such as illness or family emergency) you are expected to be present at every class. Just as in a job, notify the instructor in advance (at least 30 minutes before class begins) of any absence and then follow through with the make-up as assigned by the instructor. In a class that meets ten or more times, one absence will have no impact on the grade if the make up assignment is completed. Each additional absence will have a five percent impact on the course grade. Missing part of a class (e.g., arriving late, leaving early, stepping out for an extended period), that occurs multiple times, may also be counted as an absence. Please be sure to talk with your instructor if any of these are unavoidable.

Classroom Environment:

- The MS courses are built on principles of active, student-centered learning. Active participation informed by class readings is expected both in small and large group discussions. The use of computers and cell phones during class for purposes unrelated to the class activity underway will be construed as a lack of participation.
- A break will occur about midway through the class. Please use this time to take care of any email, cell phone or text messaging use – all of which can be a all of which can be a distraction to the others sitting nearby.

- This class uses many hands-on materials to model instructional strategies and depends on pair and small group interactions to process the content discussed in class. Many of the notes that will be taken in class involve mathematical notation that is difficult to capture on a computer. We will at times ask that you close your laptops and actively engage with the manipulatives and written mathematics, so you'll want to have a plan for taking notes by hand as well as with technology.

Assignments:

- Be sure to communicate with the instructor about any questions you have before an assignment is due if the requirements are not clear to you. Asking other students may result in inaccurate information.
- Make sure to review the rubric for each assignment that has a rubric.
- All assignments demonstrate professional organization, neatness, and quality.
- All assignments must be word processed in **12-point text** in an easy-to-read font (Times New Roman, Calibri, etc.) and printed in **black ink** on **one side** of the paper.
- All assignments must be ready to submit by the time class begins on the date due. Any assignment turned in late can earn no more than a B- grade (80% of the points).
- Any dropbox assignment must be submitted to the appropriate eee dropbox by the time class begins in .doc or .docx format.

Grading Criteria:

A (94 –100) A- (90-93) B+ (87-89) B (84-86) B- (80-83)

*** Any final course grade below a B (84%) requires the student to retake the class and is grounds for academic dismissal. ***

Your grade for Education 322B will be determined upon the completion of:

- Reading/NCTM Journal/Technology Responses – 25%
- Math Lesson Analysis Journal – 30%
- In-class Workshop Projects - 20%
- Whole Class Assessment Project - 15%
- Textbook Lesson Revision – 10%

ASSIGNMENT OVERVIEWS:

Reading/NCTM Journal/Technology Responses – Weekly (25%)

"I hear and I forget. I see and I understand. I do and I remember." Confucius

According to the Constructivist theory, learners need multiple opportunities to construct meaning and integrate new knowledge with pre-existing beliefs and knowledge. Because the information you will be reading is so extensive and foundational, we believe it is important for you to respond in various ways to these readings – both at home and in class. To help you make sense of, and capture the key points of, the readings, each week you will have the opportunity to respond to the readings assigned. Some of these responses will include preparation for in-class activities. Some may include targeted notes from assigned reading. Some may include preparing parts of a lesson.

Reading Response Rubric

10 points – Thorough, detailed reading response with specific evidence that captures the key understandings in the reading/video assigned. Professionally presented and formatted to identify key points. Reading response submitted on time.

9 points – Completed reading response that summarizes the reading/video. Professionally presented and formatted to follow easily. Reading response submitted on time.

8 points or less – Minimal reading response that does not represent the key understandings from the reading; handwritten or formatted so it is difficult to read; reading response submitted late.

See rubric on next page.

In-class Workshop Project – Weekly (20%)

Throughout the quarter you will have many opportunities to practice the skills and strategies you will need as a future classroom teacher. There will be a variety of projects in class (small group, individual, and/or partners) that will allow you to practice and work through a planning, instruction, or assessment task that mirrors what you will have to do in your own classroom. These projects/activities will be collected and graded for completeness and effort.

Math Lesson Analysis Journal – Weekly (30%)

In order to continuously focus on and refine high-leverage math teaching practices, you will analyze and reflect on your student teaching math lessons every week. You

will upload your cumulative Journal to the appropriate eee dropbox each week no later than 8:45 a.m. on Friday mornings. You will be sharing your insights during class each week, so be sure to have a copy of your reflections for that week available either electronically or hard copy.

The five high-leverage math practices we would like you to focus on are:
1) Using rich tasks to engage students in constructing their own understanding of mathematical concepts, procedural knowledge, problem solving, and/or mathematical reasoning;
2) Using representations to deepen students' understanding of mathematical concepts and make connections to procedural knowledge/skills;
3) Using questioning to elicit and build on student responses to clarify/understand student thinking about mathematical understandings and to uncover misconceptions -- including academic language scaffolding/supports;
4) Providing opportunities for students to engage in mathematical discourse -- including academic language scaffolding/supports;
5) Making adjustments to your lesson and lesson sequence based on evidence of student learning, including differentiating for struggling and advanced students.

Journal Schedule:
Week 2 (Journal #1) -- one focus area, at least two lessons
Week 3 (Journal #2) -- two focus areas, at least three lessons
Week 4 (Journal #3) -- three focus areas, at least three lessons
Week 5 (Journal #4) -- four focus areas, at least two lessons
Week 6 (Journal #5) -- five focus areas, at least two lessons
Week 7 (Journal #6) -- five focus areas, at least two lessons
Week 8 (Journal #7) -- five focus areas, at least one lesson
Week 9 (Journal #8) -- five focus areas, at least one lesson
Week 10 (Journal #9) -- five focus areas, at least one lesson

Sample Entry:
- Overview: One or two sentences that explain the context of the lesson, including the lesson objective
- Focus area 2: Use of Representations
  - Evaluation of a successful or not-so-successful use of the high-leverage practice
  - Supported by specific evidence from the lesson ["More than half of the students placed 1/4, 1/3, and 1/2 equi-distant from each other" is much more specific than "the students struggled to plot the fractions on the number line"]

- *Thoughts about adjustments* to future work with this high-leverage practice

Focus area 2: Use of Representations

The first day I used the number line with fractions, I just asked students to draw one on their papers and place 1/4, 1/3, and 1/2. I assumed that they would know that fractions would be spaced out differently than whole numbers, but I now realize that I needed to scaffold this idea. More than half of the students placed 1/4, 1/3, and 1/2 equi-distant from each other, and at least 40% of the students placed them in reverse order (1/2, 1/3, 1/4). *So now I realize that I need to help students make connections between different representations for the same concept. In this case, students already knew that 1/3 isn't halfway between 1/4 and 1/2. But they didn't automatically know how to connect this with the new number line representation. So next time I introduce a new representation for a concept, I need to start with the known representation and help students connect to the new representation.*

- Focus area 4: Opportunities for Math Discourse
  - Evaluation of a successful or not-so-successful use of the high-leverage practice
  - Supported by specific evidence from the lesson
  - Thoughts about adjustments to future work with this high-leverage practice

Focus area 4: Opportunities for Math Discourse

Please write each entry in complete sentence and paragraph structure, including

Math Lesson Analysis Journal

10 points – Thorough, detailed reflection with specific evidence related to each lesson. Professionally presented and formatted to easily identify evaluation, specific evidence, and adjustments to instruction for each focus area response. Math Lesson Analysis Journal submitted on time and includes the correct number of entries and focus areas.

9 points – Completed reflection relates to specific lessons. Professionally presented and formatted to easily identify evaluation, specific evidence, and adjustments to instruction for each response. Math Lesson Analysis Journal submitted on time and includes the correct number of entries and focus areas.

8 points or less – Minimal reflection; missing one or more lessons and/or focus areas; evaluation, evidence, and adjustments to instruction not easily identifiable; reflection respon

Whole Class Assessment Project – Due Class 5 (15%)

Using data from a math assessment, you will analyze class performance data to identify concepts and skills the students understand, have misconceptions about, or still need to develop. Based on your analysis, you will plan next steps that a teacher could use for instruction. See the Whole Class Assessment Project posted on eee for additional details and rubric.

Appendix B
Initial-Final Interview Questions

Initial Interview
Questions

Experience as a teacher educator

- How would you describe your role as a mentor/supervisor?
    - How do you put that role into action?

- How would you describe the role of the supervisor/mentor?
    - What does that look like?

- What are your expectations for pre-service teacher learning in clinical placement?
    - Tell me more about that….
    - Why?....

- *What do you think the expectations are for the other teacher educators/systems?*
    - *What makes you think that?....*
    - *What do you think of that?*

- *What are the greatest challenges of your work as a teacher educator?*
    - *Why do you think that is?*
    - *What ideas do you have to resolve these challenges?*

Video:

- What stands out to you about this lesson? As a teacher educator, what do you notice?

- What would be important to address with this candidate?
    - Why?

- How would you prioritize what to say?

Final Interview

Questions

Experience as a teacher educator

- How would you describe your role as a mentor/supervisor?
    - How do you put that role into action?

- How would you describe the role of the supervisor/mentor?
    - What does that look like?

- What are your expectations for pre-service teacher learning in clinical placement?
    - Tell me more about that….
    - Why?....

- *What do you think the expectations are for the other teacher educators/systems?*
    - *What makes you think that?....*
    - *What do you think of that?*

- *What are the greatest challenges of your work as a teacher educator?*
    - *Why do you think that is?*
    - *What ideas do you have to resolve these challenges?*

Wrap-up

- Is there anything new that you do in your work or any new ways of thinking that you attribute to your participation in this study?
- What is your big "takeaway" from this study? What have you found to be most useful – new knowledge, new ways of thinking, new practice?
- Tell me about why you chose to star the items you selected as priorities (on our list).
- Anything else you would like to say….

Video:

- What stands out to you about this lesson? As a teacher educator, what do you notice?

- What would be important to address with this candidate?
    - Why?

- How would you prioritize what to say?

Appendix C
Meeting Graphs

Meeting 1
Video File: 100_0137.MP4

13 minutes *9:55 – 22:45*	**1.1 Welcome and background for the group** • Jessica thanks everyone for participating and describes the "problem" of mentoring in field placements – MT, S, and ST. Within the research lit, there is documentation of the problem, but not solutions. This group is an attempt to develop solutions by drawing out and building on the knowledge of practitioners. • Goal of the group is to put together something concrete to help with direct work with ST's. First 2 meetings are to "get a lay of the land" in terms of what practice looks like now.
30 minutes *22:45 – 52:45*	**1.2 Activity: Brandon video and feedback chart** • Jessica shows Brandon's PACT video and asks the group to write down "what would be important to talk to the candidate about" and "what would you say to him" • Group shares feedback ideas while Jessica charts
17 minutes *52:45 – 1:13:03*	**1.3 Discussion: themes of feedback chart** • The group discusses themes apparent on feedback chart: • Common themes • Conflicting themes
8 minutes *1:13:03 – 1:21:00*	***1.4 Discussion: current and past personal experiences mentoring pre-service teachers and ideas for improvement*** • *members of the group shared problems of practice in mentoring and ideas for improvement*
1 minute *1:21:00 – 1:22:02*	**1.5 Closing: thinking about a tool to support mentoring** • For next meeting, think about what would be good to include on a tool.

Meeting 2
Video file: 100_0133.MP4
Audio File: 140108_001.MP3

3 minutes *14:35 – 17:35*	**2.1 Welcome** • Welcome Tanya and Summer to the group. • Thanks to everyone for being candid and open in interviews. • Plan for today: begin getting concrete words down for working with ST's, sharing theoretical background for the group
12 minutes *17:35 – 29:20*	**2.2 Activity theory and conceptual model of this group** • Basics of CHAT and model of interacting activity systems • Potentially shared object in the middle – but contradictions potentially built into and across systems. • Group will be using tensions to generate new innovations and ideas • We will begin developing boundaries to specify concrete actions and activity for us as practitioners
14 minutes *29:20 – 43:18*	**2.3 Discussion: What are the *things* we want to focus on with ST's?** • Participants discuss sharing info about methods course content with MT's
22 minutes *43:18 – 55:45*	***2.4 Discussion: roles and expectations for Supervisors and MT's*** • *Different roles for MT's and Supervisors* • *Feedback for MT's* • *Tool to specify what to emphasize*
5 minutes *55:45 – 1:00:32*	**2.5 Activity: using CCSS math practices to specify instructional practices we want to see ST's develop** • Jessica hands out CCSS math practices and asks participants to write down the instructional practices that support students in engaging in the CCSS math practices •
19 minutes *1:00:32 – 1:19:28*	**2.6 Activity: Tawnee video clip and feedback (using CCSS math practices as a guide)** • participants watch the clip and then share ideas for feedback • participants share ideas about connection between the video and the math practices
8 minutes *1:08:40 – 1:16:37*	**2.7 Discussion: specifying ideas for a potential protocol tool** • based on ideas for feedback raised in relation to Tawnee video
10 minutes *1:16:37 – 1:26:30*	**2.8 Closing Activity: making a plan for creating the protocol tool** • making a plan for how to put the protocol together • assigning tasks for next meeting

Meeting 3
Video File: 100_0144.MP4

1 minute *15:34 – 16:30*	**3.1 Welcome** • Welcome Jeanne, Val, and Beth to this meeting • Plan for this meeting is to start naming ideas for a shared protocol tool
12 minutes *16:30 – 28:50*	**3.2 Discussion: new ways of thinking and going about work with ST's since the intervention began** • Participants discuss new noticing and actions around the mentoring in field experience • Justine questions if supervisors know enough about MT strengths to direct ST's to observe particular practices of teaching • Participants share ideas to help supervisors learn more about MT classrooms
9 minutes *28:50 – 36:45*	**3.3 Activity: presenting 5 high leverage math practices** • Jessica suggests the 5 practices as a starting place for constructing a shared protocol • Stephanie shares what she found out after interviewing her ST about what she would like to have focused on in field experience • Jessica asks the group to think about what Stephanie is sharing *in terms* of the 5 practices • Justine is pleased ST's are learning these practices • The group gathers information from methods instructors regarding how the 5 practices are introduced and used with ST's
7 minutes *36:45 – 43:35*	***3.4 Discussion: problems with ST's and teaching event videos (Why do they keep getting stuck in a rut using powerpoints?)*** • *Lauren raises that her ST's relied on powerpoint presentations for the teaching event video* • *Group discusses ST problems and challenges related to preparing teaching event videos*
23 minutes *43:35 – 1:06:08*	**3.5 Discussion: unpacking the 5 practices – rich tasks** • Participants discuss prior learning around rich tasks and check for shared understanding • The group discusses the distinction between PLANNING a rich task and ENACTING a rich task
4 minutes *1:06:08 – 1:10:25*	***3.6 Discussion: can the 5 practices be adapted to other content areas?*** • *the group discusses removing the word "math" to adapt the 5 practices across content areas*
11 minutes *1:10:25 – 1:21:00*	**3.7 Discussion: unpacking the 5 practices - questioning** • the group discusses how questioning is presented in methods course and considers differences between planning for and enacting questions
6 minutes *1:21:00 – 1:26:15*	**3.8 Discussion: bringing the 5 practices into field experience** • the group discusses ways to bring the 5 practices into MT modeling and ST observations and lesson planning
2 minutes *1:26:15 – 1:28:10*	**3.9 Discussion: planning for the next meeting** • Jessica says we can talk about the 5 practices again at the next meeting, and asks if there are suggestions for other agenda items or approaches • Danielle says the 5 practice are hard for all teachers – not just ST's • Val says they tell the ST's it is the beginning of a journey
12 minutes	***3.10 Discussion: SWUN math curriculum*** • *The group discusses SWUN and its challenges for MT's and ST's*

1:28:10 – 1:40:00	• *Methods instructors share that SWUN conflicts with edTPA and UCI approach*
1 minute *1:40:00 – 1:41:00*	**3.11 Closing: homework for next meeting** • Jessica asks participants to ask ST's what they would have liked to learn in Winter quarter (now that it has been completed) • Jessica says she will gather 5 practices criteria from Jeanne and Val to sketch protocol tool.

Meeting 4
Video File: 100_0144.MP4

13 minutes *13:25 – 17:45*	**4.1 Welcome: review of last meeting and plan for this meeting** • Jessica reviews the last meeting with Jeanne and Val • Plan for this meeting: 1) share what we found out from ST's about what they wanted to learn in field experience; 2) specify what should go onto the protocol; 3) watch SWUN lesson video
22 minutes *17:45 – 39:30*	**4.2 Discussion: feedback from ST's** • Group shares feedback gathered from ST's regarding what they think is important to learn in field experience
18 minutes *39:30 – 57:25*	**4.3 Discussion: is anything missing from the protocol?** • The group discusses ways they have used the protocol in practice and ideas for what could be added • Group also discusses common challenges for ST's and ways to support them through modeling, planning, and feedback
14 minutes *57:25 – 1:11:56*	**4.4 Discussion: how can the protocol coordinate work?** • The group discusses how to use the protocol to best support learning in field experience • Different uses for MT's and S's
10 minutes *1:11:56 – 1:21:39*	**4.5 Closing: planning for how to use protocol before next meeting** • Participants share ideas for how they will bring the protocol into their direct work in the classroom

Meeting 5
Video File: 100_0149.MP4

3 minutes *5:00 – 8:30*	**5.1 Welcome: plan for today** • Because of the small size of the group, Jessica decides to modify planned activities and work as a whole group today
16 minutes *8:30 – 24:55*	**5.2 Discussion: how have you incorporated the protocol into practice?** • Participants share experiences using protocol in direct work, including adaptations, modifications, and function. • Participants discuss challenges of enactment of teaching in-the-moment. • Participants discuss ideas for modifications to the tool based on experience.
15 minutes *24:55 – 39:45*	***5.3 Discussion: what is the purpose of this group? How will this tool and this work impact mentoring practices in the future and beyond Ludlow?*** • *The group discusses the potential future impact of the intervention and the tool at Ludlow and at other schools.* • *The group addresses the constraints of the system of supervision in the field and the limitations of what Supervisors can do* • *The group discusses MT and S roles and raises ideas for ways to make changes to the systems to support better coordination around a shared vision of teaching* • *The group discusses how the protocol tool can impact the kinds of mentoring practices that occur in the classroom*
18 minutes *39:45 – 58:00 note: check the ending time*	***5.4 Discussion: how can the protocol tool help move towards specificity in mentoring and communication between S's and MT's/*** • *The group discusses how the protocol brings discussions beyond "things are good" but doesn't fully address all ST's need to learn* • *The group discusses the idea of having an instructional protocol and a management protocol* • *The group discusses how S observations aren't enough time to really see teaching as it occurs across days and topics – observations are "performance lessons"*
19 minutes *58:00 – 1:17:00*	**5.5 Activity: modifying the protocol based on experience** • The group considers adding a sixth idea related to responding to students in the moment • The group discusses resources to help specify some of the practices (such as rich tasks) and the ways the 5 practices are aligned with TPA and CCSS.
13 minutes *1:17:00 – 1:29:45*	***5.6 Discussion: what is the purpose of this group?*** • *the group discusses the future of the research and the potential changes for practice and the surrounding systems of activity* • *Participants discuss contributions to their own practice and work as a result of this group*

Meeting 6
Video File: 100_0165.MP4

1 minute *5:44 – 7:00*	**6.1 Welcome: plan for today** • Focus of today's meeting will be to share out how the protocol is being implemented and used in classrooms so that in the final meeting we can work towards consensus for the protocol and practices of mentoring moving forward.
29 minutes *7:00 – 36:02*	**6.2 Activity: Brandon video and feedback – examining the protocol** • Participants watch the Brandon video again (viewed in meeting 1) with the protocol tool as a guide for viewing. • Participants share feedback for Brandon based on the video and tool.
4 minutes *36:02 – 40:30*	**6.3 Discussion: what occurs differently when watching Brandon with the protocol?** • Participants share new ideas and what they notice in the video that is different from what they noticed before.
32 minutes *40:30 – 1:12:30*	**6.4 Activity: 3 Charts ("Ways you have incorporated the protocol into your work, "Suggestions for changes to the protocol," and "Potluck")** • Participants discuss their thoughts in small groups and then fill in the charts posted • The group discusses themes of ideas represented on the charts
1 minute *1:12:30 – 1:13:30*	**6.5 Closing: setting up googledocs** • To keep the conversation going, Jessica suggests that the group set up googledocs with the chart topics listed so participants can continue to add ideas between meetings.

Meeting 7
Video File: 100_0165.MP4

1 minute *5:31 – 6:30*	**7.1 Welcome: plan for today** • 2 objectives for the meeting: 1) examining the protocol again using video, and 2) "what next?" discussion for moving forward
26 minutes *6:30 – 32:30*	**7.2 Activity: Kathleen video and feedback (examining the protocol)** • Participants watch the Kathleen video with the protocol tool as a guide for viewing. • Participants share feedback for Kathleen based on the video and tool.
13 minutes *32:30 – 45:30*	***7.3 Discussion: maybe we are teaching them to do a formula lesson*** • *Participants discuss whether the ST's are being guided to do a "formula lesson" as opposed to developing responsive teaching.*
30 minutes *45:30 – 1:15:10*	**7.4 Activity: using feedback for Kathleen to consider shared vision and adapt the protocol** • Participants consider ways the protocol supported shared areas of focus for feedback • Participants consider changes to the protocol to best support shared vision of math teaching • participants discuss the importance of connecting with and responding to students
3 minutes *1:15:30 – 1:18:41*	**7.5 Closing: marking the most important ideas for moving forward** • participants indicate which of the ideas for moving forward they think are most important

Appendix D
A Priori Coding Frameworks

Expansive Action "Moves" Coding Framework

Expansive learning action "moves" CHAT definitions drawn from: Engestrom, Rantavuori & Kerusuo (2013), Virkkunen & Newnham (2013)	**Examples from meetings**
Questioning CHAT learning action definition: criticizing or rejecting some aspects of the accepted practice and existing wisdom Mentoring Study Group "move" definition: criticizing or rejecting aspects of the UC Irvine program structure or the vision of learning/goals for learning in field experience. These are "larger" questions about the purpose/goals/meaning of mentoring and learning in field experience.	*I think what we tend to think is the right lesson and what we're maybe training them – hopefully not – but maybe is to give a formula lesson…* *You said that he'd been passed…..I feel like now we're looking at this, to me, I don't think he would have passed because, did he really meet the objective?....So I guess my question is how is he being evaluated to pass?*
Analyzing CHAT learning action definition: mental, discursive or practical transformation of the situation in order to find out causes or explanatory mechanisms. Analysis evokes "why?" questions and explanatory principles. *historical-genetic* - seeks to explain the situation by tracing its origins and evolution. *actual- empirical* - seeks to explain the situation by constructing a picture of its inner systemic relations. Mentoring Study Group "move" definition: Identifying manifest problems of practice in mentoring or pre-service teacher learning in field experience or suggesting the (historical or systemic) underlying causes of problems for mentoring or learning in through field experience or attempts to identify the causes of the problems of practice participants face as teacher educators	*when [mentors] are given a student teacher, they're not always given the curriculum that the student teacher has. And then on down the line…. The student teacher will say to me, "Oh, they're not doing what… we're being taught at UC Irvine."… And so it's like there's some frustration going on there between the mentor teacher and the student teacher year after year after year."* *beginning last year, almost for the first time, I was not seeing as much of the disconnect because so many of the districts were beginning to…. implement the common core whereas UCI had been teaching it maybe for the last five years…."*
Modeling CHAT learning action definition: constructing an explicit, simplified model of the new idea that explains and offers a solution to the problematic situation.	*I don't know what your rubrics look like….. it might be interesting to have a common rubric that they are privy to prior to the lesson, and then when we do debrief, that we have the same lens for both of us, so that we don't give a myriad of different things so [pre-service*

Mentoring Study Group "move" definition: suggestions for solutions that offer concrete tools, practices, or changes to the UC Irvine-Ludlow Magnet School system(s) of activity	*teachers] don't get confused* *You can add student engagement [to the protocol]. It doesn't matter what the affect is if there is student engagement.* *We were even talking about having the student teachers use [the protocol] to observe [mentor teachers]…*
Examining CHAT learning action definition: examining the model, running, operating and experimenting on it in order to fully grasp its dynamics, potentials, and limitations. Mentoring Study Group "move" definition: Examining the potential of bringing coursework into classroom practice	*If [I] ask for the lesson [plan] early, I'm always looking at it through my frame of, "well, if I was teaching this – something like that." But if this was here, it would change, if I had that next to me while I'm looking at it. It would change how I'm looking at their lesson.* *So, I think the challenge is [the protocol] could work in certain situations but not in others…*
Implementing CHAT learning action definition: implementing the model by means of practical applications, enrichments, and conceptual extensions. Mentoring Study Group "move" definition: comments noting plans for or descriptions of implementing the shared tool or new field-based pedagogical practices into direct work with pre-service teachers.	*I see myself using these [5 practices] and sitting down and planning with my student teachers, and showing her how I make sure to be doing these kinds of things.* *I used [the protocol] for my observation. I thought it was good, it was helpful, but there were some pieces missing I felt like.*
Reflecting CHAT learning action definition: reflecting on and evaluating the process of expansive learning. Mentoring Study Group "move" definition: comments noting learning for participants in the Mentoring Study Group	*For me, this group has made me look at these things deeper. So when I'm pulling out the phonics lessons, I'm like, ok, let's talk about the questioning…*
Consolidating CHAT learning action definition: consolidating and generalizing the outcomes into a new stable form of practice Mentoring Study Group "move" definition: definitive changes in practice or plans for the next school year based upon new concepts and tools developed in the Mentoring Study Group	Not found in data

Activity System Dimensions Coding Framework

Activity System Dimensions *Engestrom (2010)*	**Definition**	**Example**
Subject Individual or subgroup whose position and point of view are chosen as the perspective of the analysis	Participants in the group	
Object The "problem space" at which the activity is directed	Mentoring pre-service teachers or pre-service teacher learning in field experience *NOTE: object coded only if discussed independent of the other dimensions*	*Mentoring practices and challenges: I have no problem stopping in the middle and saying, "okay, this is why – I don't know if you heard this question but now, I'm going here." So what I'm hoping for, I'll do that in the middle of what I'm doing because I don't want it to be lost.* *Pre-service teacher learning and development: But I feel like those however many hours they spend observing us are sometimes wasted because they don't know what they're looking for. They don't know what they don't know.*
Instruments/ tools/signs Used to turn the objects into outcomes	Tools/rubrics or curricula that have bearing on the math teaching in field experience UCI-based tools -- e.g. lesson planner Ludlow-based tools – e.g. SWUN Credential portfolio -- edTPA	*Our concern is that SWUN doesn't go…. There aren't questions. I've been teaching for 11 years, 10 have been in 4th grade, so I know what to ask. If I handed my student teacher SWUN and said "good luck" she's not going to be able to ask the questions.* *Something even like a chart. I was just trying to sketch something….You do a little check mark. And they would have something similar, we would have something so I know I have addressed this issue with them….. it definitely gives a focus.*
Community Individuals and subgroups who share the same general object	Other stakeholders in the teacher ed system that influence what happens in field experience, e.g. UC Irvine coordinator,	*You could give [the protocol] to principals and ask them to discuss it at staff meetings because it's just good instruction. So not only is it just for [mentor] teachers, it's also for all teachers.*

	principals, district superintendent, parents	*Something we talked about, too, in addition to all of that is to bring the district involved in this too which is a whole other….*
Division of labor Horizontal division of tasks and vertical division of power	Role definition for supervisors, mentors, or others who have a stake in field experience (e.g. Multiple Subject coordinator, faculty)	*I think we all recognize that part of [the supervisor's] responsibility is to make sure the student teacher is in a good situation.* *Well, when we're talking about being on the same page, and connecting ourselves together so the supervisors are out there three times doing the same thing as the teacher in the classroom who is married to them for 10 weeks……*
Rules Explicit and implicit regulations, norms, conventions, and standards that constrain actions within the activity system	Rules and expectations for mentor teachers, supervisors, and pre-service teachers that have bearing on mentoring or learning in field experiences	*But there are a lot of occasions where we'll walk into a classroom and we don't have an opportunity to talk to the [mentor] teacher. And then as soon as it's time for the debrief, they're gone.* *I think it's really important to use it for planning if you're going to use it for observing, so then that way it's just fair. Your student teacher knows what the expectations are.*

Appendix E
Expansive Action "Moves" Frequency Table by Meeting Segment

	A	B	C	D	E	F	G
1		Analyzing	Examining	Implement	Modeling	Questioning	Reflecting
2	mtg 1.2:	4	0	0	0	0	0
3	mtg 1.3:	5	0	0	0	1	0
4	mtg 1.4:	4	1	0	9	0	0
5	mtg 1.5:	0	0	0	0	0	0
6	mtg 2.3:	17	0	0	11	0	0
7	mtg 2.4:	7	4	0	21	0	0
8	mtg 2.5:	0	0	0	0	0	0
9	mtg 2.6:	3	0	0	2	0	0
10	mtg 2.7:	3	0	0	9	0	0
11	mtg 2.8:	14	0	0	15	0	0
12	mtg 3.1:	0	0	0	0	0	0
13	mtg 3.2:	3	4	4	4	0	0
14	mtg 3.3:	0	2	0	1	0	0
15	mtg 3.4:	13	1	0	0	0	0
16	mtg 3.5:	9	21	0	5	0	0
17	mtg 3.6:	0	7	0	0	0	0
18	mtg 3.7:	5	15	0	2	0	0
19	mtg 3.8:	0	1	0	2	0	0
20	mtg 3.9:	2	0	0	0	0	0
21	mtg 3.1(	6	0	0	0	0	0
22	mtg 3.1'	0	0	0	0	0	0
23	mtg 4.1:	0	0	0	0	0	0
24	mtg 4.2:	7	2	1	5	0	0
25	mtg 4.3:	8	16	0	5	2	0
26	mtg 4.4:	10	14	1	8	0	0
27	mtg 4.5:	7	2	3	0	0	0
28	mtg 5.1:	0	0	0	0	0	0
29	mtg 5.2:	3	3	11	3	0	0
30	mtg 5.3:	4	4	0	3	0	0
31	mtg 5.4:	11	5	3	5	1	1
32	mtg 5.5:	0	15	0	16	0	
33	mtg 5.6:	7	1	0	2	0	3
34	mtg 6.1:	0	0	0	0	0	0
35	mtg 6.2:	3	9	0	0	0	0
36	mtg 6.3:	0	2	3	1	0	0
37	mtg 6.4:	8	9	2	21	0	0
38	mtg 6.5:	0	0	1	0	0	0
39	mtg 7.1:	0	0	0	0	0	0
40	mtg 7.2:	0	1	0	0	0	0
41	mtg 7.3:	11	1	1	6	2	0
42	mtg 7.4:	11	11	2	23	0	0
43	mtg 7.5:	0	2	0	2	0	0

Appendix F

The Five High-Leverage Math Practices +1 Protocol

Teacher Observed: _____ Mentor Teacher: _____ Date: _____

The Five High-Leverage Math Practices +1

Learning Objective:

Math Practice	Frequency	Description of Observed Math Practice	Comments
1. Students construct their own understanding of: • mathematical concepts • procedural knowledge • problem solving,/mathematical reasoning (**rich task**)			
2. Students use **representations** to: • deepen their understanding of concepts • make connections to procedural knowledge/skills			
3. a. Teacher uses **questioning** to elicit and build on student responses to clarify/understand student thinking about mathematical understandings and to uncover misconceptions.			
3. b. Teacher **responds to students' thinking** and addresses students' misconceptions			
4. Teacher provides **opportunities for students to engage in mathematical discourse**-including academic language scaffolding supports.			
5. Teacher **makes adjustments to the lesson** and lesson sequence based on evidence of student learning, including differentiating for struggling and advance students.			

Teacher Observed: _____ Mentor Teacher: _____ Date: _____

Other: Management: pacing, behaviors, rapport (EdTPa), student engagement • What evidence do you have that… • Connections between learning activities and learning objectives • general			
Next Steps:			