Professional Development as an Ongoing Partnership: The Sum is Greater than its Parts

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ABSTRACT: This study evaluated a multi-year collaborative project between elementary public schools in one district and university researchers. While the district wanted to improve elementary grades students' achievement in mathematics, they did not want teachers to adopt an instructional approach where they focused primarily on test-defined content. Using principles from Cognitively Guided Instruction, the partnership focused on promoting teachers' understanding of mathematical thinking, as it was demonstrated by students, while they completed authentic activities. The authors used cultural-historical activity theory (CHAT) to evaluate how school administrators' evolving expectations for students' achievement influenced opportunities for teachers and the university faculty member to demonstrate more dynamic notions of students' expertise and knowledge.

The NAPDS Nine Essentials addressed in this manuscript are; (1) ongoing and reciprocal professional development for all participants guided by need, and (2) a shared commitment to innovative and reflective practice by all participants.

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Researchers have evaluated reforms aimed at altering teachers' instructional practices through professional development by addressing such questions as: Who should offer the preparation? How many sessions are required for the presentation? Who should attend? and How should its success be determined? It should be a simple process: reform content is identified; instructors with expertise in the specified area are identified; teachers apply new content in their classrooms; and, subsequently, students are assessed to evaluate its impact on learning. The process, however, is not as simple as it might first appear because of the many factors which must be addressed to answer these questions.

Professional Development Principles

Guskey and Yoon's (2009) guidelines for how schools should approach the advancement of professional development activities underscore the hidden complexity of such endeavors. To be successful, schools have to attend simultaneously to various challenges. Teachers need to have adequate time to extend their knowledge, analyze student work, and adopt and practice new instructional approaches. Time alone is not sufficient because it has to be well organized and focused so that it purposefully influences teacher learning. Collaboration in problem solving and focusing on the unique needs of a particular school also is recommended to promote a shared sense of responsibility and purpose. Finally, strong leadership is considered to be a core element for successful professional development (Blase & Blase, 1999; Heck, Banilower, Weiss & Rosenberg, 2008). Once again, despite the apparent simplicity of Guskey and Yoon's (2009) roadmap for developing successful professional development programs, schools can't simply address each of their steps in a linear fashion—complex relationships exist among their recommendations, each of which is influenced strongly by a school's unique characteristics and goals (Lincoln & Guba, 1985).

One additional insight, which might help educators, who are responsible for meeting their faculty's instructional needs, comes from notable successful professional development projects. Researchers in teacher education have long documented the importance of learning from students by using their natural thought processes as the basis for their professional development activities, including the open exploration of ideas and meaning making (Barton, McCully, & Marks, 2004; Bybee, 2000; Dyson, 2010; Halliday, 1999; NRC, 2000). Mathematics' professional development has long employed this focus and it has taken a variety of perspectives regarding the nature of content. For instance, the Teaching to the Big Ideas Project (Schifter, 1998; Schifter, Russell, & Bastable, 1999), focused on teachers' specific understandings of content and led to the development of curricular materials called Developing Mathematical Ideas (DMI)—often used in professional development sessions across the country today. Cohen (2004) noted how teachers and children began to experience mathematics in new ways and felt more connected to the classroom community as a result of their experiences with DMI.

Learning about students' mathematical thinking has additional benefits, in that, it has been shown to increase teachers' content knowledge and their adoption of those instructional practices which support student learning (Fennema, Franke, Carpenter, & Carey, 1993; Franke, Carpenter, Levi, & Fennema, 2001; Jacobs, Franke, Carpenter, Levi, & Battey, 2007). Perhaps the most widely recognized effort to assist teachers in this learning is Cognitively Guided Instruction (CGI), which was developed to support learning regarding the development of children's thinking in specific mathematical content (Carpenter, Fennema, & Franke, 1996; Carpenter, Fennema, & Franke, 1999). The fundamental ideas in CGI focus on children's intuitive thinking about whole number and rational number arithmetic. More specifically, the framework helps teachers understand how children's thinking develops and changes over time in relationship to problem solving situations.

As a pedagogical approach, CGI focuses on students' intuitive thinking to construct mathematical meaning: that is, teachers scaffold their lessons based on how students think about a particular problem as opposed to simply following curriculum guides or test-defined pacing guides; it is important to note, however, after using the CGI approach, teachers were more able to clearly see how the problems aligned with their existing curricular guidelines. Moreover, by teachers focusing first on their intuitive understanding, students are able to make better sense of numerical quantities and their relationships; consequently, CGI tenets not only become part of teachers' everyday pedagogical strategies, they also become a tool to formally assess and track students' progress.

Professional Development Framework

This article documents the ways by which an emphasis on student thinking with CGI principles influenced the behaviors, beliefs', lesson design and delivery; and interactions among school administrators, teachers, and a university faculty member (first author), who collaborated over a two-year period to improve elementary school teachers' instructional expertise in mathematics. An assistant superintendent (third author) of a rural district with a population of eight thousand students, sixty-five percent of whom were economically disadvantaged, one quarter of whom were minority, spread across eleven elementary and four middle and four high schools, in a rural section of the southern United States, initiated the collaboration.

The framework for the initial contact to develop professional development activities differed from the past efforts, where the district offered single-session workshops, asked for teacher volunteers, did not require administrators to attend, and expected immediate results on students' test performances. Moreover, as described by the assistant superintendent, their past professional development activities targeted specific skills, with no sustained efforts to help teachers to rethink their approach to teaching math. Given reformulated national mathematics standards, the district recognized a need to change the way teachers approached their mathematics instruction: they needed to rethink how they might promote more sophisticated mathematical thinking by their students. McLaughlin and Talbert (2006) refer to such changes as a movement from a traditional school community to a learning community, where teachers view emerging problems of practice as an opportunity to redirect their scaffolding to improve student outcomes.

The initial step in the school district's attempts to change was to find someone with knowledge and expertise, whom they could trust, to help them to promote students' mathematics learning across the district. The choice of this specific university was due to its familiarity to the assistant superintendent, who recently graduated from the institution. She and other colleagues in the school district met with university representatives for the first time in the fall of 2014 to develop a plan. The district received a grant to address a lack of student growth in mathematics and wanted to brainstorm how the university could help meet their needs: subsequently, as a first step and as a result of the school-university conversations about needs, they agreed to have the university offer a course on-site for 17 elementary teachers, each of whom was nominated by their principals based on his or her leadership abilities. The class met twice per month for six continuous hours, with asynchronous online assignments between course meetings. The class was held at a centrally located school in the district and substitute teacher coverage was provided for the teachers to attend the sessions. After looking at topics on mandated end-of-grade mathematics assessments, where students did not demonstrate proficiency, the content area of rational numbers (fractions) was identified as the course's main focus.

In this instance, the rational number course involved teachers learning about students' natural intuitions about fractions and how to tap into their thinking while still attending to district standards. While one of its purposes was to improve test score performances, the professional development focused on students' overall development and understanding of mathematics as a means to this end. Throughout, teachers learned how to integrate Cognitively Guided Instruction (CGI) concepts into the curriculum and helped other teachers at their schools do the same. Within a philosophy to promote teacher leaders, one of the course's final projects was to implement various rational number tasks with their students and to then demonstrate their newly gained expertise with other teachers at their schools.

At the end of the course, based on positive teacher evaluations, district leaders asked the university faculty member to focus her efforts on one elementary school (2014-15), where students' achievement was viewed as problematic. The framework for this collaboration was as follows: she visited the school two to three times per month for an entire day and met with teachers at each grade level during their Professional Learning Community (PLC) times. It is important to note that all public schools in the state where the partnership took place are required to offer PLCs once per week, set forth from principles and ideas noted by Martin-Kniep (2004) and Hord (1997). The activities included participation in a book study based on the tenets of CGI (Carpenter, Fennema, Franke, Levi & Empson, 2015; Empson & Levi, 2011); the identification of instructional activities to implement; discussion of students' understanding of mathematical concepts by evaluating work samples; and addressing other general concerns. These bi-weekly sessions occurred for an entire school year.

More specifically, teachers would read a chapter from the CGI text and bring questions to the sessions. They then developed an assignment based on their readings and discussion, which they implemented the following week. Upon reconvening, teachers and the faculty member evaluated student work samples and identified additional scaffolding. After several weeks, quite unexpectedly, teachers asked the faculty member to conduct teaching demonstrations. The purpose was not to showcase her expertise: rather the demonstrations allowed teachers to explore student thinking in the context of problem solving. Grade level teams observed the faculty member teaching and circulated around the room to focus on the work of the students and how they were making sense of the problem. As a result, the lessons revealed student thinking in a variety of ways because she used different lines of questioning. The faculty member and team then debriefed after the demonstration. The debriefing sessions helped the teachers to develop an academic language regarding what they already knew about their students. The nature of our dialogue was consistent with the inquiry stance, as described by Slavit, Nelson, and Deuel (2013).

Evaluative Framework

To understand how changes in the roles and responsibilities of public school and university participants influenced the nature of their evolving collaborative relationship, eventually transforming their actions in unique ways, we adopted cultural-historical activity theory (CHAT) as a theoretical lens (Cole, 1998; Engeström, 2008; Engeström, Miettinen, & Punamäki, 1999; Roth & Lee, 2007; Zeichner, Payne, & Brako, 2015). CHAT focuses on how evolving historical and cultural factors within a setting, in this case the school and surrounding community, privileged certain ways of thinking, as educators attempt to increase students' mathematical understanding and performances (Cole, 1996; Engeström, 2008; Leont'ev, 1981; Tulviste, 1991; Wertsch, 1981). CHAT allowed us to evaluate how the changes associated with the district's evolving expectations for students' improved mathematics achievement influenced teachers' roles and responsibilities, resulting in the promotion of more dynamic notions of expertise and knowledge for all participants.

More specifically, teachers were not viewed simply as the recipients of content, to be administered by an all knowing outside expert, the faculty member; instead, teachers now assumed a more central role by providing insights into how their students dealt with the ambiguities of solving challenging mathematical problems. Altering the purpose of professional development from a primary focus on increasing test scores to emphasizing teachers' understanding of student's mathematical thinking changed everyone's roles: now shared responsibilities evolved and a greater emphasis was placed on practitioner and community based knowledge (Turney, Eltis, Towler, & Wright, 1985). Mathematical understanding was no longer viewed as existing apart from how teachers viewed its demonstration in the daily lives of their individual students. As new types and levels of knowledge were privileged, CHAT allowed us to evaluate how teachers' and administrators' evolving and dynamic beliefs and expectations, either helped or hindered, the professional development project, while developing and maintaining necessary levels of trust among the various participants (Cole, 1996; Ellis, Edwards, & Smagorinsky, 2010; Engeström, 2008; Leont'ev 1981; Wertsch 1980).

Our evaluation required the collection of field notes; informal interviews with teachers and the Director of Elementary education, who attended the professional development sessions; an ongoing analysis of students' work samples; and videotapes of lessons. Teachers' observations of students' thinking, as it manifested itself during their interactions with classmates and their completion of different assignments, served as the primary formative assessment, in that, the content from the most immediate session was based on teachers' understanding at a particular point in time regarding students' approach to solving different sequenced mathematical problems. This focus allowed teachers to compare their observations with a theoretical framework regarding the meaning of students' thought processes relative to their scaffolding of instruction (Slavit, Nelson, & Deuel, 2013). Additionally, this framework allowed teachers to member-check the direction of the professional development activities: if anyone had difficulty with a particular topic, then the sessions would focus on the cause of the problem.

Findings

As the object of the activity changed to improving students' learning by broadening the focus beyond a singular emphasis on increasing test scores, a certain unexpected outcome was revealed, which was consistent with more recent conceptualizations of Vygotsky's zone of proximal development (Tudge & Scrimsher, 2003). Accordingly, a bi-directional flow between classroom educators and the university researcher, regardless of whether either one was more knowledgeable or competent, characterizes the relationship. For example, as a result of one's participation in this zone, responsibility for its creation and development was attributed to every member, who became almost simultaneously both teachers and a learners. Everyone's responsibilities were changed as a result of his or her participation in this zone and the change became dynamic as relationships evolved. The following examples document how the newly designed professional development activities promoted evolving levels of expertise for the participants.

Teachers favored a CGI strategy labelled direct modeling, see Figure 1, where a student describes and draws every facet of how they worked a math problem. To be implemented successfully, teachers realized how it had to be applied to content from the previous year's course and existing classroom

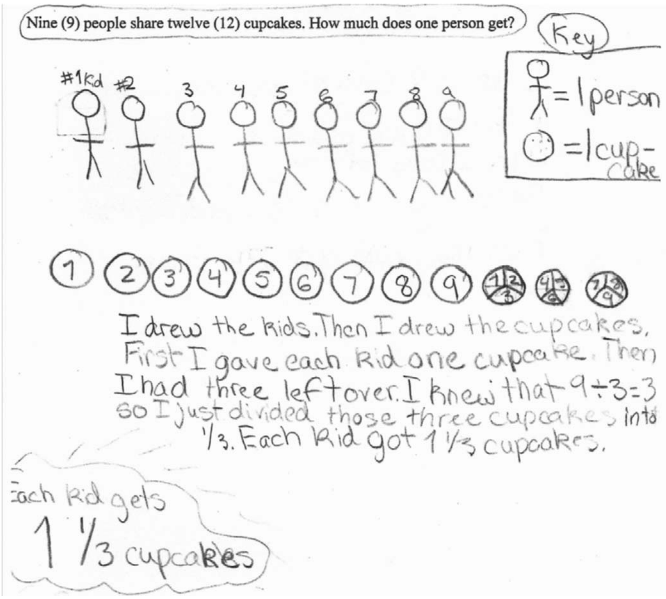

Figure 1. Student Work Sample Demonstrating the Direct Modeling Strategy

situations. To be successful, professional development activities had to combine this information with each teacher's experiences, the administrator's overall views of the school, the university faculty member's understanding of her content area, and students' work samples. Ideas from teachers' more formal studies, course content and book study, provided topics for discussion put forth by teachers, administrators, or the university faculty member: others then provided insights about how students thought mathematically about the designated topic in their classrooms. Students' work samples served as a key ingredient for such discussions, in that, they became the nexus for promoting everyone's understanding of mathematical concepts (Blumenfeld, Mergendollar & Swarthout, 1987; Doyle, 1983; Miller, 2003). While individual insights might start a discussion, it quickly became collaborative, and students' work samples grounded the discussion, thereby improving everyone's understanding of the multiple ways by which a problem could be addressed within the context of one's daily instruction.

Subsequent sessions then led to the evaluations of more student samples with teachers using the language from their more formal studies to identify different types of mathematical thinkers in their classrooms. Through these conversations, teachers started asking pedagogical questions to one another. For example, one teacher asked, "What do I do when they illustrate a problem accurately but can't express their final answer?" Others chimed in giving suggestions and one grade level team then had the idea having the first author demonstrate how she questioned students to formalize their mathematical thinking. In one demonstration lesson, the faculty member posed a CGI type question to 22 second graders as the entire team of 4 teachers circulated around to observe student thinking. Teachers and the faculty member debriefed and grounded their discussion by examining student work samples. Their conversations were not about what the faculty member did, but rather how the students were thinking. They liked the faculty member's questioning, but they focused much more on the second graders' capabilities and approach to the problem. Student thinking about problem solving was revealed and the teachers recognized its basis in their readings and studies. Many expressed how the demo gave them a host of additional ideas on how to encourage students to express and model their thinking, etc. Throughout, the nature of scaffolding, among the professional development participants, became bi-directional as opposed to unidirectional: expertise was more distributed as individuals assumed many different roles in their contributions to the overall goal of improving students' mathematical understanding and achievement. No one became the 'more competent other,' who simply transmitted information to those with less knowledge.

Such halo effects extended to the students as well, in that, one important consequence of the professional development related to those students, who traditionally failed to perform successfully. Time after time, teachers expressed surprise related to their low performing students' ability to explain their reasoning and follow discussions during the demonstration lessons and, subsequently, during their daily instruction. Students, who were marginalized under teachers' prior teaching approaches, now displayed more positive motivational orientations towards their studies. As they developed and then displayed their ongoing metacognitive abilities in the classroom, their status among their peers and within the school improved. These insights might never have occurred without the teachers' focus on students' thinking and their greater reliance on formative assessment. Allowing students to express their understanding of mathematical concepts during lessons, the thoughtful dialogue between students and teachers during instruction and among participants during professional development, and acceptance of the need for students to self-assess during instruction, allowed teachers to alter their views of students as learners (Wiliam, 2011).

The use of formative assessment within the framework of their professional development further led teachers to question the role of remediation. To observe students' thinking during instruction provided different information than what they obtained when students were asked to work towards mastery on basic skills, where the required emphasis on higher level thinking and discourse was minimal. For example, practicing multiplication facts in isolation from their application to a multi-step real world problem lacked the integrity of those situations where students were asked to display their mathematical reasoning. As a result, despite the necessity of having students involved in both situations, teachers become more aware of and knowledgeable of students' abilities and motivational orientations when observing them in the more authentic situations. It was a question of balance and teachers slowly shifted their balance to include their lower-achievers in more authentic learning situations.

There were additional positive outcomes related to how professional development influenced students' achievement on the end-of-grade assessments and on the confidence in teachers' mathematics instruction. Overall district scores at the school, the lowest achieving site in the district at the time, increased by grade level over a three-year period by 5.6, 16.9, and 10.6 developmental scale points, respectively for grades three, four, and five, where growth for an academic year hovers around 5.0 points. Surveys were also gathered to highlight teachers' experiences and overwhelmingly support the focus on students' thinking as being an impetus for improving their confidence as teachers of mathematics. Using an online survey, teachers from the schools were asked about how the mathematics PD benefited them and assisted their practice. Below are some of the responses from four teachers:

> Receiving math support has helped me by getting to share examples of student work. This helps me know that my students are thinking along the same lines as others. Getting to talk about the math talks has also benefited me as well.
>
> It has been a great help in helping me understand better how to approach different types of math problems. I feel my students have a better grasp on concepts being taught.
>
> I loved sharing student samples and talking through their thinking, so that I would better understand how to teach math tasks/talks in my classroom.
>
> I have learned to focus on what kids actually know about math concepts and then build upon that. Giving students think space to work through a problem has helped me to understand student thinking better.

Summary

The redesigned professional development altered the nature of the relationships between public schools and the university. In order to promote a greater understanding of mathematics, traditional power hierarchies between the two partners were lessened as expertise and knowledge was accessed by all members. Accordingly, greater respect and trust characterized this new partnership. In this case, everyone agreed that the sum was greater than parts.

After participating in this project, district officials now see their effort as the norm for their future actions. This conclusion supports present efforts to recognize the importance of including teachers and other important educators in any efforts to improve education for all students (Cochran-Smith & Lytle, 2009). It also signals a new way for successful relationships to develop between school districts and university researchers (Zeichner et al., 2015). Leaving out the contributions of those who interact daily with students would undermine the potential for the overall effects of professional development to be greater than the sum of its parts.

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References

Barton, K., McCully, A., & Marks, M. (2004). Reflecting on elementary children's understanding of history and social studies: An inquiry project with beginning teachers in Northern Ireland and the United States. *Journal of Teacher Education, 55*(1), 70–90.

Blase, J., & Blase, J. (1999). Principals' instructional leadership and teacher development: Teachers' perspectives. *Educational Administration Quarterly, 35*(3):349-378.

Blumenfeld, P. C., Mergendollar, J. & Swarthout, D. (1987). Task as a heuristic for understanding student learning and motivation. *Journal of Curriculum Studies, 19*, 135-148.

Bybee, R. W. (2000). Teaching science as inquiry. In J. Minstrell & E. H. van Zee (Eds.), *Inquiring into inquiry learning and teaching in science* (pp. 20-46). Washington, DC: American Association for the Advancement of Science.

Carpenter, T. Fennema, E., & Franke, M, Levi, L., & Empson, S. (1999). *Children's mathematics: Cognitively guided instruction*. Portsmouth, NH: Heinemann.

Carpenter, T., Fennema, E., Peterson, P., Chiang, C., & Loef, M. (1989). Using knowledge of children's mathematics thinking in classroom teaching: An experimental study. *American Educational Research Journal, 26*(4), 499-531.

Carpenter, T., Fennema, E., & Franke, M. (1996). Cognitively guided instruction: A knowledge base for reform in primary mathematics instruction. *Elementary School Journal, 97*(1), 3-20.

Carpenter, T. P., Fennema, E., Franke, M., Levi, L., & Empson, S. B. (2015). *Children's mathematics: Cognitively guided instruction* (2nd ed.). Portsmouth, NH: Heinemann.

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as stance: Practitioner research for the next generation*. New York, NY: Teachers College Press.

Cohen, S. (2004). *Teachers' professional development and the elementary mathematics classroom: Bringing understandings to light*. Mahwah, NJ: Erlbaum.

Cole, M. (1996). *Cultural psychology*. Cambridge, MA: Harvard University Press.

Cole, M. (1998). Can culturally psychology help us think about diversity? *Mind, Culture, and Activity, 5*(4), 291-304.

Doyle, W. (1983). Academic work. *Review of Educational Research, 53*, 159-199.

Dyson, A. (2010). Opening curricular closets in regulated times: Finding pedagogical keys. *English Education, 42*(3), 307-319.

Ellis, V., Edwards, A., & Smagorinsky, P. (2010). *Cultural-historical perspectives on teacher education and development: learning teaching*. London, United Kingdom: Routledge.

Empson, S. B., & Levi, L. (2011). *Extending children's mathematics: Fractions and decimals*. Portsmouth, NH: Heinemann.

Engeström, Y. (2008). *From teams to knots: Activity-theoretical studies of collaboration and learning at work*. Cambridge, United Kingdom: Cambridge University Press.

Engeström, Y., Miettinen, R., & Punamäki, R. L. (1999). *Perspectives on activity theory. Learning in doing: Social, cognitive and computational perspectives*. Cambridge, United Kingdom: Cambridge University Press.

Fennema, E., Franke, M., Carpenter, T., & Carey, D. (1993). Using children's mathematical knowledge in instruction. *American Educational Research Journal, 30*, 555–583.

Fennema, E., Carpenter, T., Franke, M., Levi, L., Jacobs, V., & Empson, S. (1996). Learning to use children's thinking in mathematics instruction: A longitudinal study. *Journal for Research in Mathematics Education, 27*(4), 403 – 434.

Franke, M., Carpenter, T., Levi, L., & Fennema, E. (2001). Capturing teachers' generative change: A follow-up study of professional development in mathematics. *American Education Research Journal, 38*(3), 653-689.

Guskey, T. R., & Yoon, K. S. (2009). What works in professional development? *Phi Delta Kappan, 90*(7), 495-500.

Halliday, M. (1999). The notion of "context" in language education. In M. Ghadessy (Ed.), *Text and context in functional linguistics* (pp. 1-24). Amsterdam, The Netherlands: John Benjamins.

Heck, D., Banilower, E., Weiss, I., & Rosenberg, S. (2008). Studying the effects of professional development: The case of the NSF's local systemic change through teacher enhancement initiative. *Journal for Research in Mathematics Education, 39*(2), 113-152.

Hord, S. M. (1997). *Professional learning communities: What are they and why are they important?* Austin, TX: Southwest Educational Development Laboratory.

Jacobs, V., Franke, M., Carpenter, T., Levi, L., & Battey, D. (2007). Professional development focused on children's algebraic reasoning in elementary school. *Journal for Research in Mathematics Education, 38*(3), 258-288.

Leont'ev, A. N. (1981). The problem of activity in psychology. In J. V Wertsch (Ed.), *The concept of activity in Soviet psychology* (pp. 37- 71). Armonk, NY: Sharpe.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.

Martin-Kniep, G. O. (2004). *Developing learning communities through teacher expertise*. Thousand Oaks, CA: Corwin Press.

McLaughlin, M. W., & Talbert, J. E. (2006). *Building school-based teacher learning communities: Professional strategies to improve student achievement*. New York, NY: Teachers College Press.

Miller, S. D. (2003). How low- and high-challenge tasks affect motivation and learning: Implications for struggling learners. *Reading and Writing Quarterly, 19*, 39-57.

National Research Council (2000). *Inquiry and the National Science Education Standards*. Washington, DC: National Academy Press.

Nelson, T. H., Slavit, D., & Deuel, A. (2012). Two dimensions of an inquiry stance toward student learning data. *Teachers' College Record, 114*(8).

Roth, W. M., & Lee, Y. J. (2007). Vygotsky's neglected legacy: Cultural-Historical activity theory. *Review of Educational Research, 77*(2):186-232.

Schifter, D. (1998). Learning mathematics for teaching: From a teachers' seminar to the classroom. *Journal of Mathematics Teacher Education, 1*(1), 55-87.

Schifter, D., Russell, S., & Bastable, V. (1999). Teaching to the big ideas. In M. S. Soloman (Ed.), *The diagnostic teacher: Constructing new approaches to professional development* (pp. 22-47). New York, NY: Teachers College Press.

Slavit, D., Nelson, T. H., & Deuel, A. (2012). Teacher groups' conceptions and uses of student-learning data. *Journal of Teacher Education, 64*(1), 8-21.

Tudge, J. & Scrimsher, (2003). Lev S. Vygotsky on education: A cultural-historical, interpersonal, and individual approach to development. In B. J. Zimmerman & D. H. Schunk (Eds.), *Educational psychology: A century of contributions* (pp. 207-228). Mahwah, NJ: Lawrence Erlbaum Associates.

Tulviste, P. (1991). *Cultural-historical development of verbal thinking: A psychological study*. Commack, NY: Nova Science Publishers.

Turney, C., Eltis, K. T., Towler, J., & Wright R. (1985). *A new basis for teacher education: Research, practice and supervision*. Sydney, Austrailia: Sydmac Academic Press.

Wertsch, J. V. (1980). The significance of dialogue in Vygotsky's account of social, egocentric, and inner speech. *Contemporary Educational Psychology, 5*, 150-162

Wiliam, D. (2011). *Embedded formative assessment: Practical strategies and tools for classroom K-12 teachers*. Bloomington, IN: Solution Tree Press.

Wiliam, D. (2006). Getting the focus right. *Educational Assessment, 11*, 283-289.

Zeichner, K., Payne, K. A., & Brayko, K. (2015). Democratizing teacher education. *Journal of Teacher Education, 66*(2), 122-135.

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