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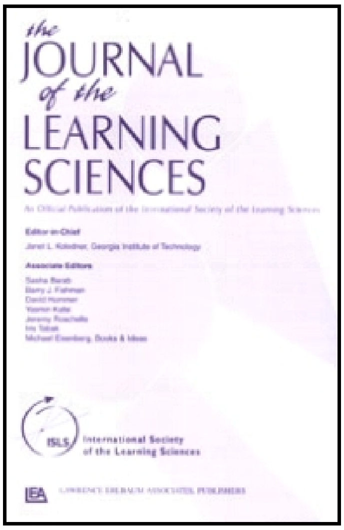

Journal of the Learning Sciences
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t775653672

Approaching Participation in School-Based Mathematics as a Cross-Setting Phenomenon

Kara Jackson[a]
[a] Department of Integrated Studies in Education McGill University,

Accepted uncorrected manuscript posted online: 22 December 2010

Online publication date: 06 February 2011

To cite this Article Jackson, Kara(2011) 'Approaching Participation in School-Based Mathematics as a Cross-Setting Phenomenon', Journal of the Learning Sciences, 20: 1, 111 — 150, doi: 10.1080/10508406.2011.528319, First posted on: 22 December 2010 (iFirst)

To link to this Article: DOI: 10.1080/10508406.2011.528319
URL: http://dx.doi.org/10.1080/10508406.2011.528319

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THE JOURNAL OF THE LEARNING SCIENCES, 20: 111–150, 2011
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ISSN: 1050-8406 print / 1532-7809 online
DOI: 10.1080/10508406.2011.528319

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LEARNING OUTSIDE OF SCHOOL STRAND

Approaching Participation in School-Based Mathematics as a Cross-Setting Phenomenon

Kara Jackson
Department of Integrated Studies in Education
McGill University

This article reports on an ethnographic study of a 10-year-old's pursuit of school-based mathematics across school and home to suggest that participating in school-based mathematics is a cross-setting phenomenon in at least 2 ways. First, I illustrate how accomplishing school-based mathematics literally extends into the home and how individuals recruit resources from their histories of participation in alternative settings to accomplish the work of school-based mathematics. Second, I show how a youth's social identification in the classroom is shaped by his teacher's partial accounts of how learning is arranged for in the home. Approaching participation in school-based mathematics as a cross-setting phenomenon illustrates the complexity inherent in participating in schooling and raises questions about how to coordinate schooling across school and home settings.

Timothy Smith, a fourth grader, was given a mathematics homework assignment from the *Everyday Mathematics* curriculum (University of Chicago School Mathematics Project, 2001) that used the context of an analog clock to introduce the addition and subtraction of fractions with unlike denominators. The directions said, "Write the fraction addition [and subtraction] problem shown on each clock face." Students were to discern the total fractional part of the shaded sectors of the clock and write a number sentence representing the combination of the shaded sectors.

An example problem showed a clock face with a sector from 12:00 to 4:00 shaded in dark blue, which represented 1/3 of the clock face (20 min out of 60 min, or 4 hr

Correspondence should be addressed to Kara Jackson, Faculty of Education, McGill University, 3700 McTavish, Montreal, QC H3A 1Y2, Canada. E-mail: kara.jackson@mcgill.ca

out of 12 hr), and a sector from 4:00 to 6:00 shaded in light blue, which represented 1/6 of the clock face (10 min out of 60 min, or 2 hr out of 12 hr). It was expected that the students would visually discern that $1/3 + 1/6 = 1/2$ because half of the entire clock was shaded (dark blue and light blue sectors combined).

Timothy sat at the dining room table to complete this homework. He told his mother Lucille that he was having trouble figuring out how to solve the problems. She sat down at the table and puzzled over the assignment. She asked Timothy's 16-year-old sister Samantha for help, but representing fractions on a clock face was unfamiliar to her as well.

Eventually, Lucille disregarded the clock representation and took the clocks as circles and told Timothy to estimate the fractional amount shaded for each sector. Identifying fractional parts of circles was familiar to her and Timothy. Lucille left Timothy to make estimates, and she continued to prepare dinner. After dinner, she checked over his estimates and said that "they looked right" to her.

When I looked at Timothy's paper the next day, I noted that his estimates for 15 min (1/4), 30 min (1/2), 45 min (3/4), and 20 min (1/3) were exact when the sector began at the 12:00 hr, most likely because such representations were familiar to him. His estimates for sectors that comprised 5 min, 10 min, and 40 min were inexact but indicated an understanding of how unit fractions (fractions with a 1 in the numerator) correspond to different areas of an object. For example, in the case of a sector depicting 5 min, he chose 1/8 (indicating that he knew that 1/8 indicated a smaller sector than, for example, 1/4). His sums for the total amount of area of the circle shaded were also inexact yet reasonable. He "eyeballed" the total shaded amount rather than using the clock representation given in the problems. (FN, 4/7/05)[1]

This vignette illustrates a mother suggesting a reasonable approach for her son to solve a series of mathematics homework problems that initially were puzzling. From a mathematical perspective, Lucille's suggestion to estimate the area of the sectors was sound, and Timothy's follow-through illustrates an understanding of the relationship between different unit fractions and an ability to reasonably estimate area. However, the story does not end there; in short, the productive work evident in the homework session was not capitalized on when Timothy took the assignment back to school.

The following day, Ms. Jones, Timothy's teacher, walked around the room to survey the children's homework. The majority of the students did not complete the assignment because they were confused by the clock representation. Ms. Jones explained to the class how to complete the assignment in a procedural

[1]FN and INT refer to field note and interview data, respectively. I describe the collection of each type of data source in the "Research Design" section of the article.

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manner. Timothy did not pay attention to Ms. Jones's explanation. At one point, he began to read a book as his classmates worked through the homework problems. Ms. Jones allowed Timothy to read. In a conversation Ms. Jones and I had about this event a few days later, she told me she knew he had completed the work and that his answers were "close enough." She believed he disengaged from class during her explanation because he was like a "special education student," and the activity was too difficult for him. As long as he sat quietly in class, according to Ms. Jones, it was okay for Timothy to remove himself from the discussion of the homework assignment (FN, 4/11/05).

Tracing Timothy's participation across the home and the mathematics classroom in relation to the homework assignment highlights the social fact that individuals regularly make their way across various settings,[2] sometimes in the pursuit[3] of learning academic content (in this case, mathematics), and that participation in one setting is potentially contingent upon events that occur in alternative settings. These two events—a productive homework session in Timothy's home followed by an unproductive class session, both revolving around the same school-based material resource—highlight the complexity of participating in, and accomplishing, mathematical work across settings.

Explanations of participating in a specific type of activity (in this case, mathematics-related activity) have traditionally focused on individuals' development of understandings and/or competence *within* a single setting (e.g., classroom, home, grocery store). Clearly, any empirical account of participation is always partial and limited. However, I contend that had I only investigated the nature of Timothy's participation in one setting (the classroom or the home), I would have falsely characterized the opportunities he had to participate in school-based mathematical activity. If I had focused on the home, I would have ignored the rather limited options for Timothy's participation in the classroom that arguably shaped what he was able to pursue in both settings. If I had focused on the classroom, I would have ignored the potentially productive ways in which his family organized for his learning as well as how the demands of schooling shaped how his learning was arranged for.

As Beach (1999) argues, the relationship between an individual's participation in one setting as compared to another has long been of interest to philosophers, psychologists, and anthropologists, among others. Academic communities differ in their motivation for pursuing this question. One reason to pursue this question

[2]I use the word *setting* to describe a specific physical place that would be identifiable as distinct from other places (e.g., a child's school and a child's home are two distinct settings).

[3]I have adopted Dreier's (2008) definition of the word *pursuit*, which he explains as follows: "There is a direction to pursuits, but it may not be well-defined and may be changed on the way. . . . The concept of pursuit has the advantage over the concept of goal in that the latter implies a degree of definition ahead of time that does not always fit with how activities and engagements proceed" (p. 100).

particular to educational research is that schooling is intended to prepare individuals to participate in alternative settings (Beach, 1999; Lobato, 2006). Another reason is that understanding the relationship between subject-specific activity in and out of school might raise important questions about the organization of formal educational practice (Stevens, Wineburg, Herrenkohl, & Bell, 2005).

In general, minimal research has taken youth's participation across settings in the pursuit of developing understanding of some academic content as an explicit object of study (cf. Stevens et al., 2005). In this article, I use the case of Timothy's participation in school-based mathematics activities across home and school settings to suggest that the nature of an individual's participation in any activity setting is likely a cross-setting phenomenon. In doing so, I illustrate the value of tracing youth's participation in mathematical activity *across* settings for educational research and practice.

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PARTICIPATING IN MATHEMATICAL ACTIVITY ACROSS SETTINGS

In this section, I describe the theoretical perspectives and empirical work that informed the conceptualization of the study and the resulting analysis. The study on which I report is informed by an emerging line of research focused on understanding individuals' trajectories of participation across recurrent and disparate events in similar and distinct settings and is informed by a sociocultural perspective on learning and human development (Dreier, 2008; Stevens et al., 2005; Wortham, 2006). Here I briefly describe two classic accounts in educational research that attend to participation in related settings (accounts of transfer and mismatch) and explain how the approach I took is different from either account. I then describe sociocultural accounts of learning that suggest the importance of framing and understanding participation as a relationship between individuals and the activity systems in which they participate. Next I briefly describe relevant findings associated with sociocultural accounts of participating in mathematical activity. I then review contemporary accounts of participation and learning that suggest why learning scientists might be concerned with tracing participation in related activity across disparate settings.

Classic Accounts of Participation in Related Settings: Transfer and Mismatch

At least two historical bodies of research posit relationships between participating in two (related) settings that are relevant to educational research—psychological research on "transfer" and anthropological and sociological work on the "mismatch" between home and school. Classic research on transfer is concerned with understanding the conditions in which individuals apply what they have learned

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in one event in a subsequent event, which sometimes involves changing settings (Bransford & Schwartz, 1999; Detterman, 1993). Classic research on transfer has taken place under laboratory conditions and has used mathematical tasks as a basis, although the type of mathematical tasks and the amount of instruction given with the tasks has varied. Historically speaking, learning theories built on a psychological principle of transfer were based on an assumption that once an individual has acquired knowledge or competency with a particular skill or strategy in one context, he or she should be able to transfer and apply it to other contexts (Bransford & Schwartz, 1999). This conception of learning presumes that the learning of some skill, strategy, or information is *complete* in the first event.

Another strand of educational research that posits relationships between settings includes anthropological and sociological studies of "mismatch" between home and school. In such accounts, researchers are typically concerned with explaining why particular groups of students (usually associated with social class and/or racial/ethnic identification) tend to fare better in school than other groups of students (Eisenhart, 2001). Explanations focus on the extent to which schooling practices "match" with home practices. This body of work has suggested that, in general, schooling practices tend to represent practices closely aligned with the home practices of White, middle-class families and communities. Children who do not come from a similar background experience the expectations and cultural norms of schooling as unfamiliar and alienating (e.g., Dyson, 1993; Heath, 1983; Jacob & Jordan, 1992; Philips, 1983; Spindler, 1982).

Accounts of mismatch have highlighted the social and cultural underpinnings of any educational activity and how particular norms of participation have the potential to privilege some individuals over others. However, accounts of mismatch have been critiqued on the basis of the conception of culture guiding such studies (Collins & Blot, 2003; Eisenhart, 2001; Levinson, 1992). In accounts of mismatch, culture tends to be conceived as bounded by physical space (e.g., "school" culture, "home" culture), and consequently, research from this perspective has rarely inquired into the potential for students to merge home and school practices. In other words, mismatch studies have generally ignored the potential for hybridization of practices across settings (González, 2004, 2005; see Hall, 2002, and Rampton, 2005, for accounts of hybridization). In addition, as Eisenhart suggests, in mismatch accounts, culture is erroneously assumed to operate at a group level (usually based on race/ethnicity, socioeconomic class, language, and/or religion markers), and it is erroneously assumed that individuals have little choice in how they take up a cultural group's patterned ways of being.

Although the assumptions guiding classic accounts of transfer and mismatch are dissimilar, they share one tenet worth noting. Both accounts appear to presuppose some sort of underlying competence on the part of individuals and groups. A classic account of transfer is based on two assumptions—(1) that there is some content out there in the world to be learned; and (2) that there is a set of observable behaviors, strategies, or actions that indicate that an individual demonstrates competence with respect to that piece of content (Laboratory of Comparative Human Cognition, 1983). Accounts of mismatch argue that different settings house and support a distinct set of practices (e.g., interactional norms, participation structures) that are fairly durable. In doing so, they also assume an underlying competence. A person gets marked as competent or not based on how well aligned his or her practices are with the particular setting. Certainly, accounts of mismatch seek to question the role of the school in socially identifying a person as incompetent according to what those in schools often claim is an objective set of standards. However, accounts of mismatch do not question the idea that groups of individuals are fundamentally competent in some set of practices; the problem, from a mismatch perspective, is that schools only recognize one form of competence.

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Sociocultural Accounts of Participation in and Across Settings

A central goal of this article is to suggest that understanding the accomplishment of work across settings is worthy of investigation as a phenomenon in its own right. Although classic research on accounts of transfer and mismatch illuminate key aspects of participating in distinct settings, they do not necessarily help researchers understand, for example, how the nature of Timothy's participation in mathematical activity in the classroom was shaped in complex ways by his movement between the two activity settings. As suggested by the introductory vignette, theories of participation that position the social and cultural dimensions of settings (e.g., available resources, social relations, norms of participation) as central are likely better suited to explain the quality of an individual's participation across settings than theories that position such dimensions of settings as auxiliary. Sociocultural theories of participation are relevant in that they frame what people do, and thus what they learn, as inextricable from the social and cultural dimensions of the setting in which the people are situated (e.g., practices of the activity, norms of participation in an activity, tools available and the normative ways of using them; Lave, 1988; Lave & Wenger, 1991; Packer & Goicoecha, 2000).

Sociocultural accounts of participation focus on the relationship between persons and activity, and learning is evidenced by a "change in the relations between persons and their situation in a way that allows for the accomplishment of new activities" (McDermott, 1997, p. 127, as cited in Wortham, 2006, p. 101; see also Beach, 1999). From a sociocultural perspective, learning is both epistemological and ontological in that it involves not only changes in what one can do or knows but also changes in who one is (Lave & Wenger, 1991; Packer & Goicoecha, 2000; Wortham, 2004). Typical sociocultural accounts of learning with respect to some established practice describe how "novices" come to appropriate particular tools, discourses, and ways of acting such that they adopt different positions within a community and participate in activity that is more central to the practice. The term *trajectory of participation* is often used to describe an individual's journey into the "center" of the practice (Lave & Wenger, 1991). A trajectory conjures the image of events linked in a particular way such that at least a participant and/or resource (i.e., the link) is consistent from one event to the next. Over time, a person participates in related activity, and it is across this trajectory of participation that shifts occur in what the person is able to accomplish and/or how the person is socially recognized as contributing to the activity.

Participating in Mathematical Activity. Over the past few decades, a number of mathematics education researchers have adopted a sociocultural perspective to investigate participation (and learning) in the mathematics classroom (e.g., Boaler, 1997; Cobb, Stephan, McClain, & Gravemeijer, 2001; Cobb, Yackel, & Wood, 1992; Gresalfi, 2009; Hiebert & Grouws, 2007). These and other studies have demonstrated that opportunities to learn mathematics are tightly coupled with the social and cultural dimensions of the classroom setting, including the norms of participation in practices (or phases of instruction), the tools available and the normative ways of using those tools, and the discourses central to the activity. In other words, the quality and depth of what students learn mathematically is part and parcel of what it means to participate and do mathematics in particular classrooms (Cobb et al., 2001). Furthermore, these studies have highlighted that social identification (both how teachers identify students and how students identify with the classroom activities and the discipline of mathematics) is central to students' participation in classrooms and, hence, what students learn (Boaler, 2000; Cobb, Gresalfi, & Hodge, 2009; Martin, 2000).

A substantial body of research has investigated participating in solving problems with a mathematical basis outside of schools, often with the purpose of comparing to and contrasting with the nature of mathematical activity in schools (e.g., Carraher, Carraher, & Schliemann, 1985; de la Rocha, 1985; Gay & Cole, 1967; Guberman, 2004; Lave, 1988; Nasir, 2000; Nasir & Hand, 2008; Saxe, 1991; Scribner, 1985). Nasir and Hand summarize the key findings of this body of research as follows: (a) Individuals' strategies for solving problems vary by context, (b) problem solving is distributed in a network of individuals and tools, (c) "access to experts" is important when learning how to solve a problem, and (d) problems that tend to be of importance are "practical or applied" and "arise as participants are seeking to solve bigger problems or reach larger goals" (in contrast to the routine, inauthentic mathematics problems generated in most schooling contexts; pp. 144–145).

Recent work by Stevens and his colleagues (Stevens, Mertl, Levias, & McCarthy, 2006; Stevens, Satwicz, & McCarthy, 2008) challenges a key finding of the out-of-school research—namely the prevailing model of apprenticeship (e.g., experts guide novices to participate in established practices). Based on

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ethnographic studies of families' financial problem-solving activities and a comparative analysis of youth's video-game play and completion of homework, Stevens and his colleagues (2006) describe a "diversity of learning arrangements" in homes that support youth's participation in problem-solving activities (p. 2). In the case of financial problem solving, sometimes parents acted as an expert, however often children were positioned as experts, and at other times there was not a clear expert–novice relationship. In the case of video-game play and homework, Stevens et al. (2008) show that participating in both activities was "tangled up" with "other cultural practices, which include relations with siblings and parents, patterns of learning at home and school, as well as imagined futures for oneself" (p. 43). On a related note, they found that when problems arose in any of the contexts that had to be solved, individuals "assembled" and "coordinated resources" that were "radically heterogeneous" (Stevens et al., 2006, p. 2). Stevens et al. (2006) contrast these assemblies of heterogeneous resources to the static, predictable ones used to solve school mathematics problems (e.g., one strategy used to solve a particular kind of problem).

Stevens and his colleagues conjecture that the diversity of the learning arrangements they found, including the coordination of heterogeneous resources to solve the problem at hand, was related to the *consequential* nature of the problems they were studying. They argue that activities like solving financial problems are "personally consequential" or "high stakes," and perhaps more so than activities previously studied. Stevens et al. (2006) suggest that by studying "consequential contexts of quantitative practice," it is more likely that researchers might gain access to the "full range of mathematical resources that people can and do use" (p. 1; see also Stevens et al., 2008).

Participating Across Settings. The majority of sociocultural analyses of trajectories of participation relevant to school and out-of-school settings have focused on trajectories of individuals' participation in and across recurrent events related to a central practice that is located in roughly the same setting. However, as illustrated with Timothy in the opening episode, participating in school-based mathematical activity is not necessarily a setting-bound phenomenon. Timothy's trajectory of participation in school-based mathematics was shaped by events that occurred inside as well as outside the mathematics classroom.

Along these lines, recent work has argued for the importance of tracing individuals' trajectories of participation across recurrent as well as disparate events, practices, and settings to account for the complexity of individuals' participation in activity, how individuals come to learn particular content, and how individuals get socially identified and come to socially identify with a particular practice (Beach, 1999; Dreier, 2000, 2003, 2008; Stevens et al., 2005, 2008; Wortham, 2005, 2006). An assumption in all of these accounts is that learning is not complete in any one event (i.e., a person does not learn to identify fractional parts of some representation in an event and then apply that learning in another event). Instead, learning is accomplished *across* trajectories of events that may be recurrent and/or disparate. A related assumption is that, as Beach (1999) aptly states, as individuals move from one activity to the next, both "persons and contexts" change, and, moreover, it is the relation between the changing person and the context that is consequential for people's learning (p. 104).

Relevant work includes Wortham's (2005, 2006) study of adolescents' trajectories of academic socialization across an academic year in an English and history seminar. Academic socialization included both coming to learn particular content and ways of making arguments and becoming socially recognized as particular kinds of students. Although Wortham focused on the setting of the classroom, he vividly illustrates how youth's trajectories of socialization depended on links between recurrent events (e.g., teachers suggesting how to participate in argument) as well as disparate events (e.g., the positioning of students in diverse ways depending on the text being discussed).

As an example of tracing trajectories of participation across diverse settings, Dreier (2008) studied the relationship between families' participation in therapy sessions and how they participated in their everyday lives outside of therapy.[4] Similar to research on out-of-school problem solving, Dreier (2008) argues that people act differently in distinct situations for good reasons. However, different from most research on out-of-school problem solving, he pushes for a theory of participation that considers understanding individuals' activity in relation to the local context of the event *and* in relation to individuals' activities across events that are linked and often nested in distinct settings (e.g., therapy session and home). He argues that individuals build, challenge, and reshape their understandings of particular content over time and across settings, depending on resources and relationships with others associated with particular settings and how events are linked with one other. For Dreier, change in participation (i.e., learning) is necessarily a cross-contextual process, and therefore studying it requires cross-contextual investigation.

Although I did not adopt an activity theory perspective in this analysis, it is worth noting that a focus on participation in and across recurrent and disparate events and settings is in line with recent developments in cultural historical activity theory. From an activity theory perspective, different activity systems (e.g., school and the workplace) may support distinct goals, specific sets of norms, divisions of labor, the use of particular tools in specific ways, and so forth. The current generation of activity theory work argues that it is imperative to consider

[4]Dreier (2008) argues that therapy is a similar intervention to schooling, in that both are intended to affect individuals' activity and participation in other settings. Of course, a crucial difference between participating in therapy and participating in schooling is that individuals presumably engage in therapy because they want to change some aspect of themselves in settings beyond the therapy context.

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relationships between multiple activity systems, for example schools and workplaces, when organizing and designing for learning (Engeström, 2001; Sannino, Daniels, & Gutiérrez, 2009; Tuomi-Gröhn & Engeström, 2003). Activity theorists often describe transitioning between distinct activity systems as "boundary crossing," which may be more or less seamless (Tuomi-Gröhn, Engeström, & Young, 2003). Research, primarily on workplace organizations and vocational education, suggests that productive boundary crossing can be designed for (Tuomi-Gröhn & Engeström, 2003; Wenger, 1998).

To this point, Wenger (1998) suggests that "brokers" and "boundary objects" can aid in the negotiation of meaning that might connect and coordinate the activities associated with two or more divergent systems (Bowker & Star, 1999; Star & Griesemer, 1989; Wenger, 1998). *Brokers* are people who minimally participate in the activity systems that are in need of coordination and who are able to facilitate the negotiation of meaning of elements of one activity system with those of another. *Boundary objects* are immaterial concepts and/or material objects that are central to the work associated with the activity systems; boundary objects represent concepts around which people might negotiate meaning that can aid in coordinating the work of the two systems. Aided by brokers and boundary objects, crossing boundaries can, in the most productive cases, involve the creation of new, hybrid spaces in which individuals negotiate and form new meanings specific to a new activity system (what Gutiérrez, Baquedano-Lopez, & Tejada, 1999, have called a "third space").

It is important to note that although coordination can be designed for, it is an empirical question whether people and concepts and/or material objects actually serve as brokers or boundary objects (Wenger, 1998). Similarly, as Stevens et al. (2005) note, it is also an empirical question as to whether what may appear to outsiders as a "boundary" is actually experienced as such by the people who inhabit the systems. For example, Stevens and his colleagues suggest that mainstream educational research has tended to compartmentalize students' learning into subject domains, thereby suggesting that students experience schooling as subject specific. Stevens et al. (2005) question whether students might instead develop "blurred understandings of the subjects in the context of the school" (p. 137).

In the analysis I present here, I make an assumption that the classroom and home were experienced as distinct activity systems for Timothy, his family, and his mathematics teacher. However, I also suggest that the nature of activity in each of the settings was heavily shaped by individuals' participation in alternative settings in complex ways. Beach (1999) suggests that a key issue in considering participation in and across multiple activity systems regards the telos of human development. He has suggested that transitions between school and the workplace are fundamentally different than transitions between school and home. Beach describes transitions between home and school as "collateral," in that they involve "individuals' relatively simultaneous participation in two or more historically related activities" (p. 115). He contrasts collateral transitions with other forms of transitions, like "lateral" transitions, in which a person participates in one activity prior to the next (e.g., graduating from a trade program and then beginning work in that trade). Beach argues that although collateral transitions occur more in everyday life than other forms of transitions, they are "more difficult to understand because of their multidirectionality" (p. 115). Given that individuals move back and forth between, for example, home and school, there is not a straightforward notion of what it means to progress or develop, as in the case of lateral transitions.

This analysis is focused on collateral transitions between home and school. Through the case of Timothy, I describe the complex work entailed in participating in school-based mathematics, some of which involves transitioning between home and the classroom. Within the home, I focus on the accomplishment of homework for a couple of reasons. First, homework is by design a mechanism by which the work of school extends into the home. Second, completing homework was a personally consequential activity for both Timothy and his parents (I provide evidence for this claim later on).

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RESEARCH DESIGN

The methodological implications of conceptualizing participation in an activity as a cross-setting phenomenon include following individuals as they pursue particular work (in this case, school-based mathematics) across settings. The data presented in this article are selected from a 14-month ethnographic study of how two 10-year-old African American children (including Timothy Smith) and their families pursued mathematics within and across home, school, and occasionally neighborhood settings. The focal youth lived in the same neighborhood, attended the same schools, and were in the same classroom in fifth grade.

I used ethnographic methods (e.g., participant observation, interviews, document collection) to document and analyze how the participants (members of both families) experienced and made sense of their participation in and across and their exclusion from a variety of mathematical activity. For the purposes of this article, I focus on Timothy, particularly his participation (including social identification) in his fifth-grade mathematics classroom and its relationship to the accomplishment of mathematics homework at home. The other focal child whom I followed, Nikki, was generally quite successful in school mathematics, and although her mother was involved in monitoring whether she completed her homework, Nikki generally did not encounter difficulties. In contrast, and as is illustrated in the opening vignette, Timothy generally struggled in school mathematics and thus sought help from family members on a regular basis. The fact that transitions between school and home were not seamless for Timothy meant that the conflicts and points of contact between school and home were much more visible in the case of Timothy than in the case of Nikki.

I met Timothy and Nikki (and their families) through work with an educational scholarship program. Timothy and Nikki were part of a cohort of 50 children in a Head Start program who were chosen to receive a college scholarship contingent upon high school graduation. In my work with families as part of the scholarship program, I provided mathematics support to struggling youth (including Timothy), to the children's older siblings, and to parents who were either interested in learning about their children's mathematics or had reenrolled in school themselves. As part of this work, I came to know several families very well, including Timothy's and Nikki's. I asked those two families to participate in the study because I had established good relationships with them, the families lived in the same neighborhood, and the children attended the same school. In addition, Timothy and Nikki were quite different in terms of academic success and family composition. I conjectured that they would provide useful contrasting cases in terms of participating in mathematical activity.

For the purposes of this article, I drew from observations in Timothy's home, observations of Timothy in his fifth-grade mathematics classroom, and interviews with Timothy and his family and his fifth-grade mathematics teacher. In what follows, I provide relevant background regarding the research settings described in the analysis. I then describe the collection of data relevant to the analyses presented in this article. Last, I describe my methods of analysis.

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Research Settings

The Mathematics Classroom. I began the study when Timothy was in fourth grade at his neighborhood K–8 school, Maple School. The opening vignette was from Timothy's fourth-grade year at Maple. However, beginning in fifth grade, Timothy transitioned to Johnson Middle School (Grades 5–8), a charter school that was located across the city. Following Timothy to a new school proved useful analytically. Timothy was new to Johnson, and aside from knowing a handful of students who had been at Maple with him and who also chose to go to Johnson Middle School, by and large Timothy was "unknown" on the first day of school. It then became an empirical question as to how he would participate and how he would be socially identified in the mathematics classroom.

Johnson Middle School aimed to serve children of color from economically disadvantaged backgrounds. The school's goal was to provide the youth with access to higher education. Both the principal and the mathematics teacher (Ms. Ridley) described fifth grade as a year of remediation. The mathematics department (in coordination with the charter school network) offered a fifth-grade mathematics curriculum that focused on "basic skills" and took a decidedly procedural approach to the teaching and learning of mathematics. A focus on "remediation" in fifth grade extended beyond academics; school leaders and teachers heavily emphasized discipline in the fifth grade, based on an assumption that the children had arrived at Johnson with undeveloped social and moral habits. As I argue elsewhere (Jackson, 2009), the school's deficit framing of the children's academic and social/moral development was rooted in assumptions about the school and home environments from which the students came.

In accordance with the provided curriculum, Ms. Ridley tended to proceduralize mathematics. She taught the children procedures to solve routine problems, she expected that mathematics problems would be solved in a prescribed way, and she neither encouraged nor accepted alternative solutions on most occasions. She focused on "getting the answer" with little discussion of the approach and emphasized speed through a variety of practices in which children who finished an assignment first were rewarded. Timothy was quickly cast as one of the slowest students in the class, and, although he was accurate and often satisfied with following a prescribed solution path, in part because of his speed, he maintained a peripheral position in mathematics across the entire year in Ms. Ridley's class.

Homework was a standard practice across school subjects at Johnson, and it was given extreme social and academic weight throughout the school. Johnson had a policy whereby any child or parent could call any staff member until 9 p.m. every evening for homework help, and each staff member had a school cell phone. Children were expected to complete their homework in prescribed ways, particularly in mathematics. Each subject teacher (math, reading, writing, science, social studies) was required to give an assignment every night. Most teachers expected assignments to take 20 to 30 min. Parents were expected to sign every piece of homework as well as their children's homework agenda every evening. Homeroom teachers checked their students' homework for completeness for each subject in the cafeteria before the children went to their classrooms. I documented numerous times when a teacher berated a child for having incomplete homework, homework that was not neat enough, homework for which the child did not show his or her work, and homework without a parental signature; all of these infractions had severe consequences at Johnson.

For the first few months of the academic year, if homework was counted as incomplete for any of the aforementioned reasons, including because it lacked a parent signature, the child had to wear a colored shirt, remain silent for the day, and serve an after-school detention and complete the homework to avoid further punishment. In December, the Johnson staff voted to change this policy because they found that it was hard to manage. Instead, they devised the following policy: Students earned a lunch detention for their first homework infraction and an after-school detention for their second homework infraction. Throughout the year, the youth I spoke to were fearful of the consequences of incomplete homework;

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completing homework (including mathematics homework) was a personally consequential (Stevens et al., 2006, 2008) activity for Timothy and his parents.

Homework Time at the Smiths'. Timothy lived in a low-income, predominantly African American neighborhood in a large northeastern city in the United States. Lucille and George Smith, Timothy's parents, were in their late 40s at the start of the study and had five children, three of whom lived at home at the time of the study. At the beginning of the study, Samantha, 16 years old, was a junior at a neighborhood high school. Timothy was 9 years old, and Pamela was 7 years old and in second grade at Maple School. George was a fireman in the city who often worked nights. Lucille was a regular volunteer at Maple School and was my assistant in an after-school mathematics class at Maple. Lucille and George both grew up in the Maple neighborhood; their house was only a few blocks from their childhood homes. Neither parent had graduated from high school.

As a young child, Timothy had received medical treatment for problems regarding the flow of spinal fluid. He tended to process information more slowly than his peers, and he had developed a stutter. Although Timothy qualified for speech services in school, he did not qualify for special education services. Timothy was generally reserved in school settings. He tended to express himself more easily at home than at school, although in both settings he had difficulty completing tasks quickly.

Over the course of the study, my observations showed that Timothy's mother and father, when he was not at work, were heavily involved in his homework. As illustrated in the opening vignette, an adult (usually Lucille) monitored Timothy's homework while he was at Maple. However, when he went to Johnson Middle School, his parents' involvement in his homework intensified in response to the demands of Johnson. Johnson students were encouraged to do their homework at lunch and in the hallways between classes. Some students managed to finish most of their homework in school and on the bus ride home each day. However, others, like Timothy, stayed up late every weekday evening working on homework.

Within the first 2 weeks of school at Johnson, Mr. and Mrs. Smith instituted a routine regarding the completion of homework. As soon as Timothy arrived home, usually around 6:15 p.m., he opened his backpack, took out his homework agenda and homework worksheets, and gave them to Lucille to review. Timothy typically managed to finish one of his five assignments in school. Lucille often told him to start with his math homework because she knew that this was the one piece of homework for which they often had to consult other resources in order for him to finish. If George was home for the evening, he and Lucille took turns between preparing dinner and monitoring Timothy.

Mr. Smith observed that math was often the most difficult in terms of the support he and his wife could offer because the methods introduced in school were foreign to them. He told me, "Most of his subjects are . . . hard facts, whereas

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some of the math is the *way* you do it" (INT, 4/6/07). He found they could often look up generic information in books and on the Internet to help Timothy with his other subjects, but the fifth-grade math curricular conventions and pedagogies associated with the curriculum were unique to Johnson. I never observed Timothy's parents actually complete his work for him. In fact, in many cases, they were unsure of the content. However, they felt that one of them had to sit with him to encourage him to "keep going." Homework time had the same general character across the school year, but there were differences in how it was arranged depending on the nature of the content in the homework, Timothy's and his parents' facility with the content, and who participated in homework time.

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Data Collection

Home Observations. Over the 14-month time period, I spent approximately 60 hr in Timothy's home. I visited his home at least two times every 2 weeks, with the exception of the winter holidays. Lengths of observations varied and were shaped by the children's schedules; however, the average length of observation was 1.5 hr. I visited Timothy's home on both weekdays and weekends, although my weekend visits tended to last longer (average 2 hr) than weekday visits (average 1 hr).

My role as a participant observer in the home was shaped by my interpretations of the activities at hand. I tended to fluctuate between observer and participant in activities. I consciously did not attempt to be invisible because it felt unnatural. I knew these families well and had been in both of their homes before and felt that an attempt to act invisible would have compromised my relationship with the families. Instead, I attempted to carefully observe the activity around me, asked questions to help me understand what I was observing, and engaged in conversation as it felt appropriate. I found homework time relatively easy to observe, as the activity took place in a concentrated spot (usually at the dining room table). Occasionally, the parents and children asked me questions, usually only about math, to which I responded. During observations in which there was less focused activity, I typically took on a participatory role, engaging in conversation while carefully tracking the mathematical activity that emerged.

I documented all of my home observations through ethnographic field notes (Emerson, Fretz, & Shaw, 1995). While in the home, I occasionally jotted down memorable bits of conversation or representative words that I hoped would evoke my memory of the event. Then, as soon as I got home, I typed formal field notes. I attempted to capture as much about the observation as I could remember, including conversations.

Classroom Observations. I conducted regular observations of Timothy's fifth-grade mathematics class at Johnson Middle School from September 2005 through June 2006 on two consecutive days each week. In total, I observed Timothy's participation in his fifth-grade mathematics classroom for approximately 130 hr. I was not allowed to formally observe in other spaces of Johnson Middle School, although I occasionally negotiated with teachers to allow me to observe Timothy in other subject areas. When I initially approached Johnson's principal for permission to observe Timothy, he told me that I was only allowed to observe the mathematics classroom and that Johnson's policy was that all observers were expected to refrain from interacting with the students or the teacher. For the first couple of months, I stayed in the back of the room and did not interact with the students in any way. However, in October, I e-mailed Ms. Ridley, the fifth-grade math teacher, and offered to circulate to answer students' questions during classwork. Ms. Ridley said that she would appreciate my assistance. For the remainder of my observations, I stayed in the back during Ms. Ridley's whole-class instruction and circulated during classwork time to answer individuals' questions. Circulating gave me a chance to see the work that Timothy was producing.

The notes I took while observing in classrooms were much more detailed than the notes I took while observing in the homes. While I was in the classroom, I attempted to write as much as I could. I tried to capture exact conversation as it occurred, patterns of participation related to Timothy as well as other students, and what was written on the board. I then created electronic versions of these classroom observations. I also collected copies of any documents used in the classroom (e.g., classwork assignments, notes to the parent).

Interviews. I conducted five audio-recorded interviews with Timothy and five audio-recorded interviews with his family members over the course of the study. Interviews with Timothy tended to last 1 hr, whereas interviews with his family members tended to last 2 hr. The interviews were semistructured and provided a focused opportunity for me to ask questions regarding what had emerged during the home observations and out-of-home observations. I asked about participants' histories with mathematics, particular events that appeared to be consequential to participating in mathematical activity and/or their developing social identities, their thoughts about schools and homes as sites for learning mathematics, their senses of themselves in various settings, and their future goals and aspirations.

In addition, I audio-recorded three interviews with the Johnson fifth-grade mathematics teacher over the course of the 2005–2006 academic year. In semistructured interviews, I asked about her changing perceptions of Timothy (and Nikki) over time, particular events that I observed in the class that appeared to be consequential for Timothy (and Nikki) socially and/or academically, and her history as a teacher and with mathematics. Interviews with the teacher tended to last 1 hr.

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Methods of Analysis

Two complementary phases of analysis informed what is reported in this article. I first completed an analysis of how learning was arranged for in various events and in various settings and how learning arrangements shifted over time. In accordance with a sociocultural account of participation, and as informed by studies of participating in mathematical activity, I documented configurations of cultural and social dimensions that proved central to Timothy's participation in events that took place in his fifth-grade classroom and home. Dimensions included ideologies concerning mathematics, education, and youth; practices central to the settings; nature of the problems that arose; what doing mathematics entailed; tools available in the settings and the ways in which they were used (and by whom); and co-participants' relationships. Although some dimensions of the settings were fairly stable over the course of the study (e.g., the teacher's ideologies about mathematics), others shifted over time, especially in relation to who was present and the nature of any given problem (e.g., nature of the problems that arose, tools available, relationships between co-participants). Therefore, I also conducted a corresponding analysis in which I traced the stability and instability of these dimensions (i.e., changes in the activity system).

Against an analysis of how learning was arranged for in various events and settings, a second analysis included tracing Timothy's (and other participants') trajectories of participation across events (temporally and spatially) and sometimes across settings to identify patterns in Timothy's participation (and that of other co-participants). In particular, I focused on the configuration of resources that was used in any given event as well as how the uses of those resources were linked to Timothy's (and others') participation in previous events.

Although I was better positioned to notice when individuals drew on resources developed or used in one setting to contribute to problem solving in a new setting, I was still limited in the extent to which I could trace such linkages by the time span in which I conducted the study and the events/settings in which it was feasible to observe. It is highly probable that Timothy and his family members drew from events that happened outside the time span and settings that I observed and that events that I did observe were implicated in events that were outside of my scope of observation.

TRAJECTORIES OF PARTICIPATION IN AND ACROSS HOME AND SCHOOL SETTINGS

In what follows, I provide evidence that Timothy's participation in school-based mathematics was a cross-setting phenomenon in at least two ways. First, I provide evidence that accomplishing school-based mathematics literally extended into the home and discuss how individuals recruited resources from their histories of participation in alternative settings to accomplish the work of school-based mathematics. In focusing on an analysis of learning arrangements in the home, I also provide evidence that Timothy's family productively arranged for his learning, although the outcomes varied. (This finding helps contextualize the findings of the second, related analysis.) Second, I provide an analysis of the trajectory of Timothy's social identification in the classroom across the course of the academic year. The goal of the second analysis is to provide evidence that the trajectory of Timothy's social identification in the classroom was in part contingent on his teacher's account of how she presumed learning was arranged for in Timothy's home.

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Learning Arrangements at Home

To illustrate the nature of how Timothy's learning was arranged for with respect to the accomplishment of homework, I present an analysis of two homework events. The events are representative of the two most prevalent types of learning arrangements I identified in the data: (a) Timothy acts as an advice-seeker, and a family member acts as an advice-giver, but the problem is not necessarily resolved; and (b) Timothy and a family member (or members) act as fellow learners, and the problem is usually resolved. In all homework events, I identified that participants assembled heterogeneous sets of resources to attempt to solve the problem at hand.

Homework Event 1: The Fraction Review.

Vignette. As mentioned earlier, Lucille was my assistant in an after-school program at Maple for 3 years, including the years of this study. During the 2005–2006 academic year, Timothy was enrolled at Johnson and did not attend the after-school program at Maple. However, Lucille's youngest child, Pamela, was in our after-school math class at Maple. During the late fall of 2005 and early winter of 2006, we worked mostly on developing our students' understandings of equivalency of fractions. At the same time, Timothy encountered work with fractions, including equivalency, in his classroom.

During our work with fractions in the after-school program, Lucille often acted as a student rather than an instructor. She engaged in the activities the students were doing, and although she monitored what the children were doing, she did so less than when we engaged in other mathematical content areas with which she felt more confident. To introduce the idea of equivalence we folded 8" × 11" paper into various fraction representations, and the children identified different equivalencies based on the visual representations. We then moved from a three-dimensional representation to a two-dimensional representation. The children were provided with 8" × 11" whiteboards. I asked them to draw a rectangular shape and to visually represent 1/2 of the rectangle. I then asked them to draw a rectangle directly below the first rectangle, with the same dimensions as the first, divide it into fourths, and represent 1/2 of that rectangle in terms of fourths. We continued doing this for different fractions, some of which I suggested and others that the children suggested (e.g., 1/3 = 2/6; 5/10 = 1/2). Over the next few weeks, the children drew on this visual model for fractions as we continued to engage with conceptions of equivalence, as well as when we discussed the addition and subtraction of fractions. Lucille began to suggest such models for the children as she assisted them in the classroom.

Meanwhile, from late January through early March, Ms. Ridley worked on similar concepts with her students, although her instruction tended to emphasize procedures and mnemonics and did not make much use of visual models. Ms. Ridley introduced equivalence in three ways: through visual models (FN, 2/5/06), as creating proportions (FN, 2/7/06), and as "reducing" fractions (FN, 2/8/06). The visual models were similar to the ones we created in the after-school program; however, Ms. Ridley drew them for the children as opposed to asking the children to create them. Ms. Ridley spent 2 days working with visual models and then introduced setting up proportions to determine equivalencies, which she called "the algebra way."

As the state test in mathematics grew close, Ms. Ridley created homework sheets that reviewed a series of content areas. On Friday March 24, 2006, Ms. Ridley's homework included word problems, plotting points on coordinate planes, a "fraction review" (see Figure 1), and a "decimal review."

Timothy worked on his math homework on Sunday afternoon. He sat at one end of the dining room table, and Lucille sat at the other end. She had photocopied his homework sheet and was attempting to work out the fraction problems (Problems 5–7) on her own. Meanwhile, Timothy looked carefully at Problem 5. Ms. Ridley had taught them to order fractions by creating equivalent fractions based on the least common denominator. However, before they did so, they were instructed to "reduce the fractions, if possible." Timothy found his notes on "ordering fractions." He also noticed the reminder under Problem 7, "Did you reduce? ☺ " He took that as a reminder for all of the questions (Problems 5–7), although, based on my interpretation of the homework sheet, I believe Ms. Ridley intended this only as a reminder to reduce the answer to Problem 7.

5) Order least to greatest: 6) $\frac{2}{3}+\frac{2}{11}=$ 7) $\frac{2}{4}-\frac{3}{10}=$

$\frac{15}{18}, \frac{6}{13}, \frac{2}{8}$ *Did you reduce? ☺

FIGURE 1 Fraction review, homework 3/24/06.

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Timothy began to reduce the fractions in Problem 5. He easily reduced 15/18 to 5/6 by drawing on a Johnson curricular convention called “factor shopping.” Students pretended that they were shopping for factors in a grocery store and in the process identified the greatest common factor of the denominators under question and then divided the numerators and denominators by the greatest common factor. He then attempted to reduce 6/13. He wrote out the factors for 6 and 13 and saw that they did not have a factor in common. This puzzled him—he was convinced that Ms. Ridley’s reminder note applied to all of the fractions in Problems 5 through 7. He asked his mother for help.

Lucille suggested that perhaps 6/13 could not be reduced. Timothy replied, “No, it says you *have* to reduce!” Lucille asked Timothy to explain how he reduced the first fraction. He told her that he went factor shopping. Lucille asked to see his notes that explained factor shopping. She attempted to make sense of his notes but was unable to do so.

Lucille then told Timothy, “Well, we’ve been reducing fractions another way in after-school. Let’s see if this works.” She asked him to sit closer to her, which he did. She took a piece of 8” × 11” paper and attempted to fold it into 13 equal pieces. After a few minutes, she gave up. Instead, she took out another piece of paper and drew a long rectangle with 13 equal parts and then shaded in 6 (see Figure 2). She asked Timothy what fraction this represented. He answered, “Six-thirteenths.”

Lucille then asked Timothy, “Can you find a way to divide this up to make an equivalent fraction?” Timothy looked puzzled. Lucille asked, “How about a half?” She asked him to draw another bar of equal size underneath and to show one half. Timothy was meticulous, making sure the second rectangle was of equal length and width to the first, and then shaded in one half of the rectangle completely (see Figure 3).

Timothy compared the areas of 6/13 and 1/2 and told Lucille, “They don’t match.” Lucille looked at the drawing as well and said to Timothy, “Six and six is twelve with a remainder of one. That just don’t work, right?” Timothy looked at

FIGURE 2 Lucille’s diagram of 6/13 (FN, 3/26/06).

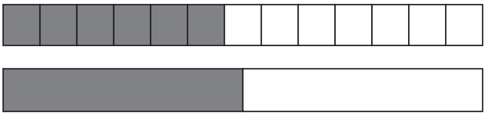

FIGURE 3 Timothy’s visual representation of 1/2 (FN, 3/26/06).

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her quizzically, and then said, “But it’s gotta reduce!” Lucille responded, “I don’t think it does. You just showed me it couldn’t be one half.”

Timothy began to breathe deeply and moved back to his chair. Meanwhile, Lucille asked me, “Kara, this doesn’t reduce, right?” I told her that it did not, and she asked me to explain that to Timothy. I told Timothy that I was fairly certain that Ms. Ridley intended the question “Did you reduce? ☺ ” for Problem 7, not for Problem 5, and that he had already shown he could not reduce 6/13 with his original method of factor shopping. Lucille suggested he call Ms. Ridley and ask her, which he eventually did. However, Ms. Ridley never returned his phone call. Meanwhile, Lucille called another parent, Sharleen, to see if her son could explain it to Timothy. Sharleen said her son had not completed the work yet but agreed that 6/13 could not be reduced. Timothy eventually left 6/13 as it was, ordered the fractions, and had the correct answers, although he still feared that he had completed the problem incorrectly because he had not reduced 6/13. However, the next day, his fears were allayed when Ms. Ridley displayed the answers to the homework problems on the overhead projector and his answers were correct.

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Analysis of the learning arrangement. In this event, it appeared that had Timothy not interpreted the assignment as suggesting that he had to reduce the answer to Problem 5, he would have felt able to complete the homework assignment without assistance from his family members. However, Timothy’s experience in school mathematics (and at Johnson in particular) framed the fact that he identified a “problem” to be solved—to reduce the answer he found to Problem 5. Timothy feared the consequences of not following the directions on the homework page and thus was concerned that “Did you reduce? ☺ ” applied to all problems. Had he not been so concerned with making sure that he adhered to the directions, it is likely he would have been satisfied with leaving his answer to Problem 5 as 6/13. Timothy’s trouble was not resolved in the immediate homework event, as he remained puzzled and unconvinced of his answer until he saw that his answers were correct in math class on the subsequent day.

The learning arrangement in this event is one that is potentially comparable to the novice–expert relationship. Timothy initially positions Lucille as a potential expert, given that he approaches her when he finds he cannot reduce the fraction 6/13. However, to be an expert typically means that one has command over a subject matter and/or direct experience with the practice or problem at hand. Lucille has had some experience with finding equivalent fractions, but she does not provide a mathematical argument as to why 6/13 could not be reduced. And because Timothy is convinced that 6/13 must reduce, he does not trust Lucille’s conclusion that 6/13 cannot be reduced, thereby calling into question her positioning as an expert. A more accurate way of describing Lucille and Timothy’s relationship in this problem is one of giving advice and seeking advice (Lucille is the giver and Timothy is the seeker).

Lucille responds to Timothy's problem by assembling a set of diverse resources (e.g., Lucille's experience with equivalence in the after-school program, use of Timothy's notes on factor shopping from the school with little avail, a phone call to another parent, a phone call to Ms. Ridley that was not answered). Together, the unfolding of this event was contingent upon Lucille's and Timothy's trajectories of participation in previous events in different settings and, presumably, their shared participation in previous homework events.

Homework Event 2: Converting Fractions to Decimals. The following event from early June illustrates a different learning arrangement, including a different assembly of heterogeneous resources, to solve the problem at hand. This event is representative of the character of the learning arrangement when Mr. Smith took on the role of homework monitor. Because he worked most nights, he did not take this role often.

Vignette. This evening's homework required Timothy to convert fractions to decimals. Timothy, George, and Lucille sat at the dining room table. Lucille looked over Timothy's homework assignments for all of his subjects while George sat next to Timothy. Timothy struggled with the problem "Convert 8/11 into a decimal." He first attempted to use his understanding of proportion to convert 8/11 into $x/100$, as he had been taught at Johnson. However, he was unable to find a factor to multiply 11 by to result in 100, so he resorted to an alternative strategy that was a combination of what he had learned at Maple and at Johnson. At Maple, they were taught that to change a fraction into a decimal, "divide the numerator by the denominator," and they were given calculators to complete the calculation. However, Johnson did not allow the use of calculators. Timothy then remembered that at Johnson they had recently begun work with dividing whole numbers that resulted in a decimal answer (but not in the context of converting fractions to decimals). He represented 8 divided by 11 on this paper (see Figure 4). Timothy then turned to his father and asked, "How many zeros can I put?" He was referring to how many zeroes he could place after the decimal point to the right of the 8. Mr. Smith told him he was not sure. Timothy then asked me, and I told him he could put as many as he liked, that it would not change the value of the number.

Meanwhile, Mr. Smith went to the Internet site askjeeves.com and typed in "changing fractions to decimals." He also asked Timothy how he was completing the problem. Mr. Smith took out an index card and copied the information

$11\overline{)8.}$

FIGURE 4 Timothy's attempt to convert 8/11 into a decimal number (FN, 6/2/06).

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the website displayed and Timothy's explanation "divide the numerator by the denominator." Mr. Smith then said, "Oh, that's how you do it. We didn't know how to do it. You know, we learned the old-fashioned way." He said he would save the index card for the future. He then told me, "You know, we don't usually know how to do the math. We ask Timothy, and he can't remember. It's really hard when we don't know how, and he asks us, and we're like, 'We're not in school, you are, you have to come explain it to us.'"

Meanwhile, Timothy solved the division problem correctly. Mr. Smith then said to Timothy, "Okay, try this problem." He asked him to convert 23/26 to a decimal. Timothy wrinkled his brow and sat still. Mr. Smith said, "It's the same as what you just did." He then wrote on Timothy's paper $26\overline{)23}$. Timothy continued to sit still. Mr. Smith then said, "Okay, let's do an easier one first so you can get in your groove." He asked Timothy to convert 1/4 into a decimal number. Timothy immediately did so, using the same procedure that he had used to convert 8/11 into a decimal. Lucille then said, "Okay, now you have to go back to the harder one and complete it. Just do the same thing."

As Timothy worked on converting 23/26 into a decimal, Lucille calculated the answer on her calculator. She confirmed whether he was right or wrong as he determined each digit in the answer. Timothy asked her to stop telling him if he was right or wrong. Lucille stopped, and then once Timothy had finished, she confirmed that he was correct. Timothy smiled, and George said, "See, I knew there was a genius in there!" George patted Timothy on his back.

Analysis of the learning arrangement. In this event, the problem, from Timothy's perspective, was how to solve the homework problem "Convert 8/11 into a decimal." This is different from Event 1, in which the problem was in aligning Timothy's mathematical solution with his perception of the directions provided in the homework. Also different from Event 1 is that the trouble was smoothed over rather quickly. His problem was resolved, and his father used their interaction as an opportunity to have Timothy engage in an arguably more difficult conversion.

Timothy did not ask his father for help with the larger task (converting fractions to decimals); he initiated George's involvement by asking for his advice regarding a step in the process of solving the larger problem (how many zeroes he could put after a whole number and a decimal point). Once Timothy initiated an interaction, George took notice of the task and explored how to solve the problem for himself (at that point, Timothy had already found a solution path that appeared to work). One plausible interpretation is that Timothy positions his father as the advice-giver (as he did with his mother in Event 1) by asking him for assistance. What is interesting, though, is that once Timothy solves the homework problem, his father then builds on the momentum and asks him to solve another problem, much as an expert or teacher might do.

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In this event, George (and to a lesser extent Lucille) scaffolded Timothy's attempt to convert fractions to decimal numbers very deliberately (e.g., asking Timothy to complete an easier problem, 1/4, when Timothy had difficulty converting 23/26 to a decimal). What is critical is that they did so *without* an a priori mathematical understanding of what Timothy was expected to do. I saw this on numerous occasions during homework time. For example, recall in the opening vignette when Lucille suggested that Timothy ignore the context of the clock and instead treat the figures as circles even though her understanding of fractions was arguably limited. Although Timothy's parents had limited mathematics content knowledge, they supported his participation in school-based mathematics by assessing the situation, drawing on available resources, and reorganizing aspects of the situation to make it easier for Timothy to proceed. In this case, George learned how to convert fractions into decimals (albeit in a procedural sense) alongside Timothy. In this event, then, I argue that George and Timothy take on the roles of fellow learners rather than novice–expert.

In Event 2, Timothy assembled a variety of resources to solve the initial homework problem, and his father assembled resources to further his own learning and archived them to support the accomplishment of future work. Timothy drew from past instruction at Maple School as well as his current instruction at Johnson, and his father used askjeeves.com and catalogued the information he retrieved in a pile of index cards that Timothy and his parents regularly consulted during homework time.

Summary of Learning Arrangements in the Home. These homework events (including the vignette with which I opened this article) suggest evidence of a productive support system in Timothy's home in relation to completing mathematics homework. In response to Timothy's identification of a problem, his family arranges (and rearranges) the situation such that Timothy is better positioned to solve the problem at hand. In support of Stevens and his colleagues' (2006, 2008) findings, I find that although both representative events are aimed at a similar pursuit—that of supporting Timothy to complete his mathematics homework—they illustrate slightly different learning arrangements. In neither one is there a clear expert–novice relationship, partly because no one has a secure understanding of the mathematics content in question. And in both events, participants assemble a variety of resources to solve the problem at hand.

The variety of resources used to solve (or attempt to solve, as in Event 1) the problem at hand illustrate clearly Dreier's (2008) argument that a person's participation in one event is mediated not only by the resources, norms, and practices associated with that event but also by the person's past participation in linked events. Each participant in the two events drew on resources and participation in previous events to approach the problem at hand. In other words, participants' use of the various resources (including ideas, strategies, and representations) had histories that extended beyond the immediate setting of the home.

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In general, what happened in the home regarding homework was clearly in response to the demands of schooling. The completion of mathematics homework was personally consequential for Timothy and his family because of the consequences that would occur at school. Timothy's family deliberately arranged for his accomplishment of homework so that he would not suffer the consequences of not having completed his homework correctly when he returned to school.

Of note is that his family supported the accomplishment of homework without much support on the part of the school (e.g., telephone calls were not answered; his family was unfamiliar with the conventions, like factor shopping, that were associated with the Johnson mathematics curriculum). I found no evidence of brokers that could support the coordination of the accomplishment of mathematics homework at home. Timothy was the only person who participated in the two activities (math class and homework). He could not serve as a broker relative to the accomplishment of homework given that he was the person experiencing the problem at hand. Similarly, I found no evidence of boundary objects that could potentially support the coordination of the accomplishment of mathematics homework at home. The homework assignment and Timothy's notes were material objects available in both settings (classroom and home), however, there was little else that would support the accomplishment of the work involved in the homework assignment across the two settings.

From Disabled to Coddled at Home: The Trajectory of Timothy's Social Identification in the Mathematics Classroom

I now describe the trajectory of how Ms. Ridley socially identified Timothy in relation to his participation in the classroom across the fifth-grade year. How Ms. Ridley socially identified Timothy was central to his opportunities to participate in the mathematics classroom and therefore his opportunities to learn mathematics. This analysis builds on what I have already established—that participation in one setting is linked to participation in alternative settings that partially structure learning opportunities in the immediate setting. What is significant is that the trajectory of Timothy's social identity in the classroom was in part dependent on how Ms. Ridley imagined (and to a limited extent participated in) what happened in Timothy's homework sessions in his home. Therefore, the trajectory of Timothy's social identification in the mathematics classroom illustrates further how participating in school-based mathematics might be conceptualized as a cross-setting phenomenon.

Attributing a Lack of Ambition to a Disability. Across the school year, Timothy tended to complete nearly all work more slowly than the rest of the students. For example, he was one of the last students to complete "morning work," a set of math problems that students were to complete over breakfast before first period began. He was often the last child to go to first period (which was mathematics) because he was trying to finish up his morning work. (Students received infractions if they did not complete morning work before first period began.) In class, he often raised his hand to answer questions but seconds after the majority of the class had their hands raised. When he did speak, it was often in a low voice. He told his mother that he did so because he was afraid that he was going to stutter. Occasionally, Ms. Ridley called on Timothy when his hand was not raised. Although he usually took about 3 s before answering her question, I noted that he always answered the question correctly.

In addition to observing Timothy in the classroom in the first couple of weeks of school, Ms. Ridley learned from the Smiths that Timothy tended to process information a bit slowly. In early fall, the Smiths pressed the Johnson staff to test him for special education services. (They had not pressed the staff at Maple to test him because at Maple the special education students were segregated and the special education classroom was reputed to be a chaotic environment.) However, Timothy did not qualify for special education services. The special education teacher at Johnson Middle School explained that in order to qualify, Timothy would have to demonstrate a discrepancy on his performance on a series of tests used for qualifying purposes. He “scored low on all of the tests,” thereby disqualifying him from receiving special education instructional services. However, because of Timothy’s stutter, Johnson arranged for him to receive biweekly speech services. And the special education teacher included Timothy in the small group of students she serviced in mathematics when possible (usually 3–4 times a week for 30 min/session) because she (and Ms. Ridley) found that he benefited from smaller group interactions.

At the beginning of the year, Ms. Ridley described Timothy as limited as to what he could do and reticent to ask for help, and she attributed these characteristics to a cognitive disability. This is not surprising given that the Smiths pressed the school to recognize Timothy as having a disability; in other words, this was an available resource to understand the nature of Timothy’s participation in the classroom. In an interview in early October, Ms. Ridley described Timothy’s participation in math class as follows:

> [It’s] not that Timothy can’t do the work, it’s just that sometimes his disability sometimes can limit what he can do in my class. . . . He doesn’t ask for help . . . quickly. . . . I have to, like, coax it out of him. Like, “Are you sure you get this?” “Oh, I’m fine, I’m fine.” I’m just like, “No you’re not.” You know what I mean? “I know you need my help.” . . . [H]e can do the work. It’s more just like, he’s definitely not as ambitious. (INT, 10/4/05)

She established that Timothy’s disability “sometimes can limit what he can do,” but at the same time she acknowledged that he was capable of completing the mathematics problems she posed.

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However, over the course of the year, Ms. Ridley's explanations of *why* Timothy participated in particular ways as compared to his peers changed. She came to interpret a "lack of ambition" not as a function of any cognitive challenge but as a result of having been "coddled" at home. This identification was due at least in part to Timothy's family use of the Johnson telephone policy during homework time.

Attributing a Lack of Effort to Participation Patterns at Home. Timothy's family made use of the telephone in all of the subjects. As was illustrated in Homework Event 1, Timothy's family regularly encouraged him to call Ms. Ridley, and in some cases his parents called. I never observed an instance in which Ms. Ridley answered Timothy's phone call, so the descriptions I provide are based on what the Smiths and Ms. Ridley told me. In the beginning of the year, according to Lucille, Timothy called Ms. Ridley about once every 2 weeks, and she answered his calls. Occasionally, Mr. Smith used the "speaker" function on the phone so that Lucille, George, and Timothy could all hear Ms. Ridley's explanation. In addition, George often shared with Ms. Ridley what they had done to try to address the problem before calling her. He told her about his Internet searches. Ms. Ridley described these phone calls:

> The dad will make him call me a lot just for homework help. The parents will make him call and the dad will actually get on the phone and put him on the speakerphone. I hate that, oh god, you got to watch what you're saying. (INT, 3/29/06)

However, Ms. Ridley told me that the number of phone calls decreased as the year went on and that Timothy called her about three times per 10-week quarter.

In contrast, the Smiths said that they continued to encourage Timothy to call when he had a question, but Ms. Ridley (and Timothy's other teachers) rarely answered or returned their phone calls.

> Lucille: And then you call, and I'd say eight times out of ten, they don't call back. What were you doing today? What do you want us to do with the homework? You get a message and you don't get no call back. So you do your best. . . .
>
> George: Yeah [the principal says] "We do our best." Gotta do better, gotta do better.
>
> Lucille: Well, my thing was when they first offered that [cell phone numbers of teachers], as a helping hand, it sounded great.
>
> George: Sounded great.
>
> Lucille: Sounded great. And if you don't get feedback, and I'm here, waiting staying up until 10 or 11 o'clock waiting for that feedback . . . I call you at 7 and I'm giving you a couple of *hours* to call me back.

> . . . 'Cause I got a concern here that I'm trying to call you about with the work, and if he doesn't know, I don't know, then I need to know that, you say "find a way," then I'm trying to find a way, and that's your main slogan. "Find a way." You know, then what else are you to do? (INT, 4/6/07)

In addition to calling for help with math homework, the Smiths also contacted Ms. Ridley when they had questions regarding non-math-related events because she was Timothy's homeroom teacher. On at least two occasions, Mr. Smith drove to Johnson to find out why Timothy had to stay after school for a homework detention. In both cases, it was because the Smiths had forgotten to sign a homework assignment. They thought that it was unfair to Timothy to have to stay after school because they had made a mistake. Johnson staff did not waver, and it seemed likely that the Smiths' questioning of the school policy influenced how Timothy was positioned in the school as a whole, and particularly in Ms. Ridley's class.

At the end of March, Ms. Ridley said that she felt Timothy was "working a little harder" than he had in the past but she was unsure as to why. She described his parents as helpful and again characterized Timothy as able to complete the work. Ms. Ridley noted that she did not need to prod him to do as much and summarized these observations as an improved "work ethic."

> Timothy continues to work very hard. He is very fortunate, I think his father and his mother are very helpful with his homework. I will say, I feel like he's working a little harder than he was and I don't know why. I really don't know where that's coming from. For a while there, I would have to force him to do classwork. I don't feel like I'm in that same boat anymore. And it's kind of just been this gradual progression and I don't know if it's just because we've been in contact with the dad, or because he's finally realized, eight months later, that he can't just sit here and do nothing. I would say for him, it would be work ethic has improved with math.

However, in the same interview, although Ms. Ridley initially characterized his parents as helpful, she then described what she believed to be the root of Timothy's tendency not to put forth enough "effort"—being "babied at home." And, similar to Timothy's teacher at Maple, she described him as having a personality characteristic of a special education student.

> He pretty much understands, I'm not worried about his ability in math. I'm just more concerned about his effort level. . . . And I think Timothy is a little bit babied just based on the homework. And that can affect personality, if you're babied at home. And I think that's probably why he didn't fit in here at first, because none of the teachers here are going to baby a child. We're not gonna hold anybody's hand and he, I think, spent a lot of time either getting his hand held or he's used to it at home. It was kind of a negative clash. He's got some room to grow, but I do feel like,

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> Timothy isn't special ed, he's just speech, which is really easy to fix. . . . I don't even think he's low. He's just got this personality that's like special ed characteristic personality.

She then described how she imagined homework unfolded in the Smith home.

> To me, I don't even know if the speed is the disability, I feel like in a way it's like this baby thing. Like speed it up man. I don't know if it is a disability. I can visualize him doing homework at night and it taking 3 hours because he's just putzing. I don't think this child has a problem, I think this child has just been allowed to take his good old time on everything and then he comes into an environment like this where it's just not okay. We've had many run-ins with his dad complaining about stuff we're doing here. And it's like, you know, if you don't want to follow our rules, take him back to Maple. But you obviously want him here for a reason. So when we come up with something and we have a certain rule that you don't feel good about, our school works, we must be doing something right. I in a way feel like he's been mislabeled and not pushed because of his personality, and the stuttering too. I feel guilty sometimes, I call on him in class and he gets all anxious. But he's getting a little better. (INT, 3/29/06)

Similarly, in an interview on the last day of fifth grade, Ms. Ridley noted progress in terms of Timothy's participation across the school year. However, she described times when he did not participate, which she described as "not putting forth any effort." She then attributed this supposed lack of effort to his parents' behavior, which she described as "coddling."

> Like, he doesn't raise his hand. And the argument we make here is, he should be raising his hand whether he knows the answer or doesn't know the answer. So like regardless, your hand should be up. You should be ready to answer a question or you should be ready to ask one. And he never raises his hand. And then the dad will get upset because he [does not get report card points] for effort. Well he doesn't raise his hand. He's not putting forth any effort to answer my questions. He got a little bit better towards the end once we talked to his parents, but not enough to really make up for the fact that the first few marking periods [he was] nonexistent. You wouldn't even know if he was slumped over and died, just because he didn't make any kind of moves. And that's hard. You put him with a partner and the partner's ready to strangle his neck because he's not really doing anything. He needs, he needs a fire under his butt. Some kind of umph to like push him and he doesn't have that. I think his parents try to do everything for him. It's sort of got to come from within. There's only so much we can do without doing it for him, and then that's part of the problem. He's been coddled for so long. (INT, 6/12/06)

What I have shared here came out of private conversations that I had with Ms. Ridley. However, on a few occasions she also publicly identified Timothy's family as overly involved in his work in conjunction with identifying Timothy as using unsanctioned resources to complete homework. For example, in late February,

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Timothy asked a question in class related to his homework from the night before, and Ms. Ridley responded, “What, did your dad tell you that? Did you look it up on the Internet? Tell your dad to use the [notes you copied in class]” (FN, 2/28/06).

Summary of Timothy’s Social Identification in the Classroom. Ms. Ridley’s description of Timothy’s behaviors in the classroom (completing work more slowly than his classmates, being reluctant to raise his hand or to ask for assistance) was consistent with my observations of Timothy. Her description of *why* he exhibited those behaviors in class, particularly her description of his parents’ involvement with Timothy, was inconsistent with my observations and the analysis of homework events provided previously.

I have provided a detailed analysis of Timothy’s difficulty in participating in the mathematics classroom elsewhere (Jackson, 2009). In short, I argue that Ms. Ridley’s interpretation of Timothy’s behaviors in the classroom have to be understood in relation to what was valued in the classroom socially and mathematically. The behaviors Ms. Ridley lamented in Timothy were only visible against a particular set of norms and practices. As McDermott (1993) suggests, “An identical cognitive absence can be interpreted different ways depending on the scene” (p. 290). The scene of Ms. Ridley’s math class emphasized speed, and Timothy was generally not quick in solving mathematics problems in school or elsewhere.

To the point of this article, the preceding analysis illustrates that Timothy’s social identification in the classroom was produced not only in the classroom but also via Ms. Ridley’s interpretation of the Smith family’s involvement in Timothy’s schooling at home, practices with which she had minimal direct contact. A novel contribution of this study is that I was in a position to contrast Ms. Ridley’s account with my own observations of what happened in Timothy’s home. It is typical that either individuals’ accounts of what happens outside the setting of interest are ignored, or evidence is not available to verify the relative veracity of such accounts. The account I provided raised questions about the extent to which Ms. Ridley’s account accurately characterized the general character of the support the Smiths provided to Timothy. I return to the potential role of these types of data (e.g., accounts of youth pursuing school-based mathematics, or other activities, across settings) in the next section.

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PARTICIPATING IN SCHOOL-BASED MATHEMATICS AS A CROSS-SETTING PHENOMENON

From the point of view of the mathematics education research community, the nature of what Timothy was expected to do in the Johnson mathematics classroom was limited in that it was at best aimed at developing a procedural understanding of mathematics (National Council of Teachers of Mathematics, 2000). One could then reasonably ask what we as researchers gain by studying a youth's participation in a classroom that is not aimed at challenging and supporting youth to develop significant understandings of mathematics. My response is twofold.

First, although there are aspects of instruction unique to the Johnson curriculum (e.g., conventions like grocery shopping for factors), in many ways the goal of instruction in Ms. Ridley's classroom is representative of the majority of mathematics classrooms across the United States, in which routine problems are intended to be solved by reproducing a set of given procedures (Stigler & Hiebert, 1999). Most classrooms are not aimed at developing sophisticated understandings of mathematics that many mathematics educators, myself included, support.

I do not ascribe to the view that one cannot still learn from research in classrooms aimed at different learning goals than those articulated in, for example, the National Council of Teachers of Mathematics (2000) *Principles and Standards for School Mathematics*. Whether it is fruitful to research in such classrooms depends upon the goal of the research. In the analysis presented here, my goal was to understand and document the complexity involved in participating in school mathematics, which in Timothy's case involved negotiating an extremely narrow view of what mathematical activity involved across at least two settings (the classroom and home).

Second, it is worth remembering that Johnson Middle School (and its associated network of charter schools, which are located around the country) was designed to explicitly serve youth of color from economically disadvantaged backgrounds. Its mission was to provide access to higher education for youth that have been historically underserved by neighborhood public schools. School leaders and teachers designed curricula, pedagogy, and procedures (including consequences) regarding the completion of homework and parental involvement that they believed would result in students' access to higher education. In this article, I do not focus on the Johnson mathematics curriculum or pedagogy and its relationship to access to higher education (see Jackson, 2009, for considerations of those aspects of participating in mathematics at Johnson). However, I do view this analysis as contributing to important conversations about designing for the coordination of schooling across settings, particularly in the context of improving educational experiences and outcomes for historically disadvantaged groups of students.

Keeping both of these points in mind, I now highlight two related issues that emerged from approaching participation in school-based mathematics as a cross-setting phenomenon: the complex work involved for Timothy (and his family) to accomplish school-based mathematics and teachers' recruitment of limited understandings of homes to explain classroom behaviors.

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The Complexity of Participating in Schooling

Participation in any event involves a complex coordination of individuals, conceptual resources, tools, norms of participation, and so forth. Sociocultural accounts of learning mathematics in the classroom certainly have conveyed the complexity involved in participating in school mathematics. Understandably so, these accounts have often been limited to tracing individuals' participation in the focal activity in the classroom. This study was in a position to also highlight the fact that part of the complexity of coming to participate in school mathematics (and hence learning mathematics in the context of schooling) involves negotiating transitions between the classroom and home that, as Beach (1999) suggests, are not straightforward.

This analysis shows that in addition to literally pursuing school-based work across settings, individuals recruited resources from past (and imagined) events in alternative settings to solve or explain problems in the immediate setting. For example, in both settings described (Timothy's home and fifth-grade mathematics classroom), individuals drew from resources that were related to participation in alternative settings to shape possibilities in the immediate setting. Lucille drew from her participation in the after-school program to contribute to solving a homework problem. Timothy melded together strategies from fourth-grade mathematics at Maple and fifth-grade mathematics at Johnson to solve a problem at Johnson. George turned to an Internet site as he puzzled over his son's homework problem. Participating in school-based mathematics, and presumably participating in other activities, is a cross-setting phenomenon because it involves links to participation in a past activity that may or may not have been situated in a similar setting (cf. Dreier, 2008).

Sociocultural accounts of learning to participate in some activity (including school mathematics) have tended, for good reasons, to focus on the trajectories of successful individuals or of a successful group of individuals (e.g., Boaler, 1999; Cobb et al., 2001; Lave & Wenger, 1991). This analysis also illustrates the complex work involved in maintaining a peripheral position in relation to some activity. Timothy's positioning as a peripheral member of the classroom did not mean that he did not try to become a more central participant in the classroom—he completed all of his work in class, raised his hand in the classroom (albeit a few seconds after the majority of his peers), and answered questions when called upon. However, the quality and inflexibility of the participation structure of the classroom meant that he struggled to participate in, rather than was supported to participate in, the practices of the classroom.

When examining homework time at the Smiths, it was clear to me that his family supported Timothy's participation in completing mathematics work that originated in school. Although there is not evidence that he learned mathematics per se, there is evidence that with some rearranging of the situation, Timothy was

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able to participate in and accomplish school-based mathematics when he was at home. However, I found no evidence that the apparently productive work in the home positively influenced Timothy's positioning in the classroom.

Studies of mismatch have attempted to account for individuals' experiences of discontinuity across settings, and in particular their struggles in classrooms. This is especially true for those who are members of historically disadvantaged groups of students. However, as suggested in the critiques of mismatch accounts offered at the beginning of this article, accounts of mismatch portray different settings as rather static containers with predictable norms, practices, and ways of participating.

This analysis illustrates that the classroom and particularly Timothy's home were not isolated containers of activity. Instead, what happened in one event in one setting impinged upon a subsequent event in another setting and so forth and sometimes (but not always) resulted in changes in activity. This is another way in which accomplishing school-based mathematics can be understood as a cross-setting phenomenon. For example, "homework time" at the Smiths was altered in fifth grade given the heavy weight that was placed on complete and accurate homework at Johnson. In addition, Ms. Ridley's emerging social identity of Timothy as someone who was "coddled at home" and therefore unmotivated in the classroom was based largely on the few times that Ms. Ridley spoke with the Smith family concerning homework. Ms. Ridley's account of what happened in Timothy's home then influenced how she positioned Timothy in the classroom.

Recruiting (Limited) Understandings of Homes to Explain Classroom Behaviors

The case of Timothy is perturbing, as it provides evidence of a teacher recruiting a limited and partial understanding of how his family arranged for his learning in support of a thesis regarding why he did not perform as she would have hoped in the classroom. One could treat the discrepancies between Ms. Ridley's account and the account I provided of the learning arrangements in Timothy's home as simply a case of a teacher constructing an inaccurate account of a child's parents' involvement given her limited access to what happened in the Smith household (aside from participating in homework phone calls). However, in my view, this case raises an important issue regarding how teachers make sense of students who appear to struggle in the schooling context.

The work of Horn (2007) is relevant to this point. Horn studied teacher conversations in high school mathematics department meetings, and in particular how teachers framed the problem of struggling students in relation to their views of mathematics. She suggests that different framings of the problem have different implications for what the teacher might do to address the problem of struggling students. Teachers who framed the problem as related to an inherent trait of the student (e.g., the student is unmotivated) were less likely to then consider what they might do instructionally to support the student's participation in the classroom. In contrast, teachers who framed the problem of a struggling student in terms of a relation between the student and classroom activity were more likely to consider instructional alternatives.

The evolving explanations Ms. Ridley offered for Timothy's struggles were ones that constructed something (or someone) other than the norms and practices in the classroom (and the school at large) as responsible for what she termed his "lack of effort." The nature of the explanations made it unlikely that Ms. Ridley would have considered what she might do differently to support Timothy's participation in the classroom. (It is arguable that had Ms. Ridley maintained the cognitive disability explanation, she might have sought additional support for Timothy from special education services.)

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CONCLUSION

I have provided an empirical account that illustrates the cross-setting nature of participating in and accomplishing the work of school-based mathematics in two ways. First, I illustrated how accomplishing school-based mathematics literally extended into the home and how individuals recruited resources from their histories of participation in alternative settings to accomplish the work of school-based mathematics. Second, I showed how a youth's social identification in the classroom was shaped by his teacher's partial accounts of how learning was arranged for in his home. Timothy's lack of success in fifth-grade mathematics was not just produced in the classroom; it included a complex movement between the classroom and home that resulted in little change in the extent to which he could participate successfully in the classroom. I suggest that this work has implications for two areas of educational research and practice—research on participation (and hence learning) and how to coordinate activity between the school and home.

Theories of learning and how to support youth's learning (in mathematics, but perhaps in other areas as well) could benefit from empirical accounts of participation and learning that privilege understanding transitions across recurrent and disparate events that may be located in disparate settings. Of course, the nature of the transitions one might investigate depends on the nature of the phenomenon of interest. In this case, the classroom and home were important sites for Timothy's participation in and accomplishment of school-based mathematics. As illustrated in the case of Timothy, pursuing a particular activity (e.g., school-based mathematics) often requires and is consequentially shaped by activity that occurs in similar and disparate settings. Accounts of participation (and learning) that focus on individuals' activity in recurrent events in one setting (e.g., the classroom) are

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not necessarily positioned to capture the complex negotiation entailed in achieving success, failure, or otherwise in that setting.

As I noted at the beginning of this article, limited research has taken following the accomplishment of school-based mathematics, or other activities, across settings as an explicit object of study (Stevens et al., 2005). In Timothy's case, transitioning across home and school was not seamless, and the goals of mathematical learning as dictated by Johnson Middle School were limited. It would be worth researching cases in which transitioning is more seamless and in which the learning goals are ambitious.

What does the case of Timothy suggest regarding the issue of coordinating schooling across settings, particularly in schools that serve historically disadvantaged groups of students? A prominent response in educational research and practice to the problem of struggling students and/or failure is to suggest mechanisms by which parents can get "involved" in the work of the school (e.g., Jeynes, 2005). An underlying assumption of many of these calls for "involvement" is that youth who struggle do so because their families are somehow deficient (Valencia & Solórzano, 1997).

Johnson Middle School implemented policies that required parent involvement, and by many accounts it was a school in which parents were visibly active and involved in the schooling of their children. However, as was illustrated in the homework events, Timothy's family arranged for his learning with minimal support to coordinate what they did at home with what Timothy did at school. If the cell phone policy had been more strictly adhered to (i.e., if teachers had responded to the Smiths' phone calls for assistance), one could imagine that the teacher might have played a brokering role of sorts. For example, it would have been useful for Ms. Ridley to clarify directions in the homework assignment discussed in Homework Event 1. However, as it was, Timothy's family assembled a variety of resources to assist him to solve problems, hardly any of which were provided by the school. Although Timothy's family seemed very willing to do all they could to assemble resources, it may not be reasonable to expect all families of struggling students to do the same. At the same time, though, given the rather limited mathematical goals evident at Johnson, there is a tension involved in suggesting that schools coordinate more explicitly with the work of home. In this case, attempts to design for coordination across settings might have resulted in an emphasis on speed and applications of procedures in homes, which could have detracted from some of the productive work that I identified in how Timothy's learning was arranged for in his home.[5]

Instead, I am suggesting that the work of coordinating school-based activity across school and home might be better focused on how to work with teachers and school leaders to problematize explanations of student failure that attribute

[5] Kevin Crowley suggested this point in his useful comments on a previous draft of the manuscript.

fault to the child, the child's family, and/or other factors. In other words, how can teachers and school leaders be supported to shift what Horn (2007) calls the "problem space" of failure in school mathematics? How can teachers be supported to view student performance as a relation between the student and what the student is supported to do in the context of the classroom (cf. Horn, 2007)?

At present, there are limited accounts of how caregivers organize and arrange for students to accomplish school-based activity outside of school. This analysis provides evidence that, at least in the case of Timothy, caregivers (including those with arguably weak content knowledge) can be significant resources in the academic lives of students. One possible contribution of accounts like these could be the creation of empirically grounded stories that could be used in professional development contexts to challenge and support shifts in explanations for why youth struggle to participate, including how caregivers are conceptualized in relation to struggling youth.

I worry, though, that academic discussions like these can potentially romanticize the possibilities for connections between families and schools. The analysis provided here illustrates one important version of reality—that even when families productively organize for their children's learning, they might still be viewed as deficient. The work of future research, in my view, is to make visible the various types of work that caregivers do to facilitate the accomplishment of school-based mathematics in coordination with teachers to consider how aspects of the classroom activity system can be altered to support struggling students.

In summary, I have argued for a conception of accomplishing school-based mathematics as a cross-setting phenomenon in which work is accomplished across trajectories of events, some of which are located in disparate settings (particularly home and school, but arguably others). Taking this stance suggests the usefulness of tracing individuals (in interaction with resources and other individuals) as they pursue related work across events that occur in recurrent and disparate events and in similar and distinct settings. To be clear, I am not claiming that accounts that focus on individuals participating in mathematical work, for example, in one setting (e.g., a classroom) are not valuable. As long as those accounts presume that individuals *and* activity settings change over time (i.e., as long as they do not assume that settings and practices are static), such accounts can continue to enrich our understanding of how individuals can be supported to learn particular content and develop social identities with respect to a discipline.

However, it is worth considering two apparently endemic aspects of participating in school-based activity. First, individuals pursue school-based work across settings on a daily basis (partly because institutions often require it). Second, the resources people recruit and use to solve problems (i.e., explaining why a student is failing a class, solving a mathematics problem) are not bounded by settings. Thus, if experts are to understand the nature of participation and thereby design for substantial opportunities to learn, it is useful to develop accounts of learning

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that are informed by the pathways that individuals take within and across settings as they attempt to accomplish a particular type of work.

ACKNOWLEDGMENTS

I would like to thank Kevin Crowley, Reed Stevens, Stanton Wortham, and two anonymous reviewers for providing extremely useful feedback on previous versions of this manuscript. This material is based upon dissertation work supported by National Science Foundation Grant ESI-033753. Any opinions, findings, conclusions, or recommendations are my own and do not necessarily reflect the views of the National Science Foundation. A previous version of this manuscript was presented at the Ethnography Forum (Philadelphia, PA) in February 2008 and at the American Educational Research Association Annual Meeting (New York, NY) in April 2008.

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