The Kids Inquiry Conference: Tensions in Literacy Activities, Practices, and Actions across Elementary-Level Spaces for Student-Driven Inquiry

by

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TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

Dedications

Everyone who has completed a dissertation knows that it doesn’t happen in isolation. This is not a journey we go on alone. In addition to the teachers and students whose partnership and ingenuity made this research possible, I dedicate this work to:

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“Well, the world is exhausted and the wreckage is all around
But the arc of your life could still be profound.”
(Wilson, 2017)
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Tensions in guiding writing

Tensions in guiding design of students final presentations

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Abstract

This exploratory case study aims to better understand the interactions between and literacy activities, practices, and actions of fifth-grade students, their teachers, and learning environments during a student-directed extended inquiry unit (the Kids Inquiry Conference – KIC) where students propose their own topics to be researched. This study details how inquiry as cultural activity unfolded over time and across spaces within the school (i.e. the fifth-grade classroom, library, etc.). The goal is to understand how enactment of inquiry as a cultural activity – including the repertoires of practice, spatial arrangements, and materials in interaction with participants – both fits into and creates tensions within the larger school context and culture.

This study is rooted conceptually in cultural-historical activity theory; Deweyan perspectives about experience, authenticity in learning, and inquiry; assumptions about literacy (i.e., meaning-making) that assert the multimodal, embodied, spatial, and material nature of interaction and meaning-making; as well as assumptions about the persistent entrenchment of school culture in neoliberalism and back-to-basics teaching and learning. Importantly, this research emphasizes inquiry from a literacy and design standpoint rather than the more common stance foregrounding scientific principles and processes.

Observational data of participants (i.e., students and teachers) was collected over the three-and-a-half months long KIC project (i.e., audio, video, researcher field notes, artifacts). Interviews were collected from participating teachers, students, and administrators. Data analyses included: domain and taxonomic analysis; multimodal/spatial interactional analysis; descriptive coding of activity systems; and multimodal discourse analysis. Two activity systems were extensively decomposed and analyzed for their interrelationships and tensions: 1) KIC project pedagogy and guidance and 2) KIC project learning and doing.

Major themes and tensions revealed in the activity systems under analysis include: a) supporting agency of students’ bodies during inquiry learning; b) balancing students’ access to resources during inquiry; c) open student choice, widened access to resources, and text readability; d) honoring and pedagogically supporting student choices in inquiry; e) student purposes for inquiry learning in schools; f) teacher purposes for inquiry learning in schools; and g) the socioemotional supports of inquiry learning.
CHAPTER ONE:
INTRODUCTION

"There is, I think, no point in the philosophy of progressive education which is sounder than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process, just as there is no defect in traditional education greater than its failure to secure the active cooperation of the pupil in construction of the purposes involved in his studying” (Dewey, 1938a, p. 67)

John Dewey wrote these words nearly eighty years ago, arguing that the institution of education as it stood then misunderstood what it meant for individuals to learn in schools. He implored to teachers that the foundation of a child’s education was prior experience, and that for children to learn best, future educative experiences ought to be rooted in their lived histories. Experience helps to spark that initial desire to know more; it then forms into authentic purpose through guidance, and ideally ignites interest in that child – leading him or her to question, investigate, and want to explore further. Dewey wrote extensively about inquiry, espousing that “problems are the stimulus to thinking,” (Dewey, 1938a, p. 79) and that engaging with such ill-structured problems – ones with multiple pathways to different truths and perspectives – is learning, with the teacher’s role as that of a guide or scaffold. Dewey’s pragmatism and theories about democratic education underpin many of the foundational assumptions of what it means to learn and teach in a society which touts values associated both with personal freedoms as well as the greater good – thinking for oneself, open-mindedness, and making decisions based on given information and prior knowledge.

Yet, the institution of United States education remains ensnared in a “culture of correct answers” (Lantolf, 2007, p. 366), historically perpetuated by a narrow view of what are considered to be acceptable ways of learning and teaching (Stedman, 2011). This
culture of correct answers\(^1\) is one fostered by the social force and narrative of the failing school system leading to students’ generalized poor achievement. However, traditional rote methods of teaching and learning are described as a persistent social force as “the historical deep structure of schooling: assembly-line teaching, encyclopedic curricula, test-based accountability, and impersonal institutions. Textbooks and chalk-and-talk methods have dominated teaching for over a century (Stedman, 2011, p. 5).”

**Neoliberalism in Public Education**

This is further exacerbated considering the entanglement of U.S. public education in neoliberal value systems (Apple, 2000; Stedman, 2011). In neoliberal conditions, institutions both public and private attempt to overlay corporate models of easily measureable efficiency, accountability, and productivity onto the messy, relatively unpredictable, variable, and human endeavor that is education. As such, there is a considerable disconnect between what experts in learning and teaching (i.e., teachers and educational researchers) deem to be good pedagogical practice for their students and what policymakers compel as “scientifically-based” practices. Competition is also fostered as a core value. Saltman (2014) writes that

> Neoliberal ideology sees education not as a public good ideally serving a democratic society but as a private good primarily useful for preparing workers and consumers for the economy. . . The individual should understand him- or herself foremost as an economic actor competing against others for scarce resources. Within this view, schooling should be oriented toward educational competition in preparation for

\(^1\) Throughout this study, this concept will also be referred to as school culture and/or the culture of schooling.
economic competition, initially against others in the nation and then for competition against other nations (p. 251).

This is further exacerbated by the linkage between competition as a purpose for learning, curriculum, high-stakes assessments, and common standards - the state-wide adoption of which were at one time specifically tied for bids to increased federal funding, as in the case of Race to the Top (Duncan, 2009; Hollar, 2017; Stedman, 2011).

**The achievement gap.** In policy documents, such practices and curricula are promoted under the idea that all children should “have a fair, equal, and significant opportunity to obtain a high-quality education” in the effort to close the achievement gap (No Child Left Behind [NCLB], 2002, Sec. 1001). While the sentiment to provide children such an opportunity would appear to be aligned with the notion of basic education as a fundamental right, there are two fallacious assumptions undergirding this agenda. First, the gap is not simply one of achievement (Stedman, 2011; Saltman, 2014), and second, such gaps cannot simply be closed by providing instruction of uniform content through the same “scientifically-based” pedagogical vehicles assessed by performance on a single assessment. Providing children with access to the same information in the same way (and holding teachers to such strict parameters) is insufficient (Gee, 2004). Furthermore, this achievement gap has been used to legitimize the narrative of failing schools for the purposes of privatization (Hollar, 2017; Stedman, 2011; Saltman, 2014). Saltman (2014) writes that as neighborhood schools determined to be failing on standardized assessments close, private industry “has positioned education in the United States as a roughly $600 billion per year industry, ripe for takeover” (p. 251). Various gaps in students’ achievement have persisted throughout educational history in one way or another (Stedman, 2011). The
reasons for these are multifaceted, evolving, and more complicated than what is let on by the narrative that schools are failing children based on the narrow measure of a single test score (and subsequently, that privatizing education is the answer).

The reality is that we cannot address any gaps in achievement until we first recognize the gap in experience. There is an “opportunity to learn gap” for children in their educational experiences and background knowledge, particularly as related to standardized assessments, didactic teaching styles, and the culture of school (Gee, 2003, 2008; Hilliard, 2003). Having equivalent opportunities to learn means that children are not only accessing the same content, but they also have equivalent embodied and dialogic experiences with the same social practices, semiotic domains, and social languages (Gee, 2003; 2008). A feat like this would be next to impossible since each child’s set of experiences in this world is entirely unique with respect to these factors. This highlights an ongoing tension in schools today between achievement of “prepared forms of skill” (Dewey, 1938a, p. 18) and authentic learning grounded in the experiences of children.

And yet, this tension is where teachers must operate with their students on a regular basis. How do teachers - those who strive to uphold Deweyan principles of learning through experience and inquiry - navigate the world of one-size-fits-all curricula, mass standardization, and an overwhelming pressure to get the right answer in the effort to create meaningful learning opportunities for their students? It is within this tension and with such a question that the story of this study begins.

The Story

This research began as many projects do – as a seed planted in conversation between two colleagues who, over time, realized they have overlapping questions from
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different perspectives. In this case, the perspectives hail from that of a library media specialist in an elementary school (Michelle\textsuperscript{2}) and a doctoral student who was once an elementary school teacher (myself). Over almost three years on a different project, Michelle and I became close through our conversations and shared experiences, finding in each other a sort of kindred spirit regarding our approaches to how children learn and ways to best support that learning as an educator.

The seed was initially sowed in fall of 2016, when we started talking about the importance of space in learning, especially when students are engaged in self-selected inquiry projects and research. In such projects, students were given opportunities to make choices about what they would like to learn, how they would like to go about learning it, as well as how they would demonstrate what they had learned. Such inquiry projects would be a way for students to take ownership of their own learning through their own curiosities rather than set of topics to learn about in a given subject area prescribed by standards or a teacher. How could the physical learning environment – that is, space and materials – be leveraged to help students learn in such self-directed projects?

It just so happened that I had recently taken a course in which I delved into spatial-temporal perspectives about literacies and learning. Michelle had also recently met with her superintendent, who had encouraged her to think about ways she could redesign her library space to better support her students and teaching practices. Michelle believed that as children’s relationships with technologies and other tools and/or materials for learning and research change, it would make sense that their space ought to, as well. As such, Michelle wanted to better understand how students specifically used the library space and

\textsuperscript{2} All teacher and student participant names used in this research are pseudonyms.
its materials to support their inquiry learning. She wondered about how students interacted with places, objects, and others in her classroom beyond what she was observing in her own daily practice, or if perhaps if there were some aspects of the learning environment that were being ignored. Michelle felt that this knowledge would provide her with more ideas about how she might improve her space to support her students’ inquiry practices. I mentioned that this was something I was interested in exploring productively along with her, especially since my research interests intersected with her own wonderings, particularly those dealing with how space, objects, and their arrangement shape student learning experiences.

This seed idea of coming to understand how space and materials impact student-directed inquiry projects was nurtured by another important aspect of Michelle’s teacher practice – her work with classroom teachers during the school day. Michelle worked with classroom teachers and their students to support these extended, student-driven inquiry projects during the school day and throughout the school year, rotating throughout grade levels and pushing into their classes for weeks at a time. Despite the more rigid literacy and math curricula adopted by her school district, Michelle was working with classroom teachers to find substantial amounts of time for children to dedicate to asking their questions, doing extensive research based on their interests, and crafting full presentations on the results of their inquiry. This was happening at the local level in a suburban school with a linguistically, economically, racially, and academically diverse group of learners. Further, it was happening at multiple grade levels with classroom teachers, with more and more teachers getting on board with student-driven inquiry each year. Such inquiries were constructed as interdisciplinary. I had observed all of this in action, despite a stubborn,
neoliberal, macro-level school culture of correct answers, didactic forms of learning, and standardized assessments reigning supreme. Teachers at Legacy Elementary specifically commented on the prescriptive and developmentally inappropriate reading curricula and the damaging nature of standardized assessments, particularly for the large proportion of students learning English as a new language who were forced to sit through high-stakes tests largely unintelligible to them for extended periods of time. Over time spent at Legacy Elementary, I noticed the ways in which Michelle leveraged her flexible position as a library media specialist to not only provide resources and supports for teachers who endeavored to move beyond prescriptive kinds of instruction (e.g., modules, worksheets) but to actually learn through authentic, purposeful questioning and investigation rooted in student interest.

It became clear to me, after working with Michelle during this time in 2016, that she actively played a substantial role in creating and sustaining a culture of inquiry with students and teachers throughout the school, securing support from administrators as well as students’ families along the way. Recognizing the richness of the spaces and practices that Michelle has helped to create and sustain in her school, a new partnership began to blossom: I would observe her classroom as well as the classroom of two fifth-grade classroom teachers and their students, providing them with an analysis of usage of the library space and materials throughout the inquiry projects (Chapter 4), so Michelle and classroom teachers could better inform her ideas about improving her classroom space. In turn, the story of this inquiry project as an activity system – its space, people, things, and literacy practices (Chapter 5 and 6) – would become my dissertation.
Purpose and Research Questions

The purpose of this exploratory study aims to better understand the interactions between and literacy practices of the fifth-grade students, their teachers, and learning environments during an extended inquiry unit culminating in a conference-type event for all fifth-graders in the school district (i.e., the KIC project). This research is undertaken in the effort to detail how inquiry as cultural activity unfolds over time and across spaces within the school (i.e., the fifth-grade classroom, library, etc.). The aim is to also better understand how this enactment of inquiry as a cultural activity both fits into and creates tensions within the larger school context and culture. The questions undergirding this research are:

1. What are the literacy practices enacted across interactions between people (i.e., students, teachers) and materials (i.e., tools, technologies physical materials, curriculum) during the fifth-grade inquiry unit?
2. How does the built environment (i.e., design and use of classroom spaces) support these literacy practices during the fifth-grade inquiry unit?
3. What are the relationships between enacted inquiry as carried out through the literacy practices, built environment, and broader institutional contexts?

Definitions and Epistemological Stances

What is inquiry? This research focused on inquiry will operationalize Dewey’s (1938b) definition of inquiry, expressed in his Logic: Theory of Inquiry as the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole. (p. 104-105)
In unpacking this definition, Dewey imparts that inquiry becomes useful in situations where one’s prior expectation and current experience are held in tension. As such, inquiry begins with an ill-defined problem, project, or question of some sort – “an indeterminate situation.” The “transformation” occurs through the directed exploration of this problem, project, or question. Through processes of inquiry - including observation, concept-building, and continuous reflection on new and prior experiences - solutions, artifacts, and answers are surfaced, and what was once an indeterminate situation becomes part of a more unified knowledge base, creating space within an existing and ever-expanding network of understandings. As such, inquiry learning is rooted in the experiences and background knowledge of the learner.

Dewey expands on what makes for an educative experience. Dewey takes this up in *Experience and Education* (1938a), highlighting the authentic, problem-posing, continuous, interactive, reflective, and embodied aspects of an educative experience. Since then, others theorists and researchers have added their own expertise to these qualities of educative experience exemplified by Dewey. Taken together with inquiry, these ideas can be used as a theoretical lens through which to consider and analyze teaching and learning.

**What are literacy practices?** Much in the same way that Street (1984; 2003) argued that literacy is a social practice, ideological in nature, and culturally-situated, this research assumes there are specific social practices for meaning-making inherent to activity systems in which inquiry is enacted in these spaces. I elect to use the term *literacy practices* to describe these specific social practices. While the term literacy practices implies a privileging of linguistic signs (i.e., spoken and written word) through interactions of reading, writing, listening, and speaking, I endeavor to open my analysis to assume
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literacy to include a wider scope of the building blocks of meaning to include bodies, visuals, and objects as well as language – and the interactions occurring between these. In such interactional analysis, the smallest unit of analysis is mediated action (Norris, 2004; Werstch, 1998), and meaning is constructed interactionally from visual (e.g., images, print text, film), bodily (e.g., gaze, gesture, haptics, action, proxemics, facial expression), aural (e.g., spoken word, music, ambient sounds) and other sensory signs as they unfold over time in space together. These mediated actions can add up to create the “regular or recurring patterns of activity” (Greeno & Engeström, 2014, p. 128) which are literacy practices occurring within activity systems. Activity systems are larger units of analysis which consider not only the individual and their mediated actions but also their experiences, other participants, objects of learning, tools, as well as cultural practices of the environment as a whole (Greeno & Engeström, 2014; Jornet, Roth, & Krange, 2016).

**Literacy practices, activity systems and context.** In terms of literacy practices, I will be striving to understand how these and their associated pedagogical practices work together to constitute literacy activities within larger activity systems representative of the inquiry project under study (KIC project). I have defined two main activity systems under study (i.e., KIC project pedagogy and guiding; KIC project learning and doing). From there, I identified larger literacy activities that comprised this project around four main literacy goals of the KIC project: 1) doing research; 2) writing an article; 3) creating a visual presentation; and 4) giving an oral presentation for each activity system. At that point, my analysis of observational data over the length of the KIC project as well as curricular documents informing its enactment informed my identification of literacy practices and their smaller actions which make them up over the course of the KIC project. How the
actions that added up to create these broader literacy practices of production and reading are described in detail in Chapters 5 and 6.

The cultural-situatedness of literacy and learning within an activity system is central to this research, as the goal is to understand not only the practices of this space by teachers and students, but also to uncover how these have evolved and been sustained over time. As such, it becomes deeply important to not treat the school site and classrooms as “context” to be backgrounded but rather positioning this context as a central component of this research. Context here must move beyond the container metaphor to also include participants’ movement within, across, and out of these school spaces (Leander, Phillips, & Taylor, 2010), as well as the repertoires of social practice and experiences (Gutiérrez & Rogoff, 2003) that participants take with them across multiple activity systems with which they engage in and learn from regularly (Vossoughi & Gutiérrez, 2010). Time is also implicated in the study of activity systems, as the patterning identified over shorter timescales (i.e., while analyzing mediated action) will necessarily relate to longer timescales within that space (i.e., while analyzing instantiations of practice in activity systems or the activity systems themselves) (Lemke, 2000).

Extending beyond the local, these aforementioned activity systems are further embedded in larger cultural structures which operate at the institutional and societal levels (Engeström, 2005). It becomes critical to widen the scope or “circumference” of analysis (Werstch, 1998) to consider these institutions (e.g., the institution of education at the state and federal levels) and society (e.g., widespread perceptions of education) in order to better comprehend the historical nature of mediated actions and activity systems rooted within these larger cultural schemes. In analysis, there is a recursive relationship between
“the analysis of individual actions to the analysis of their broader activity context and back and again” (Engeström, 2005, p. 32), engaging the dialectical relationship between the local and the global.

**What are texts?** Given that meaning-making during inquiry projects is the matter under study, it is important to define assumptions around the nature of texts. Texts, in this research, are defined as anything intentionally composed, constructed, or found by persons at some point in time. This includes the traditional notion of texts, which are rooted in language and contain the written word (i.e., print text, like books, articles, notes, anchor charts). However, texts here are assumed to include the multimodal and embodied, which will be further elaborated upon in Chapter 2. Briefly, I will explain how these inform my expanded definition of text in the Kids Inquiry Conference project under study here.

**Texts are multimodal.** From the view of multimodal social semiotics, texts are created by the interweaving of modally diverse “threads” that are constructed in a given social context with culturally available resources (Kress, 2010, p. 207). These threads are embodied by different modes, all of which communicate meaning in distinctly different ways, yet come together purposefully to create a unified text. These texts are made coherent through socially constructed principles of cohesion within the given context. Multimodal texts can foreground one mode and medium, such as: videos on YouTube, images such as graphs or photos. Multimodal texts can also include an orchestration of multiple modes interacting together at different times. In a students’ presentation viewed as a multimodal text, for example, there can be visual modalities present (i.e., photos and videos), linguistic modalities (i.e., speech and writing), as well as object-oriented modalities (i.e., a demonstration of the science concept).
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**Texts are embodied.** Tightly interwoven with multimodal texts, it is assumed that bodies in interaction are also able to be read and interpreted. While they might not be announced and delineated sharply as “texts” throughout the findings, bodies are sites of meaning-making is a concept that underpins this research. Actions and emotions are enacted through the body and can be used to help contextualize and interpret what is meant. For example, when teachers teach a minilesson or students give a presentation, actions (e.g., gestures, proximity, and object-handling) and emotions (e.g., also denoted by changes in prosody, demeanor, facial expression), such information is made apparent upon individuals’ bodies that can be used to inform meaning-making (Siegel, 2016). This works in tandem with other sources of information to create a multilayered, multimodal and embodied text.
CHAPTER TWO:
LITERATURE REVIEW AND THEORETICAL FRAMEWORK

In this section, I begin by highlighting the body of literature pertaining to inquiry learning, its spaces, as well as its practices with elementary age students, identifying and highlighting gaps in the research that this study aims to fill. Then, I will discuss the conceptual approaches I will use to understand learning and its practices unfolding over time – Dewey’s educative experiences and cultural-historical activity theory. Finally, I will further clarify my theoretical stances and assumptions about meaning-making in inquiry spaces from multimodal and embodied, spatiotemporal, as well as material perspectives.

Understanding Inquiry Learning and Pedagogy

Kinds of inquiry. Since Dewey’s (1938b) writings on the subject, inquiry learning has been operationalized in myriad ways in schools. Figure 2.1 below reveals a continuum of the kinds of inquiry which are commonly described within literature surrounding the subject of student inquiry learning (Colburn, 2008; Jones & Eick, 2007; Martin-Hansen, 2001). While research about student-focused inquiry at the elementary level generally falls under the subject area of science (e.g., Amaral, Garrison, & Klentschy, 2002; Dunlop, Compton, Clarke, McKelvey-Martin, 2015; Hampton & Rodriguez, 2001), it also can be associated with children’s literature (Laman, 2006; Moses, Serafini, & Loyd, 2016), social sciences (Shih, Chuang, & Hwang, 2010) and mathematics (Meletiou-Mavrotheris & Paparistodemou, 2015). This research aims to study students and teachers engaged with inquiry learning at the less teacher-directed end of the continuum, such as coupled or open
forms of inquiry, that take place during the science block of the school day (Figure 2.1).

Figure 2.1. Kinds of inquiry.

**Processes of inquiry.** The processes of inquiry are already well-documented and tend to be described in steps, phases, or lists of practices (Dunlop et al., 2015; Löfgren, Schoultz, Hultman, & Björklund, 2013; Pine, Aschbacher, & Roth, 2006; Wu & Hsieh, 2006; Zhai, Jocz, & Tan, 2014). These syntheses of inquiry practices tend to hail from other inquiry-related research (e.g., Colburn, 2008; Jones & Eick, 2007; Martin-Hansen, 2001) or national standards documents (e.g., National Science Education Standards). The most commonly defined and foregrounded steps of inquiry include: a) making and recording observations, b) asking and developing questions or experiments; c) constructing explanations, d) exploring the topic/question/data, e) problem-solving, f) artifact creation to explain/present findings, and g) drawing conclusions and reflection.
**Cultural practices of inquiry.** In addition to the processes and practices of inquiry learning described above, inquiry learning distinguishes itself in some ways from the culture of traditional, didactic school learning. Some of these practices include:

- a) working in collaborative groups and communicating ideas (e.g., Dunlop et al., 2015; Moses et al., 2016)
- b) relevance of students’ lives, experiences, background knowledge and of the “real world” (authenticity) in developing their own lines of inquiry (e.g., Gray, 2006; Meletiou-Mavrotheris & Paparistodemou, 2015)
- c) teachers designing an authentic learning environment/context (e.g., Chen, Tan, Looi, Zhang, & Seow, 2008; Laman, 2006)
- d) interactions between material and artifactual components of inquiry (e.g., Hampton & Rodriguez, 2001; Shih et al., 2010)
- e) multiple paths and perspectives for problem-solving (e.g., Amaral et al., 2002; Laman 2006); and
- f) emotional investment, such as student curiosity or excitement (e.g., Gray, 2006; So & Kong, 2007).

**Significance of this Research**

However, there is a gap in the research regarding the space in which inquiry as a cultural activity is enacted in schools. While there are some studies that consider the physical spaces and places in which student-focused inquiry unfolds (Chen et al., 2008; Shih et al. 2010) or briefly attend to the spatial design and organization of a space for inquiry (Dunlop et al., 2015; Zhai et al., 2014), there is a dearth of research giving analytical primacy to the activity system of inquiry spaces in a school, comprehensively including the
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contexts (including students' lived experiences), spaces, and materials in which student inquiry and its practices take place (for an exception to this, see Jornet et al., 2016). Additionally, Woods-McConney, Woznitza, and Sturrock (2016) recently state in their study of group dynamics in small groups engaged in cooperative inquiry learning with middle grade science students, “There are too few examples of what inquiry teaching looks like in the classroom” (p. 857). This study intends to address both of these gaps in the literature from the joint perspectives of what makes for an educative experience (Dewey, 1938a) and activity theory (Engeström, 2005; Greeno & Engeström, 2014).

Theoretical Frame: Experience and Education

As described in the introductory section, Dewey (1938) explained that a child’s lived histories and associated background knowledge are the foundations upon which all other educative experiences should strive to be built from – including (and perhaps especially) those which deal with inquiry. A close read of Education and Experience (Dewey, 1938) provides four important ideas that help to frame how I have come to conceptualize inquiry as an ideal educative experience: Inquiry as 1) having authentic purpose and problem-posing; 2) having continuity; 3) having processes of social interaction and reflection; and 4) being embodied and sensorial.

Educative experiences are problem-posing, grounded in authentic purpose. Dewey (1938a) troubles the dichotomy between traditional, teacher-centered, one-size-fits-all instruction and what he called “progressivism” and labeled as unilaterally student-centered “free activity,” (p. 20). He instead desires to meet in the middle of these poles – where instead of adhering blindly to a rigid curriculum, students’ prior knowledge and experience serves as the starting point for instruction. It is up to the teacher to engineer a
learning environment conducive to extending students’ learning through activation of their prior knowledge and piquing their curiosity. Dewey (1938a) writes that, “Purpose stems from the curiosity of the student” (p. 79). This purpose provides an authentic basis for solving a problem, answering a question, or undertaking a project meaningful to the student – all of which are considered to be “the stimul[i] of thinking” (Dewey, 1938a, p. 79).

When problems to be solved and projects to be undertaken grow directly and purposefully from the experiences of the students, they are said to be authentic. Barab, Squire, and Dueber (2000) describe authenticity as “an emergent process that is actualized through individuals’ participation in tasks and practices of value to themselves and to a community of practice” (p. 37). Authenticity is the antithesis of the traditional, prescriptive, or “pre-authenticated” model of education, because it implies that learning should be determined to be personally, purposefully meaningful by the student. Concepts built, skilled practiced, and processes learned should serve solving a greater task unfolding within the classroom based on prior knowledge and experience. This where a teacher’s expertise in curricular and pedagogical design becomes integral. The persistent question of a reflective, problem-posing teacher is, “How will what I plan to teach be useful and relevant to my students?” In other words, how can authentic learning be supported?

**Educative experiences have continuity.** Dewey (1938a) defines and discusses at length two intricately connected principles of what makes for an educative experience: continuity and interaction. He writes that "the principle of continuity of experience means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after" (Dewey, 1938, p. 35). In this sense, teachers need to both ensure students the opportunity to build concepts based on
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their prior experience and remain mindful of anticipated future experiences that students could expect to encounter if they continue with certain lines of inquiry. This continuity requires engagement in reflective, iterative, and design-oriented processes on behalf of the teacher while in the context of the classroom with students. For example, teachers could observe their students, get to know their lived experiences, assess what they do know, and use this knowledge to design subsequent learning environments and activities. After the implementing newly designed lessons and activities, teacher reflects upon her teaching and makes observations and assessments about her students’ learning, thus beginning the cycle again.

Educative experiences have both interaction and reflection. Along with continuity, the other principle necessary for an experience to be considered educative as per Dewey (1938a) is interaction. Dewey contends that "the principle that development of experience comes about through interaction means that education is essentially a social process" (Dewey, 1938a, p. 58). It is here that Dewey asserts the interactional, deeply contextualized nature of educative experiences, linking the students, teacher, and learning environment together. This notion, too, is a critique of traditional schooling, in which the teacher is the foremost source of social power and voice of authority, oftentimes serving to replicate oppressive social norms; students’ voices and their relationships with their peer are perceived as inconsequential. It is about what happens in the head of the individual.

In Dewey’s vision, the teacher is no longer the keeper of social control. Instead, the shared activity of the classroom would authentically maintain and promote organization and control. A sense of accountability toward shared work is engendered rather than teacher-dictated behavior and actions. With an authentic purpose for engaging in the
problem-solving within the classroom, students could develop a sense of investment in the social, day-to-day interactions occurring in that space. Students, with their experiences, become viable sources of knowledge to both the teacher and each other.

Learners also have more inward interactions, ones which link their prior experiences to the subject matter in service of solving problems and/or creating artifacts – this is the process of reflection. For Dewey (1938a), reflection is an integral part of experience as it relates to the development of purpose. For the student, reflection on one’s lived histories is part of the process of turning a mere impulse or desire into a purpose. Reflection helps learners determine when their prior understandings and experience clash with what is actually happening in front of them in the current moment. It is what piques curiosity, enables question formation, and leads to developing new inquiries. For the teacher, reflection is also part and parcel of the aforesaid design of the learning environment. The teacher reflects on her own instruction as well as students’ emergent understandings in order to develop the next activities, tasks, or lessons to be taught. Reflection helps undergird future teaching and learning experiences.

**Educative experiences are multimodal, embodied, and sensorial.** In *Logic: Theory of Inquiry*, Dewey (1938b) contends that inquiry is guided by “operations” that deal with “ideational or conceptual subject-matter” and “activities involving the techniques and organs of observation” (p. 117, italics added). Not only does Dewey describe a dual emphasis on both the content and processes of meaning-making, but he also specifically uses the words “organs of observation” to describe the embodied and sensorial nature of learning through perceiving the world, or through experience. While behavioral and cognitive models of learning tend to consider learning as occurring within the individual's
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mind, this persistence of ignoring the body in education has been challenged (Horn & Wilburn, 2005; Siegel, 2016; Varela, Thompson, & Rosch, 1991). Varela and colleagues (1991) argue that “cognition depends on the kinds of experience that come from having a body with various sensorimotor capacities” (p. 173). In other words, understanding is derived from our bodies’ sensory “organs of observation,” the perceptions of which are then encapsulated within our range of experiences.

If we are to consider the body as instrumental in learning, then we must also consider the different modalities through which students can make meaning. In schools, the dominant, privileged mode of what counts as knowledge tends to be verbocentric (e.g., speech, written word). If an experiential perspective of learning considers the body’s role in meaning-making, then we must also think about the other modes through which humans not only perceive but make sense of information (e.g., color, eye gaze, gesture, proxemics, still and moving images, etc.) (Kress, 2010). Wound tightly together with the perspective of multimodality and experience is the importance of space, place, and emotions (Sakr, Jewitt, & Price, 2016).

In scientific traditions, including that of scientific inquiry, there is a tendency toward negating the influence of emotions and feeling while engaging in the work of thinking and learning. In this view, learning and problem-solving is objective, and there is no room for the human tendency to be “creatures of emotions and habit” (Dewey, 1938a, p. 81). Nevertheless, there are “biologically based accounts” between affect, cognition, and action, demonstrating the importance of emotion in learning by showing how individuals with brain damage inhibiting emotions are not able to use skills learned in one context across other contexts (Immordino-Yang & Damasio, 2007, p. 9). In this sense, not only do
emotions undergird learning processes and experiences, but they are necessary for the principle of continuity and building upon what one learns over time. Dewey (1938a) also argues that emotions and habit are instrumental if his “intelligent method” of experiential education and problem-solving is to take root in students and be useful outside of the context of the classroom, writing “there is nothing in the nature of emotion to prevent the development of intense emotional allegiance to the method” (p. 81). In short, our habits of coming to know the world through experience are necessarily embodied and emotional.

**Emotions, feelings, and embodiment in inquiry.** If emotions undergird processes of learning from an experiential and neurological standpoint, then it is critical to better understand how emotions play into students’ experiences of doing inquiry in school. A number of studies in elementary-level inquiry experiences examined students’ attitudes, emotion, and/or feelings during inquiry to some degree. Figure 2.2 is a visual representation of felt experiences of students in this research.

More specifically, three studies made the connection between emotions, felt experience during inquiry, and the “trying on” of new identities in the process (Moses et al., 2016; Kim et al., 2012; Zhai et al. 2014). However, while identity work is explicitly stated and described in Kim and colleagues (2012) work, there is no data describing how this actually occurred in the classrooms, as this was not the focus of their study.

Moses and colleagues (2016) collected observational data and observed students acting like authors and publishers (e.g., planning their writing and images, making stylistic formatting choices) in the effort to emulate the style of writing and design of an author who wrote a series of informational texts used in their class inquiry. The authors state that the inquiry project was “an invitation for young readers to become authors and to join an
important community of artists and thinkers as they composed an informational picture book of their own” (p. 538). Zhai and colleagues (2014) similarly address the link between identity and the performance of an identity – in this case, they discuss students’ perceptions of what it means to “do” school science and “do” science like a scientist would, as evidenced by student drawings of themselves doing science in school and science in the library. When students compared themselves to scientists, it was the doing and thinking of science (i.e., doing experiments, thinking mathematically, observing and recording data) that made them feel as though they were “acting like a scientist in their science classroom”
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(p. 567). There was emotional investment during these times they felt like a scientist, actively trying on this new identity because it was considered engaging and fun.

Conversely, there were multiple instances of drawings reflecting school science that involved students taking notes at individual desks while a teacher taught at the front of a classroom which students did not associate with doing science like a scientist. Taking on these identities meant engaging in the emotionally-laden, embodied practice of doing inquiry, whether it was in the effort to create an informational text or conduct experiments in science class.

Theoretical Frame: Cultural-Historical Activity Theory and Activity Systems

Dewey describes the actual doing of educative experiences as transactional, highlighting the importance of not only the individual learning but of the environment in which learning takes place, including the people, materials, and transactions with these over time. He states, “an experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment” (Dewey, 1938a, p. 43). This notion speaks to what it means to conceptualize learning in activity systems (Greeno & Engeström, 2014). Current understandings of activity systems originating from the work of Vygotsky begin with the critical assumption that something learned is the result of “the transformation of an interpersonal process into an interpersonal one” (Vygotsky, 1978, p. 57) through processes of interaction with one’s sociocultural environment (i.e., more knowledgeable others, tools, and signs) and processes of reflection within the individual (i.e., interactions and tool use mediated by inner speech). As such, a full concept of learning must consider both the individual and the
sociocultural environment, the processes involved in their interaction, and how they mutually elaborate each other.

**Mediated action as unit of analysis.** Wertsch (1998) extends this work of Vygotsky (as well as his contemporaries and students), focusing on the import of the “relationship between mind and sociocultural setting” (p. 3) through the study of human action. For Wertsch (1998), the building block of thinking and learning is “agent-acting-with-mediational-means” or mediated action (p. 24). He makes a point to explain a great deal about these mediational means, including the importance of their materiality, their affordances and constraints, their transformational potential, as well as their relationship with power and authority. However, we need additional theoretical tools in order to study the embeddedness of such mediated actions and their relationship to larger society.

**Activity system as unit of analysis.** Thinking of an activity system as the unit of analysis operationalizes Dewey’s (1938b) move from traditional notions of education and learning towards experience, continuity, and interaction. Instead of considering an individual’s achievement as the prime indicator of learning, activity theorists consider “the unity of whole persons, their material and social environment, and their changing transactional relations (mutual effects on each other) across time” (Jornet et al., 2016, p. 285). This emphasizes the social and transactional nature of educative experiences.

Considering activity systems as units of analysis also allows for the educative experience of inquiry to be thought of as a cultural activity. Educators are challenged to think of “culture” as a verb and something to be done rather than a noun (Gutierrez, Larson, Enciso, & Ryan, 2007; Heath & Street, 2008). In this sense, inquiry is a cultural activity enacted by students, teachers, and other educational stakeholders across multiple
activity systems and timescales (Lemke, 2000), including spaces and timescales within an elementary school.

**Kinds of activity systems.** Cultural-historical activity theory and activity systems are useful tools for contextualizing mediated actions (Foot, 2014; Jonassen & Rohrer-Murphy, 1999). There have been three iterations of activity systems generated from the initial Vygotskian ideas about mediated human action and learning. This initially offered the concept of mediation through cultural artifacts, with the individual and society held in irreducible, dialectical tension. Of the first generation conceptualization of activity systems, Engeström (2015) writes that “the object ceased to be just raw material for the formation of the subject... became cultural entities and the object-orientedness of action became the key to understanding human psyche” (p. xiv). The unit of analysis included an individual, their action, and the mediating cultural artifact, as shown in Figure 2.3. However, this unit analysis was criticized for being too individually focused, and so Leont’ev (1974) set out to conceptualize a second generation understanding of activity and activity systems, which was later illustrated by Engeström (Figure 2.4).

![Figure 2.3. First-generation activity system model.](image-url)

Leont’ev (1974) defined activity as
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a unit of life mediated by mental reflection whose real function is to orient the subject to the world of objects. Activity is thus not a reaction or a totality of reactions, but rather a system possessing structure, inner transformations, conversions, and development. . . in all its varied forms, the activity of the human individual is a system set within a system of social relations. (p. 10)

Leont’ev also initially introduced into activity systems the division of labor, community, and rules aspects of such a system – the system of social relations described above. Engeström (2015) describes that “internal contradictions” specifically between production and communication are “the driving force of change and development in activity systems” (p. xv). As such, current understandings of activity systems consider the transactions between subjects (people and their histories), objects (of learning), instruments (as mediation), as well as their shared social relations (division of labor, rules, community, and the discourses embedded in all of these). All of these components acting together encompass the unit of analysis (Greeno & Engeström, 2014; Jornet, Roth, & Krange 2016).

Figure 2.4. Second-generation activity system model (from Greeno & Engeström, 2014)
Criticisms toward the second-generation activity system model included the lack of clarity between “relationship between object-oriented production and communicative exchange between two people” (Engeström, 2015, p. xv) and the short-shrift paid to cultural diversity within a given activity system. In short, the object within an activity system may share some similarities but in actuality could be vastly different for different subjects, due to their multiple perspectives and cultural difference. The most recent generation of activity systems, conceptualized here by Engeström (2015), must contain at least two “networks of interacting activity systems, dialogue, and multiple perspectives and voices” (Engeström, 2015, p. xv) (Figure 2.5). This has been conceptualized by Engeström as expansive learning. This expansiveness is understood as occurring in multiple directions. Expansion moves “up and outward” by focusing on “interconnected activity systems with their partially shared and often fragmented objects” (Engeström, 2015, p. xv). The activity systems also expand “down and inward” by focusing on “issues of subjectivity, experiencing, personal sense, emotions, embodiment, identity, and moral commitment” (Engeström, 2015, p. xvi). Such expansiveness as a point of analysis will be discussed later in the chapter in terms of vertical and horizontal orientations towards learning and practice, respectively.

Figure 2.5. Third-generation activity system model (from Engeström, 2015).
Using third generation activity systems. In this research, multiple activity systems are play, depending on who or what are foregrounded. The first two research questions of this study focus on interaction between teachers, students, and their learning environment as co-constructed by the teachers, students, built environment, and materials around a similar object – the inquiry project under study. The third research question expands outward and serves to determine how the inquiry project builds into a larger culture of inquiry developing at the school as well as macro-level discourses of school culture as reified over time and history. The third-generation model (Engeström, 2015) depicted and described in Figure 2.5 enables close study of those smaller interactions, pedagogies, and practices rooted in two different subjects (i.e., the teachers, the students) as well as how their objects (i.e., Object-1) come together to create an emerging culture of inquiry (i.e., Object-2) within a larger school context (i.e., Object-3).

The two activity systems I am choosing to focus on in this study are teachers teaching/guiding in the Kids Inquiry Conference and students doing/learning in the Kids Inquiry Conference. Object-1 for each subject is inclusive of the intended goals for the inquiry project. There are moments of distinct difference in these intended goals between those of teachers and those of students (i.e., purposes for doing inquiry), but there are also clear similarities (i.e., the overarching goal for students to present their research knowledgeably and coherently). As such, the activity systems are both held in tension and have resonances with each other in multifarious ways, as identified and demonstrated by teachers as well as students. These will be delineated in Chapters 5 and 6.

The second object (Object-2) includes what actually happened with students during the course of the project – that is, what has transformed. This study is not necessarily
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looking at concrete measures of knowledge transformation as in pre-post testing of what was learned or using checklists to identify if students, in fact, met specific objectives of the KIC projects. Instead, this research is interaction- and practice-focused; analyses places primacy on how both the teacher- and student-oriented activity systems individually surface tensions and resonances with an unfolding culture of inquiry in a larger culture of schooling. However, these activity systems are never operating in isolation and are, in fact, concurrent. They come together to feed into the larger third object (Object-3), which is Legacy Elementary developing a culture of inquiry through engagement with inquiry projects, practices, and mindsets. Of course, this Kids Inquiry Conference is only one component that feeds into that developing culture of inquiry, but it is an in-road to studying this complex system in terms of Discourses, activities, practices, and micro-level interactions between participants. This means that the “third-generation” activity system model is better suited for my research. Table 2.1 provides the definitions used as a framework to structure my thinking about activity systems during this project.

What are vertical and horizontal orientations toward activity? Engaging in activity systems analysis is essentially a study in surfacing contradictions and tensions among the elements of the activity system (e.g. division of labor and community; community and rules) as well as those specific to the context of the research at hand (e.g., teacher-centered and student centered; authenticity and prescriptiveness; school culture and a culture of inquiry). However, it is a tenet of activity theory, as will be explained further in Chapter 2, that these tensions are dialectical in nature rather than dichotomous. Thus, it is important to find a way to problematize false dichotomies, such as
Table 2.1
Definitions of Activity System Components

<table>
<thead>
<tr>
<th>Activity System Component</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td><strong>Subject</strong></td>
<td>The <em>subject</em> (sometimes called agent) “can be an individual but also could be a group of people” within an activity system (Greeno &amp; Engeström, 2014, p. 130). They are the people under focus in the activity under study (Jonassen &amp; Rohrer-Murphy, 1999).</td>
</tr>
<tr>
<td><strong>Object</strong></td>
<td>“The <em>object</em> of the activity is the physical or mental product that is sought. The object is acted on by the subject. It represents the intention that motivates the activity” (Jonassen &amp; Rohrer-Murphy, 1999, p. 63). This is disambiguated above according to the different kinds of objects represented in the third-generation model of activity systems, rather than previous activity systems’ notions of goals or outcomes; all three kinds are “partially shared and often fragmented objects” across multiple activity systems, two of which are described in this study (Engeström, 2015, p. xv).</td>
</tr>
<tr>
<td><strong>Mediating Artifacts</strong></td>
<td>“Activity always involves <em>artifacts</em> (instruments, signs, procedures, machines, methods, laws, and forms of work organization).” (Jonassen &amp; Rohrer-Murphy, 1999, p. 66)</td>
</tr>
<tr>
<td><strong>Rules</strong></td>
<td>Artifacts which can also become rules: These are reified artifacts “that govern the subject’s interaction with members of the community in addition to or instead of functioning as tools” which, when perceived by the subject, have “administrative demand” (Foot, 2014, p. 336-337).</td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td>“The <em>community</em> consists of the interdependent aggregate (e.g., designers within the organization, subject matter experts, designers within professional associations, customers) who share (at least to some degree) a set of social meanings.” (Jonassen &amp; Rohrer-Murphy, 1999, p. 64)</td>
</tr>
<tr>
<td><strong>Division of Labor</strong></td>
<td>The <em>division of labor</em> involves the way “which members of the community engage in which types of actions using which tools” (Foot, 2014, p. 333) in an activity system.</td>
</tr>
</tbody>
</table>

the one drawn between the historical and pervasive “school culture” and an unfolding “culture of inquiry” – one which I have observed to be ensconced within the space of the school culture at Legacy Elementary. I’m looking to find points of resonance as well as tensions and contradictions between these two concepts that I’ve come to see as distinct.

The foregrounded contradiction, per my research questions, is drawn between the between teacher-directed learning and pedagogy (i.e., typified school culture) and student-directed
learning by their curiosity and agency (i.e., a culture of inquiry). I seek to understand their relationship, overlap, and tensions. These can both work together and against each other in practice through demonstrated cultural repertoires (practices) demonstrated in a culture of inquiry as enacted through fifth-grade inquiry projects in this public school. Within these cultural repertoires, I think there are vertical and horizontal literacy practices enacted in terms of production (i.e., writing, design, presenting) and reading (i.e., research, other students’ presentations).

**Vertical orientations toward learning and practice.** Vertical orientations to learning and practice are ones which align with institutionalized forces present through reified frameworks (i.e., curricular documents, standards, scope and sequence) that tend to be foregrounded in teacher-guided and teacher-directed parts of schooling. Analytical questions that point towards vertical orientations in activity systems include: What’s aligned with the curriculum/scope and sequence/standards? What’s expected of the writing article (rubrics, packets)? How does this relate to standards and student movement from novice to expert? How are projects assessed? How does that assessment impact student performance in school? What are the parameters of the project set by the teachers that serve to reinforce institutional forces? Example literacy practices that were observed and theorized to be involved with vertical orientations towards learning in this research are driven by the documents and language which reify them include: reading for information, reading online/on iPads, determining the validity of sources, using appropriate conventions and grammar while writing, and so on. In essence, a vertical orientation toward learning and practice involve the objectives as set down by curricula,
standards, and institutional forces (i.e., teachers and administrators) and the practices which serve to support these.

**Horizontal orientations toward learning and practice.** Horizontal orientations toward learning and practice relate to student and teachers existing knowledges, practices, interests, and choices that are *not* included in the framework provided by the curriculum, standards, and larger institutional forces at play. In other words, the horizontal deals with socioemotional, collaborative, cooperative, in-the-moment, interest-based, agentive parts of learning. For students, this involves opportunities for students’ to think for *themselves*, negotiate for *themselves*, make their own decisions and choices, generate their own ideas based on their own interests and prior understandings, and using tools to achieve their established goals. Further, horizontal orientations consider the interweaving of students’ lives in and out of school, inclusive of their families, relationships, interests, passions, and feelings. For teachers, horizontal perspectives of learning deal with navigating challenging or unexpected situations which arise during the course of authentic learning, how they must flexibly navigate and guide students through a plethora of content and tool-use, and how teachers socioemotionally create spaces for authentic collaboration, cooperation, and communication (Engeström, 2015). Teachers work within extant frameworks of curricula and standards while also navigating the unfolding, ever-shifting pathways carved by the choices and impetuses of their students.

**Uncovering tensions at the vertical-horizontal intersection.** It is within the cross sections that I endeavor to discover tensions and resonances between components of the KIC project activity systems. I am aiming to uncover how the KIC project works within a co-constructed culture of inquiry in a larger school setting with institutional forces, including...
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administration, reified documents that frame instruction, and the school space itself.
Teacher and student observed interactions as well as interviews can also surface
information with respect to their funds of knowledge (Moll, Amanti, Neff & Gonzalez,
1992), which serve them during the inquiry projects but extend well beyond the narrow
framework that the reified documents which frame instruction. Vertical and horizontal
orientations towards learning and practice are not diametrically opposed from one
another. Instead, they overlap. They work to serve each other differently, depending on the
space and circumstance, and they are held in dialectical tension. As an example, students
doing inquiry in school can be driven by both the more vertically-oriented desire to
perform well academically (e.g., get good grades) as well as more horizontally-oriented
desires to learn more about topics that authentically interest them (e.g., following curiosity
and wanting to share their knowledge with others).

Thinking of an activity system as the unit of analysis operationalizes Dewey’s
(1938b) move from traditional notions of education and learning towards experience,
continuity, and interaction. Instead of considering an individual’s achievement as the prime
indicator of learning, activity theorists consider “the unity of whole persons, their material
and social environment, and their changing transactional relations (mutual effects on each
other) across time” (Jornet et al., 2016, p. 285). This emphasizes the social and
transactional nature of educative experiences.

Theoretical Frame: Turns of Literacy Studies and Inquiry

In literacy studies, meaning-making stemming from encounters with various “texts”
during our lives through is ultimately the phenomenon under study. Despite its roots in
more positivist, quantitatively-oriented, and experimental field of reading education,
literacy studies has since expanded its ontological, epistemological, and methodological stances. Through various “turns” of literacy studies (including the social, critical, digital, multimodal, spatial, material, embodied, and affective), researchers and educators for the most part hold expanded perspectives of literacy practices, texts, and contexts (Mills, 2015; Siegel, 2016). In this study, I foreground the multimodal, embodied/affective, spatial, and material turns. While these will be briefly described in a discrete manner reflective of the shifts in the field of literacy research, it is important to note that such turns are in actuality inextricably intertwined.

Multimodal and embodied turns. The perspective of multimodality is firmly grounded in the theory of social semiotics, which is the study of meaning-making through the use and interpretation of various signs “in all social occasions and in all cultural sites (Kress, 2010, p. 2). The perspective of multimodality focuses on how signs and their meanings are produced and communicated through the use of multiple modes, like speech, image, gesture, gaze, color and multiple others (Kress & van Leeuwen, 2001). In our society, linguistic signs have typically predominated as a communicative mode, especially in school contexts. It is for this reason that educational researchers have tended to focus on talk in order to discern meaning and provide evidence for their claims. In addition, non-linguistic modes and their signs, such as the visual (e.g., images, layout) and bodily (e.g., gaze, proxemics, action), are often backgrounded as “context” and are not considered as important or analyzed as rigorously as talk.

However, the multimodal turn in literacy studies has helped open up new ways of thinking about possible data sources and analysis that attend to non-linguistic modalities (Mills, 2015; Siegel, 2016). The argument is that because all modes convey information –
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sometimes more clearly and coherently than language depending on the situation—multiple modes are an essential part of analysis when examining instances of meaning-making (Franks & Jewitt, 2001; Goodwin, 2000; Kress, 2010). In essence, life is experienced and understood multimodally. When collecting data in service of answering questions of sense-making and experience, it is imperative that the data sources collected are representative of not only linguistic modes but equally inclusive of visual, bodily, and other modes as well. As such, methods of data collection, reduction, and analysis must manage to give these modes equal analytical weight, if not analytic primacy (e.g., Norris, 2004).

Multimodality and theories about embodiment intersect in ways central to this research. If life is experienced multimodally, then we need to assume in tandem that we require a body and mind (thought of as one) to actually perceive the information these signs convey—to experience and work with multiple modes. However, this assumption is one that, like the perspective of multimodality, tends to be ignored or backgrounded in policy and practice. Siegel (2016) argues that while historically, the body has been implied as implicated in reading and meaning-making, from a teaching and learning perspective this influence of the body is not usually explicitly addressed. This relationship between embodiment and multimodality has been explored by other researchers who productively identify and use their complementarities as well as tensions when discussing participants’ gestures and actions in learning contexts (Franks & Jewitt, 2000; Goodwin, 2000; Hostetter & Alibali, 2008), digital media composing (Ehret & Hollett, 2014; Miller, 2013; Wargo, 2015), filmmaking (Mills, Comber, & Kelly, 2013), and affect (Ehret & Hollett, 2014; Sakr et al., 2016; Wargo, 2015). In this research, multimodality and embodiment inform the kinds
of data being collected to grasp a fuller picture of how children use their senses and bodies to make meaning in inquiry spaces during the school day.

**Material turn.** The perspectives of multimodality and embodiment reflect the importance of the *materiality* of a mode in meaning-making:

In the engagement with any sign, the materiality of the modes – where *sign* and *mode* are understood broadly – interacts with the physiology of bodies. All signs ... are always embodied, for maker and remaker alike. In this way the meaning potentials of the mode in which a sign is made become embodied (Kress, 2010, p. 77, italics in original).

This “meaning made material” stance is well-aligned with an activity systems approach, which does not only value the interactions between people but also those involving humans, the tools of sociocultural activity, and the things they produce together. Just as people have histories and identities, materials and artifacts can also take on these qualities in interaction (Rowsell & Pahl, 2007). In literacy studies, taking such a perspective involves bringing materials and people onto a more even playing field in terms of how they each shape literacy practices (Mills, 2015; Pahl & Escott, 2015).

For example, in this inquiry space, participating fifth-grade children have been assigned individual iPads that they are able to use and take with them throughout the day during school. The iPad materially provides students access to the internet, useful applications specific to their classes, and documentation tools (i.e., camera, notes application, audio recorder, GPS/GIS software). Its design affords portability; the students can carry it around in its protective case with them as easily as a folder or some books. Its GPS/GIS features also affords the ability to locate the iPad in the case that it is lost,
mistakenly picked up, or even stolen. A constraint of these iPads could be their outdatedness – they may load slower than what children could be used to in their interactions with newer, faster devices. Even with this brief example outlining the iPads’ materiality, it is clear that what these things afford or constrain during use can shape the way students interact, do work, and make meaning with them.

Spatial turn. In complicating traditional notions of context as discussed in the introduction section, the role of place, space, and time in learning are also implicated in the sociocultural and interactional aspects of research participants. In literacy studies, this is positioned as the spatial “turn” (Mills, 2015). This way of thinking about the research context – learning in place – views such a place (i.e., classroom, school site) as “a multiplicity, a product of interrelations” (Leander, Phillips, & Taylor, 2010, p. 336) rather than a single site. As such, it becomes important not only to consider the participants’ actions and interactions while they are in the research site but also the participants’ own histories (what they bring to the site), flows of information and materials (in and out of the site), and affective relationships (Leander et al., 2010) within a space.

This spatialized view becomes particularly important when studying teachers, students, and other educational stakeholders who attempt to create better educational opportunities by transforming their practice. It is integral to study how space is implicated in such efforts, because carving out new or “thin” spaces within or alongside older, traditional, or “thick” spaces can be exceptionally difficult, even with the best intentions and resources (Sheehy, 2004). A socio-spatial lens can also be useful when attempting to exemplify how power flows in, out, and around different classroom spaces. For example, Kress et al. (2005) observe and analyze positioning of educational standards documents,
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student work, teacher work, bodies, furniture, and how these provide access to different kinds of English (and power) to students.
CHAPTER THREE:

METHODODOLOGY

In this research, I engaged in observational and interview research practices, aiming to better understand how the interactions between students, teachers, and their environment (i.e., space, materials) during the fifth-grade inquiry projects unfold to produce literacy practices over an extended inquiry unit culminating in a district-wide conference presentation event. My aim is to know how these interactions over smaller timescales create patterns and connect with the larger timescale of the project, speaking to the outcomes of the student inquiry projects as understood by all participants. I plan to include even larger timescales and expansion of contexts to include the histories and experiences of participants through life history interviews (Seidman, 2013). I have paid specific attention to the use of bodies, space, and materials, not only in the sense that use of these “tools” mediate meaning-making and thus are engrained in mediated action and practice, but also to inform Michelle of how the current design of her library space supports these student inquiry projects. Finally, I am particularly interested in how activity systems involved in this inquiry project both upholds and disrupts current grand narratives regarding the institution of education and its cultural norms, as indicated by educational policy documents at the federal and state levels, general perceptions of education held by the public, and the history of education in the United States of America. This purpose aligns with the three research questions proposed at the outset of this document.

Research Design

This research is an interpretive case study (Creswell, 2013; Merriam, 2001) for which data collection extended over approximately three-and-a-half months (March 27,
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2017 through June 21, 2017). A case study was selected because it is a form of qualitative research that is well-suited to exploring a line of inquiry in-depth through a case possessing clear boundaries. Additionally, Merriam (2001) writes that interpretive case studies involve gathering “as much information about the problem as possible with the intent of analyzing, interpreting, or theorizing about the phenomenon” (p. 38). Because of the observational nature of case studies, they are especially useful when the research questions involve how people and things interact in authentic contexts.

Parameters of case study design. This research fits these definitions of case study through the following parameters:

• At the local level, this case is bounded by school, grade-level (fifth-grade), and the length of the longest class-wide timescale for the Kids Inquiry Conference projects (KIC projects) (i.e., the length of time spent on the KIC projects). In other words, the case is bounded by the activity systems constructed by the KIC projects. I specify “local level” in regards to the activity system under study here to draw explicit attention to the embeddedness of this project in the larger institutional context of education.

• This case is interpretive in that it is grounded in established stances of social theory, including Dewey’s educative experiences, cultural-historical activity theory, as well as meaning-making in inquiry from multimodal, embodied, spatial, and material perspectives. Additionally, the case is situated within the larger institution and culture of U.S. education. The situativity of this case within these theoretical and historical frames will enable me to not only analyze the case in these terms but to also create a dialogue between contexts, theory, and data; theory serves as a
diallecal scaffold for the case and its analysis (Dressman, 2008). In other words, 
theory helps tell the story of the data, and the data has the potential to elaborate 
and/or generate theory.

- The emphasis on interaction between physical bodies, space, and materials in this 
research necessitates observation in an authentic, naturalistic setting (i.e., the 
classroom). As such, case study methodology is an appropriate study design for this 
research.

In addition to the initial three-month period of data collection, triangulation with teachers 
and focal student participants during analysis and writing occurred across November 2017 
through January 2018.

Contextualizing the School Site

School demographics. Legacy Elementary School\(^3\) is located in the northeastern 
United States, serving culturally, linguistically, and socioeconomically diverse Kindergarten 
to Grade 5 students. The demographic breakdown of students is reported as follows on the 
state Department of Education’s School Report Card database for school year 2016-2017:  
Asian and Pacific Islander 18\%, Black 13\%, Hispanic 8\%, White 57\%, Multiracial 4\%, and 
American Indian or Alaskan Native less than 1\%, enrolling a total of 335 students. Notably, 
this school district has centralized their English as a Second Language (ESL) program and, 
as such, all elementary students designated as English as a New Learners (ENL) that enter 
the district attend Legacy Elementary; thirty-one percent (31\%) of students at Legacy 
Elementary are designated ENL. Fifty-six (56\%) percent of students are identified as male. 
Sixty-seven (67\%) percent of students are labeled as economically disadvantaged. The

\(^3\) All institutional names are pseudonyms.

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above dataset reflects the enrollment of over 30 refugee children during the 2016-2017 school year at Legacy Elementary. This led to a 4% increase in number of ENL students over one school year and required the creation of another fourth-grade class for the 2016-2017 school year.

**Classroom demographics.** As will be described in more detail below, I elected to follow four focal students for one fifth-grade class taught by teacher participant Kelli Bianchi as they moved through their reading, writing, and library classes. The demographics of Kelli’s class are as follows: Asian and Pacific Islander 42% (10 students), Black 17% (4 students), Hispanic 8% (2 students), White 29% (7 students), Multiracial 4% (1 student), and American Indian or Alaskan Native 0% (0 students), with a total of 24 students. The gender breakdown of Kelli’s class is 17 of 24 students are identified by the researcher as male (71%). Five students received intensive ESL services (i.e., daily push-in and pull-out sessions with ESL teachers), labeled as having beginning proficiency in English (21%). Multiple other students had received ESL services prior to this, but information about the entire class was not available at this time. In some ways, these demographics are not reflective of the overall demographics of Legacy Elementary school, as there are substantially more students were identified as Asian/Pacific Islander, substantially fewer students were identified as White, and substantially more students were identified as male.

**Inquiry spaces at Legacy Elementary.** Legacy Elementary School is one where students have multiple opportunities to engage in inquiry, both during the school day and afterschool programs through community partnerships. As described in the introduction, Michelle structures her in-school library time for the purposes of student-directed inquiry projects at all grade-levels. At different points of the year, these projects can last as short as
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One or two library sessions or can be more involved and extensive, like the KIC project under study here, which is several weeks long and ends with a conference-type presentation of individual students’ work.

One after school inquiry project available to Legacy Elementary students is Junior Docents; here, students have the opportunity to learn about local historical events, architecture, and artifacts over a number of weeks at actual site in the community, culminating in a presentation given by students about a selected piece of history. Another popular opportunity for inquiry that has been available to upper-elementary grade students (third through fifth) is an engineering and literacy afterschool club developed in partnership with a local research university. This club is a space where children learn more about what it means to think, talk, and act like an engineer, engage in the engineering design process, and solve problems by working with different kinds of materials in design teams.

Furthermore and perhaps most saliently to this research, Legacy Elementary has taken up the call sounded by the Next Generation Science Standards (NGSS Lead States, 2013) to emphasize the STEM disciplines (i.e., science, technology, engineering, mathematics) and the kinds of thinking and reasoning which underpin them, including processes of inquiry. For example, Legacy Elementary staffs a science specialist teacher to facilitate science inquiry thinking and experimentation with students. This is supplemented by the long-term inquiry projects that Michelle intersperses throughout the school year, though it is important to note that the inquiry projects are not solely STEM-focused. For example, another short in-school inquiry project that fourth- and fifth-graders engage in is the Discovery Hour project. This project is modeled after Google’s “Genius Hour,” in which
their developers are able to spend 20% of their work time on passion projects of their own design, so long as such projects have potential to benefit the company (Kesler, 2013). Discovery Hour was initially started by Michelle and Kelli (a fifth-grade teacher and participant in this study) to help students engage in more open-ended student-directed inquiry projects in which they were able to choose literally any topic of study that interested them, though there were still some parameters in terms of research and presentation. In these ways, Legacy Elementary school maintains a progressive stance towards STEM subjects and inquiry in general, making it an ideal space for investigating literacy practices involved in an extended, more established inquiry project during the school day like KIC.

**Site and Participant Selection**

This study site was selected using purposeful sampling (Creswell, 2013), which encourages selection of a site (and thus participants) which is “most promising and useful” (p. 100) to the study’s purpose and research questions. This site is ideal for researching student-driven inquiry learning, as the teachers selected to participate in this study selected are already engaging in inquiry learning pedagogy and by extension, the students are engaged to some degree with inquiry projects.

**Teachers.** While I initially sought participation from two teachers (Michelle Stasik as the library media specialist and one fifth-grade classroom teacher), my conversations with Michelle helped clarify the project from a literacy perspective more clearly, which shifted the number of teacher participants I required. Michelle explained that while all three fifth-grade teachers taught their homeroom students’ reading blocks (and I could

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4 All names are pseudonyms provided by the researcher.
observe any one of those teachers), one fifth-grade teacher was solely responsible for teaching writing workshop during the KIC project. The final piece of writing workshop during the KIC project was a research article on the individual topics that the students’ chose to do their research. In addition to Michelle, I recruited Kelli Bianchi to observe her and her students’ during KIC project reading workshop as well as Mandy Short, the fifth-grade writing workshop teacher.

**Michelle Stasik.** Michelle is an experienced teacher of 22 years. In her early educational history, Michelle identified as a “successful school student,” overcoming initial aural disturbances as a child in noisy school settings (e.g., bus, cafeteria), eventually growing to love being at school. She attributed this love of school – particularly how her earliest teachers modified their practices to help her succeed – toward her desire to become a teacher. Michelle’s professional educational background includes an undergraduate degree in special education and elementary education, a Master’s degree in education, as well as a certificate of advanced study in educational leadership. Michelle has held a variety of teaching and administrative positions over that span of time, including that of a classroom teacher at multiple grade levels, a K-12 behavior specialist, adult education consultant, teacher representative for child study teams, assistant to the director of special services, reading and math interventionist, leading up to her current position as library media specialist. She began teaching at Legacy Elementary in 2008, becoming the school’s library media specialist in 2013. She currently holds state-level certification in special education, elementary education, therapeutic crisis intervention, and educational leadership. She is also a certified Special Olympics coach.
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Michelle’s library. The library is a dynamic space that functions as a central hub of the school, with students, teachers, and staff entering and leaving the space flexibly and frequently throughout the day - during open library periods, while library class is in session, as well as during afterschool clubs or meetings. Creating a sort of thick, L-shape, the library provides multiple points of access to the main office, faculty room, one cafeteria, a hallway leading from the school’s main entrance, and the literacy resource room. The library is covered in ever-changing student-created projects and designs, teacher-created posters and chart papers, as well as recently published print books on prominent display. In addition to shelves of books that surround the room and stretch into the center, the library space is equipped with a smartboard, flat-screen television monitor (that is largely unused), a rolling iPad cart with headphones, and a class set of older desktop Macs. There are a number of tall cabinets and shelves for storage space along two walls, which is where Michelle keeps much of her materials for building and tinkering (e.g., Legos, clay, blocks, vehicles, tracks, etc.).

During the school day, it is not uncommon to find Michelle moving tables and materials around the classroom to make space for different objects for exploration and demonstrations, such as a shorter square table that she calls the students’ “maker space” filled with creative materials like the ones described previously. Students have immediate access to the internet and other useful applications through the computers and iPads, and the fifth-grade students in particular are each assigned their own iPads which they are able to take with them throughout the day at school. Students are also encouraged to use several circular tables stocked with writing and drawing utensils, butcher paper, as well as space for play, moving around, and sitting as a whole group.
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In informal observations of Michelle’s interactions with her classes in the library, there seems to be an understanding that children need not be confined to seats or sitting during their time in this library space. It is not uncommon during whole group instruction to see children laying on their stomachs propped on their elbows, sitting in chairs at tables, sitting on stools or chairs along the perimeter of the rug, as well as sitting in the typical “criss-cross applesauce” fashion found in most elementary school classrooms. Children do not need to ask if they would like to change their position in the classroom, as the practice embedded in the space is that they simply move when they need to do so, provided they are still doing their best to remain engaged and attentive. Michelle often uses a mini-lesson format where she introduces the day’s work, they discuss it, and then students go on accomplishing their tasks; as such, whole group instruction tends not to take the majority of the class period – usually between 5 to 10 minutes of the 45-minute block. These qualities of Michelle’s library space speak to a cultivation of a student-centered culture of inquiry and authentic, interest-based exploration.

Kelli Bianchi. Out of the three teachers in this study, Kelli is newest to the field having taught for seven years. Kelli’s recalls a “love/hate” relationship with school during her elementary years – she did not like being at school, but she loved her teachers, particularly the ones who balanced high expectations with compassion in the form of tough love. These teachers inspired her (and later on helped to shape her own teaching style), and explained that she came into her confidence as a student in middle school. Kelli tended to excel academically after that point, including taking college psychology and physics while she was in high school. Professionally, Kelli earned an undergraduate degree in education with a minor in social studies as well as a Master’s degree in curriculum and
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instruction. At the time of this study, she was in her fourth year of teaching fifth-grade at Legacy Elementary. Prior to that, she taught first-, second-, and third-grade. She currently holds state-level certification in early childhood and elementary education (birth through sixth-grade). She imparted to me in interviews as well as students during the KIC projects that prior to becoming a teacher, she wanted to be a meteorologist. As such, Kelli also has some background in earth science and weather. Kelli also teaches Sunday school at her church.

*Kelli’s fifth-grade classroom (reading)*. Kelli’s classroom serves as the main meeting space for her own class, as well as social studies classes for fifth-grade. In the course of the KIC project, she is responsible for reading instruction and helping her students navigate the span of the projects (i.e., facilitating topic selection, doing experiments, choosing a presentation medium and mode, and creating presentations). It is located down the hall from the library and past a cafeteria, where it is podded along with two other fifth-grade classrooms as well as the science lab, which is used informally during the course of the KIC projects.

The classroom is delineated in multiple kinds of spaces that stay relatively fixed throughout most of the project: whole-group meeting space (rug); individual desks clustered into four groups; and the half-circle table (where most of Kelli’s teaching materials are located). The whole-group meeting space is lined on two sides by shelves full of leveled books (Fountas and Pinnell alphabetical leveling) and on a third side a swivel chair, an easel, a rocking chair, and a small end table stocked with writing supplies where Kelli sits during her daily minilessons. The student desks are labeled with their names and are situated in clumps of six or seven, which is where many students (but not all) situated
themselves after Kelli taught her minilesson and released them to work independently. Student work lines the walls above the half-circle table where Kelli tends to work when she is not circulating around the room helping her students. On the rest of the walls are colorful posters exemplifying schedules; anchor charts; rules and codes of conduct; and sentence strips in pocket charts for varying purposes; these are handwritten by Kelli, her students, or sometimes printed out on the computer.

In Kelli’s classroom, there are multiple technologies present – some of which are universal to all classrooms in the school and others which are unique to their space. There is a projector and whiteboard against which it is projected, which most classrooms have in some capacity. Each fifth grade classroom is also equipped with charging cubbies on a countertop for students’ and teachers’ iPads, necessitated by the one-to-one device initiative implemented at the fifth-grade level. Kelli also has her own MacBook laptop as well as two older models of MacBook laptops that students can use if they would like. Unique to Kelli’s classroom is an inkjet color printer as well as a black and white LaserJet printer that she and the other fifth-grade teachers can print from. There are also two places in the classroom that Kelli calls “resource stations,” which are equipped with coloring and writing utensils, sticky notes, highlighters, Sharpie markers (a student favorite), glue, and other design-related materials which students can use when as needed.

In addition to individual student seating, there are multiple other places students are permitted to occupy during their independent work time. Though most children chose to stay at their individual seats and desks, some students will use this time to spread out and work on the rug, sit in the rocking chair or swivel chair, sit back at the half-circle table, or even use a big, blue yoga ball to sit rather than their seat. Sometimes, students would
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elect to work in the library or the science lab for a chunk of independent work time. Similar to Michelle’s classroom, students did not need to ask permission to move about the classroom spaces (unless children left the room, in which case they needed to let Kelli know before going). This shared space was one where students could use it as necessary to do their best work.

Kelli’s classroom contained seven English Learners, and as such, there were multiple times per day that adults would push in and pull out students for ESL instruction. Most mornings, there was a teaching assistant (TA) that assisted these students before they were pulled out of the classroom by their ESL teacher. Other times, Michelle would push in and assist students in their KIC projects. There was also a young man who acted as a mentor for one of the students in Kelli’s class (Owen) from a behavioral standpoint; he would pull Owen out of Kelli’s class every Friday to work on the KIC project with him. There were many adults who moved about Kelli’s classroom more so compared to other fifth-grade classrooms. Her classroom can be described as a dynamic space where students could generally move freely in order to achieve the task at hand.

**Mandy Short.** Mandy has been teaching elementary school for 13 years entirely at Legacy Elementary. She describes her K-12 years academically as being an “average student but a leader” – she spent a great deal of time of high school involved in school clubs and volunteering. Mandy described her desire to become a teacher as stemming from first-grade, as she loved her first-grade classroom teacher thanks to her warmth and compassion towards her students. Professionally, Mandy went on to earn a Bachelor’s degree in elementary education with a concentration in English as well as a Master’s degree in reading education. She currently holds state certification in teaching Pre-K
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through sixth-grade and has been teaching fifth-grade at Legacy Elementary for six years at the time of this study. Prior to teaching fifth-grade, she taught second- and fourth-grade. In the past as an early-career teacher, she also taught summer school.

*Mandy’s fifth-grade classroom (writing).* Mandy’s classroom serves as the main meeting space for her own class as well as writing for the grade level. As such, she is responsible for teaching writing the research article for the KIC projects. Like Kelli, she also her own class of students navigate the KIC projects overall (i.e., facilitating topic selection, doing experiments, choosing a presentation medium and mode, and creating presentations). It is located in between Kelli’s classroom and the science lab in the fifth-grade pod of classrooms down the hall from the library and past a cafeteria.

Upon entering Mandy ‘s classroom, I am immediately struck by the sheer amount of anchor charts and posters on the wall – some of them have to do with the KIC project and scientific writing. Beneath a screen were more anchor charts and posters around the craft of writing. Also similar to Kelli’s classroom, there are specific spaces delineated for whole-group meetings (large foam floor with easel, seat for teacher, and desk with supplies) as well as a half-moon table for small group instruction. However, individual seating for students are at solid rectangular and circular tables, and Mandy maintains her own space in the form of a traditional teacher’s desk (though never once was she seated at this desk during writing workshop, often opting for the half-circle table if she was sitting at all). There are also books along one side of the foam floor.

From a technology standpoint, Mandy’s classroom is similar to the other fifth-grade classrooms in that it also has a projector as well as the iPad charging cubbies for her class’s set of devices. She does not have her own printer and instead either prints to the one in
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Kelli’s classroom or the library. Materials for design (i.e., writing and drawing utensils) are in plastic bins at each table for easy student access. There are some resources (i.e., tape, glue, white-out, rulers, facial tissue, hand sanitizer) that are located in a cabinet near the doorway to the hall. Like Kelli’s classroom as well as Michelle’s library, students need not ask to use these materials. While there is individual student seating, but it is notable that students do not have nametags nor do they have assigned seating in Mandy’s classroom. Students are able to choose where they work best on a daily basis, though many times children do tend to stay in the same seat over the duration of a project. In Mandy’s classroom, students may opt to use the desks, spread out on the foam floor, work at a corner desk isolated from others, work along the countertops near the charging stations, or even opt to use a tri-fold cardboard piece to block others from view. Students chiefly stayed in Mandy’s classroom during writing time, and tended not to be pulled out for any sorts of services. The ESL teacher usually pushed into Mandy’s writing classroom daily during this time and worked with her English Learners at the half-circle table. Mandy would sometimes turn on quiet music (i.e., Debussy; Chopin; Enya) during independent work times, though this was not a daily practice.

Students. While there are points where my data collection focused on a single fifth-grade class as a whole (i.e., Kelli’s class of 25 students) or groups of fifth-graders collected together (i.e., groups of fifth-graders gathered for final KIC project presentations), I recruited a total of ten student participants. Out of those ten students, I followed four of those students focally throughout the entirety of the KIC projects, all of whom came from Kelli’s class.
The process of student participant sampling was initially determined by participating teacher. As Kelli had agreed to the project (and recall that at first, I was only going to observe her and Michelle teaching), I made a brief presentation to her class prior to the inquiry projects, discussed the project, and handed out informational notes to parents with an attached consent document. As four students returned their forms the next day, they became my focal students. This means that they were observed during reading workshop with Kelli, writing workshop with Mandy, library with Michelle, as well as during their final KIC project presentations. These students were also individually interviewed twice during the course of the KIC projects and participated in a focus group interview together.

However, when it became clear to me that these four students would only be visiting the library three times during the course of the project (which I do not believe is enough time to understand how fifth-grade students used the library during the KIC projects), I opened up recruitment across the fifth grades and recruited six more students, most of them from Mandy’s class and one from another fifth-grade teacher (Mrs. G) who did not participate in this study as she was a) not teaching an additional literacy component during the KIC projects and b) not teaching any of the focal students under study. These six students would be observed during library with Michelle as well as during their final KIC project presentations. Like the focal students, these students were also individually interviewed and a part of the focus group interview. The demographic information of all ten student participants is located in Table 3.1, and brief narrative portraits of the four focal students follow. In some ways, these demographics are not reflective of the overall demographics of Legacy Elementary school, as there are substantially more students self-
identified as Asian/Pacific Islander (55% if Saabira’s self-designation of both Arabic and White are honored giving equal weight to each identifier) and substantially fewer students self-identified as White (15% if Saabira’s self-designation of both Arabic and White are honored giving equal weight to each identifier).

**Table 3.1**

*Student Participant Demographic Information*

<table>
<thead>
<tr>
<th>Student Pseudonym</th>
<th>Age (as of June 2017)</th>
<th>Gender (self-identified)</th>
<th>Race/ethnicity (self-identified)</th>
<th>Languages Spoken</th>
<th>Fifth-Grade Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aiden</td>
<td>10</td>
<td>Male</td>
<td>African-American</td>
<td>Arabic, English, Twi, Spanish</td>
<td>Kelli Bianchi</td>
</tr>
<tr>
<td>Ameena</td>
<td>12</td>
<td>Female</td>
<td>Brown</td>
<td>English, Korean</td>
<td>Mrs. G</td>
</tr>
<tr>
<td>Chimin</td>
<td>11</td>
<td>Female/girl</td>
<td>Asian/South</td>
<td>English, Korean</td>
<td>Mandy Short</td>
</tr>
<tr>
<td>Dimitri</td>
<td>10</td>
<td>Male</td>
<td>Asian/Sri-Lankan</td>
<td>Sinhala Chinese, English</td>
<td>Mandy Short</td>
</tr>
<tr>
<td>Emma</td>
<td>10</td>
<td>Female</td>
<td>Asian/Chinese</td>
<td>English</td>
<td>Kelli Bianchi</td>
</tr>
<tr>
<td>Fatima</td>
<td>11</td>
<td>Female</td>
<td>Arabian</td>
<td>English, Arabic</td>
<td>Kelli Bianchi</td>
</tr>
<tr>
<td>Hudson</td>
<td>10</td>
<td>Male</td>
<td>Asian/Indian</td>
<td>English, Telugu</td>
<td>Mandy Short</td>
</tr>
<tr>
<td>James</td>
<td>10</td>
<td>Boy</td>
<td>American (German/Polish)</td>
<td>English</td>
<td>Mandy Short</td>
</tr>
<tr>
<td>Owen</td>
<td>10</td>
<td>Male/boy</td>
<td>African-American</td>
<td>English</td>
<td>Kelli Bianchi</td>
</tr>
<tr>
<td>Saabira</td>
<td>10</td>
<td>Female</td>
<td>Arabic/White</td>
<td>English</td>
<td>Mandy Short</td>
</tr>
</tbody>
</table>

*a Focal participants are indicated using **bold and italic** print (and are also Kelli Bianchi’s students)*

*b On demographic questionnaire, students identified their “gender” as open response. No options were provided.*

*c On demographic questionnaire, students identified their “race” and/or “ethnicity” as open response. No options were provided.*

**Aiden.** Bespectacled and the tallest in his class, Aiden is a boy who has a curious kind of intensity about him (Figure 3.1). At times, this intensity is inward and focused, writing for pages in his writers’ notebook or voraciously devouring novels in a single sitting. Other times, that energy explodes outward when he is interacting with his classmates and friends, especially during social occasions, like lunch and recess. According to his teachers as well as my own observations of him over the years, Aiden holds himself
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to very high academic expectations. As such, he is an excellent student, but he can also
become upset if he does not reach his expectations for some reason, which sometimes leads
him to act out behaviorally in school.

Figure 3.1. Aiden working on his poster presentation in his homeroom (Kelli’s classroom).

Aiden participated in engineering club for all three years it has been offered so far; it
was there I observed him identifying confidently as “an artist” as well as taking up the
identity of an engineer while working on design teams (i.e., asking questions, contributing
and sketching ideas, building and testing designs, etc.). He is athletic, playing basketball and
football, as well as studying Tae Kwon Do and enjoying running. Aiden has also been
playing the saxophone for two years; he plays in the Legacy Elementary band, has learned
solo pieces, and has performed in the All-County Elementary Band. In interviews, I learned
that Aiden is particularly interested in learning more about math and numbers, different
countries around the world, as well as what happens when “real scientists” work in a
laboratory, in addition to his already established interests in basketball and saxophone.

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Aiden chose to study air pressure for his KIC project, doing a science experiment using different amounts of liquids in plastic cups to create pressure seals on index cards covering the cup opening when turned upside down. During the course of the KIC projects, I observed Aiden continuing to have high expectations of himself and his quality of work. Usually when I asked him questions about what he was learning, he gave me detailed, in-depth responses, often times pointing to his writing to show how much work he had done and where he had written the information he was telling me about. There were a couple of times when I asked him questions about his project that he did not want to share as much; it seemed that he preferred to be left alone to continue working. Aiden’s final project involved a demonstration of his experiment as well as a poster containing the main components of his written article blocked out in black borders around a white tri-fold poster board.

Emma. Emma is a girl possessing a quiet, focused energy and a clear desire to succeed academically (Figure 3.2). During the inquiry projects, she tended to work quietly and tenaciously on her own, though she did not shy away from interacting with students working at her table when they asked her questions. Emma was observed spending the majority of her time in the research phase of her project, often taking notes off of different websites, handwritten directly into her notebook or typed into a note-taking app (Notability) on her iPad. Emma also spent a great deal of time rehearsing her oral presentation both alone and in front of others prior to the KIC conference, describing nervousness at speaking in front of her peers.
Figure 3.2. Emma practicing her poster presentation in the library.

Emma’s fifth-grade teachers describe her as an average student who works hard on her assignments, and she is often positioned as not very talkative. However, Michelle has noticed over the years that Emma’s quietness is paralleled with being very observant and when provided with the opportunity to speak, she seems to have quite a bit to say; Michelle called this a “quiet intensity.” Additionally, I observed Emma tending to talk socially with one or two specific classmates during whole group time regularly.

Emma is an ESL student transitioning out of receiving services for her English language development and would be designated having advanced proficiency in English; I did not notice her getting any sort of ESL services during my observations. Emma also participated in engineering club for the first two years it was offered at Legacy Elementary. Over the duration of engineering club, particularly in the second year, I noticed her taking more and more of an active role in coming up with ideas, bringing her group’s ideas to life,
and most notably, being a leader by helping group members who were absent catch up by explaining what was going on and demonstrating how to build. In interviews, I learned that in addition to engineering, Emma was fascinated by color (e.g., recreating rainbows, learning how different colors mix together), animals, the weather and forecasting, as well as countries around the world. In her free time, she likes to play outside with her friends and watch videos on YouTube.

Emma chose to study how temperature impacted properties of materials, conducting a multi-variable experiment in which she exposed balls made of different materials (e.g., plastic ping pong balls; rubber bouncy balls; foam balls) to cold, hot, and room temperatures and observed how this changed their bounce height. When I asked Emma questions about her KIC project, she was always happy to provide me with an update on where she was that day. She often remarked that her KIC project was a “tough topic” because she was studying molecules, and it was difficult to find articles on molecules that she could read and understand easily. Emma also was concerned about her poster display and approached me multiple times during her poster design with questions related to the content of her poster, how she could use color and borders to frame that content, as well as how she could make her poster look more appealing in general. Emma did an oral presentation with her poster at the KIC conference and answered questions asked by her classmates as well as the district science teachers, who were moderating presentations in the science lab where she presented.

**Fatima.** Fatima is a very bright, self-possessed, and highly curious girl who does not shy away from asking questions; indeed, it seems as though she treats life as one big inquiry project! Fatima often worked well-ahead of the KIC project schedule and had
finished all parameters of the assignment well in advance, pairing the writing of her paper alongside the construction of her Google Slides presentation. After finishing ahead of time, Fatima consistently helped her classmate and friend finish her project in a way that distinguished her understanding of the KIC project. Fatima often positioned herself as a knowledgeable helper toward her friend, careful not to “do the work for her” but instead asking her pinpointed questions about the content and design of the poster board and oral presentation so it met the criteria for the KIC project. Fatima seemed to possess a an uncanny, meta-level awareness about the function of not only the KIC project but of elementary and secondary education itself, calling it “mandatory,” perceiving it as a gatekeeping mechanism for higher education, and providing an impetus about why “getting a good grade” is important.

Figure 3.3. Fatima working on her iPad on the floor in Mandy’s writing classroom.

Fatima is described as top-notch student academically, though one who tends to fit her work into project parameters without going above and beyond the call of the rubric. She is described by Kelli, her homeroom teacher, as “a little adult,” attributing this to living
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with her two older brothers who are in their twenties due to a remarriage. Kelli wondered on multiple occasions whether or not Fatima’s more mature conversational nature and approach might estrange her from other students in her grade socially, as her directness could position her as outspoken. I have been able to observe Fatima since she was in third grade, as she was also a participant in engineering club as well as during the KIC projects. In both of these spaces, Fatima worked well with others. In engineering club, she took up leadership and less “in control” positions on her design teams (e.g., tape ripper). When in leadership positions, she stayed on task throughout the project until the goal was fulfilled. In positions where she appeared not to be the leader, she fulfilled her duties and subsequently engaged with whatever interested her after this point, even if there was more she could have contributed toward project goals.

In KIC project observations, I noticed that Fatima tended to work on her own or tightly with her friend who she helped during the KIC project. She often answered questions in class and was generally attentive, but she seemed to be most engaged when she was reading independently (outside of the KIC project, usually a graphic novel) or helping her friend. There were a couple of times where she extended herself socially past this singular friendship in service of the KIC project (e.g., discussing the project with Owen at his desk during writing).

Fatima is especially interested in technology and their affordances, particularly those around cell phones, tablets, computers, and video gaming consoles. In particular, she is interested in these digital technologies’ qualities like their graphics, operating systems, and other device features. She identifies as a gamer herself, and one who finds herself wishing there were more games with female heroines (e.g., “They need to have [Princess]
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Peach save Mario more... I really need to figure out how that happens.”). When asked more about her love of all things digital, she described to me an inquiry project she created in fourth-grade where she detailed how to create apps in iOS 9 (an Apple operating system) from a programming standpoint. When asked during interviews about what she was interested in learning more about (in addition to digital technologies), Fatima described her desire to open up and run a business – specifically a bakery. Here, Fatima detailed to me a lengthy plan describing how she will need to go to both culinary school and school to figure out how to open up a business, even providing the timeline that of having “about 11 years until I pretty much am eligible to open a bakery.”

Fatima elected to inquire about electromagnetism, creating one using a nail, wire, and batteries and doing multiple experiments attempting to pick up paperclips and comparing its performance to that of a bar magnet. Her hypothesis was that the electromagnet would be stronger than the bar magnet. Fatima talked easily and confidently about electromagnetism in front of her peers and fielded their questions throughout. Furthermore, even though her experiment did not support her hypothesis, she explained clearly that this was because the batteries she used were not strong enough and that typically, an electromagnet would probably be stronger than a bar magnet and more advantageous because it could be turned on and off. Fatima and I also had many conversations about her multimodal design choices in her presentation during my classroom observations (e.g., the importance about cohesion across theme and color over a presentation visually and organizationally).
Owen. While the photo above shows a boy intensely focused on his inquiry writing, Owen could often be found with a smile on his face. He is an upbeat, curious, and self-aware boy who values putting in hard work in order to grow and learn, not only in school but across his other interests, especially sports like basketball. This desire to work hard in order to achieve academically was embodied throughout his KIC projects. Owen spent much of his time working on his own during the KIC projects, often isolating himself from his friends, identifying this distance as a way that he could do his best work. As such, Owen was a student who preferred to create his own space in the classroom, whether it was spreading out on the rug with his iPad and KIC folder, or sitting at the corner desk during writing. He could often be found sprawled out on his stomach on the rug, propped up on his elbows, alternating between reading on his iPad and jotting notes in his notebook. Owen was aware of good public speaking skills (e.g., making eye contact and speaking clearly)
and used index cards to help guide him through his Google Slides during his oral presentation.

Owen’s teachers described him as an above-average, hard-working student who has come a long way in terms of his social and academic behaviors during school. Owen tends to agree with this positioning, saying that he “used to act up” and did not perform well academically (e.g., “I used to be all way behind” his peers in reading). In my own observations of him over time (including his time in engineering club), I noticed the evolution of a child who could be described as energetic and rambunctious into an individual who has learned to wield that energy purposefully, directing it towards his personal goals in- and out-of-school. In engineering club, Owen liked to joke around with his peers while working, sometimes to the detriment of the project. Often, he needed redirection during projects and tended to wander to other groups mid-project, especially as a third-grade student. Over time, both in the second year of engineering club as well as during his fifth-grade KIC project, I observed a boy who was self-aware of his own attentiveness, habits, and strategies he could employ to do his best work in school. In conversations with Michelle, I know that Owen spent time with the school counselor on a regular basis; during the KIC project, he also worked every Friday with a mentor – a young man who pulled him out of class and worked with him one-on-one in the cafeteria in the morning. In my time knowing Owen, he has matured a great deal without losing that energy or excitement.

Owen is a boy who has multiple talents and interests. He is an athlete and identifies strongly as a basketball player who cannot get enough of the sport. He constantly dons athletic wear (i.e., tracksuits with Nike swooshes and sweatshirts with slogans that valorize
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tenacity and toughness) and exemplifies an easy, working knowledge of the sport as he discusses basketball moves and offers knowledge of players off the top of his head. Owen also performs musically; he plays the trombone and also sings quite well. In terms of his family, Owen looks up to his father and says he has learned a lot from him. His father is a business administrator and project manager, and engages with a lot of public speaking. This helped to inform Owen’s own public speaking in school, where he says he has learned that “you gotta look at your audience” while giving a speech or presentation. Thus, it is not surprising that Owen excels at speaking in front of his peers. In interviews, Owen described wanting to learn even more about succeeding in school and life, nutrition and eating healthily, and how to become a mechanical engineer.

Owen’s KIC project was conceptually about Newton’s second law of motion: that an object’s acceleration is dependent on its velocity, time, and distance. He performed an experiment in which he changed the distance of where he shot a basketball in order to determine how this impacted the velocity and how it related to acceleration. Whenever I would ask him about his KIC project, he was excited to provide answers about what he was working on that day. Owen asked me a lot of questions about the design of his presentation, particularly when he wanted to use specific pictures and graphs to explain concepts like velocity in relation to distance, time, and acceleration. Owen saw the KIC projects as not only an opportunity for him to learn about his own selected topic for his own edification, but as a way for him to share this knowledge with others who might also be interested.
As a part of this study, I also interviewed Legacy Elementary School’s current principal, Jeff Banach, in order to get perspectives about how inquiry was supported. Jeff has been working in schools as a teacher and then as an administrator for a total of 22 years. His educational background includes studying Pre-Law as an undergraduate student, moving on to obtain a Master’s degrees in Elementary Education and School Administration. He holds state certification in elementary education (birth through sixth-grade) as well as administrative certifications. Jeff spent eight years teaching sixth-grade, subsequently serving as an assistant principal for five years. He has been a principal at Legacy Elementary for a year, but has been working for the district as an administrator for longer than that. Mr. Banach’s interview was used for triangulation purposes in this research.

Demographically, I identify as a white cisgender woman working as a student researcher, graduate assistant, and adjunct instructor within the university setting. My relationship and experience with this school site and Michelle has been one in a state of evolution over the past four years, beginning with my role as a research assistant on the engineering and literacy afterschool club project in fall of 2014. This research assistant role persisted through March 2017, when data collection for the engineering and literacy project culminated. Thanks to my prolonged involvement with the engineering and literacy project, I have become increasingly familiar with not only Michelle but other teachers, administrators, students, and families in the space of Legacy Elementary school. Of the ten student participants in this study, I have come to know nine of them through their

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5 I attempted to secure an interview with the former principal of Legacy Elementary School, but was unable to do so due to time constraints and a many unanswered emails.
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participation in engineering club since 2014. Given my presence and persistent positioning as a researcher at Legacy working in partnership with the school, I believe this helped me build rapport and establish trust (Glesne, 2011) with students, teachers, and the building administration.

In the context of the research proposed here, my chief role would be that of a participant observer (Spradley, 1980) with a background in literacy education as well as teaching experience at the elementary level, including fifth-grade. Given my prior experience at Legacy Elementary, my presence was not be perceived as totally foreign in this space, particularly to former participants in the engineering and literacy club currently in fifth-grade. Furthermore, while I did not engaging in any formal teaching duties while in this space, I positioned myself as another adult resource for students during their inquiry projects and often consulted with students as a teacher would in a one-on-one capacity. This increased the already existing rapport with students, and I believe created an easefulness for students during observations and interviews. These roles are aligned with Spradley’s (1980) definition of a “moderate” participant observer: a researcher who maintains both an “outsider” role (e.g., taking field notes without intervening in student interactions) and an “insider” role (e.g., being involved in the space prior to the study; engaging with students if and when they required assistance).

Data Collection

Data sources in this research included a) classroom observations with researcher field notes, video, and audio; b) teacher/administrator demographic survey; c) semi-structured interviews with teachers, students, and principal; and d) artifact collection; these sources are described and delineated below.
**Classroom observations.** Classroom observations occurred daily for a span of six weeks whenever inquiry teaching and learning was the focus during class periods: reading (Kelli’s classroom; following focal students); writing (Mandy’s classroom; following focal students); and library (Michelle’s classroom; following ALL student participants). Each of these class periods were approximately 40 to 45 minutes in duration. Each classroom observation entailed setting up at four video cameras in the space so as to capture multiple perspectives of typical daily inquiry work, including teacher-student, student-student, and participant-material interactions involved in any instructional grouping (e.g., whole-group instruction, small group work, independent work of focal students) within the classroom space. There were six audio recorders strategically placed to adequately capture classroom conversation. *Observational field notes* and *photographs* were taken during this time, as I placed myself in the classroom space.

In addition, I collected similar observational data on the day of the inquiry projects conference in June. On this day, students were spread out over four classrooms; a camera and an audio recorder was set up in each classroom in order to capture the oral presentations and presentation artifacts (e.g., poster, slide presentation, video, experiment demonstration, etc.) of the ten student participants, as well as teacher’ and other students’ actions, questions, and other talk as they the presentations proceeded throughout the day. I circulated from classroom to classroom taking field notes on participating students’ presentations, especially focusing on the four focal students (i.e., Aiden, Emma, Fatima, Owen).

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6 I followed all student participants into Michelle’s library space, as this space was only visited by the four focal students one three times due to days off, state testing, and the rotation schedule. I did not think three days was adequate time for me to capture the feel and practices in Michelle’s library space with her students, so I elected to observe all ten student participants while they used the library for the inquiry projects.
Semi-structured teacher and principal interviews. Teacher interviews took place three times over the duration of the inquiry projects for approximately 30 to 45 minutes apiece. The interviews were spaced at approximately two-week intervals, toward the beginning, middle, and end of the inquiry projects. Due to teacher time constraints, both Kelli’s and Michelle’s second interviews were done over two sessions. Only one principal interview took place over the duration of the inquiry projects, spanning for approximately 30 to 45 minutes. For each of the interviews, the participant was verbally presented with each interview question and asked to provide their verbal responses while I took handwritten or typed notes. Participants were presented with the option to skip any items they did not wish to answer. Interviews were audio recorded and transcribed by me.

I used a semi-structured set of interview questions with the principal (Appendix A), seeking his perspectives as an administrator about inquiry teaching and learning, meaning-making, and the overall purpose of education. These questions were semi-structured and changed briefly (though not greatly) based on the course of the interview and the conversation that ensued between us during the interview.

For the teachers, I used Seidman’s (2013) semi-structured, three-interview series, with each successive interview session increasing in specificity and informed by the preceding interview as well as classroom observations. The first interview focused on the teacher’s life history broadly, the second addressed current experiences inherent to teaching (including the facilitation of inquiry), and the third interview encouraged a deeper reflection and conversation about inquiry teaching and learning in conjunction with larger institutional and societal pressures and norms. All three semi-structured question sets are located in Appendix B.
Teacher and principal survey. All adult participants were provided with a teacher educational background information survey (Appendix C) through Google Forms. This was filled out online during the course of this study. This brief survey provided to me demographic data regarding overall teaching experience, educational and certification histories, as well as teaching and/or administrative positions held by the participants, which helped inform the short portraits written above.

Informal student interviews and focus group. Informal student interviews took place briefly before, during, or after independent student work on inquiry projects. They occurred twice, towards the middle of the KIC projects and after the projects culminated. These informal interviews occurred in a one-on-one context and in one instance, in partnerships. The sole partnership interview occurred because the two boys (Dimitri and Hudson) were in the same class working together to inquire about the same topic: electromagnetism. As such, it was relevant that these students were interviewed together based on the nature of their working relationships in the space. These interviews lasted between 10 to 25 minutes apiece. All ten students participated in these interviews, having provided consent and assent to participate in this research. The focus group interview was conducted about a week and a half after the KIC project presentations. The focus group met after school and included five students at a time; these felt qualitatively different compared to the one-on-one or partnership interviews described above, as it felt like more of a conversation across students rather than a one-on-one interview. Michelle offered the library as a space for the participating students to gather, and we provided snacks for all ten of the students as they discussed their perspectives and feedback about the inquiry projects.
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For the informal student interviews and focus group interview, the students were prompted to answer questions about topics similar to those listed within the Student Interview Procedures located in Appendix D. Specifically, these questions differed slightly across students, given that these questions will be directly related to their own inquiry projects as they unfolded over time; as students’ projects were different in terms of topic, experiment/demonstration, study habits, presentation modality, and so on, these questions were based on observations and were unable to be precisely predicted ahead of time.

Artifact collection. Artifacts included but are not limited to the following:

• teacher planning materials (i.e., schedules, calendars, curriculum overview, scope and sequence documents, professional development materials)
• teacher records of students performance during the inquiry project (i.e., rubrics for presentation and written research article)
• student work (inquiry project proposals, notebooks and note documents, KIC packets, drawings, individual students’ KIC presentation schedules, students’ final inquiry presentation artifacts, draft and published written research articles)
• information sources used not captured during the course of observational field notes but visible during review of video (websites, videos, databases)

I prompted the teachers to provide teaching artifacts such as those listed above as well as some student artifacts (i.e., KIC packets, student notebooks, individual KIC presentation schedules) after interviews as well as after the KIC project culminated. For each artifact requested, I asked if the teacher would prefer I take the artifact in hard copy to keep, take a photograph of the artifact, or make a copy of the artifact. There were
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instances of each of these that occurred, though most of the time, I took high resolution photographs of artifacts.

Narrating space videos: A researcher-prompted student artifact. On the same day of the focus group interviews, I provided iPads to students and asked them to circulate the school and describe the spaces in which they did their inquiry projects. Specifically I asked them to act like a narrator or storyteller, showing visually and explaining verbally why this space was important to their learning and inquiry projects. I provided some prompts, stating to the students the following:

Maybe you’ll show me a place where you had an important discovery, or maybe it will be a place where you finished your poster. Maybe it is a place where you felt really good or a place where you helped someone out. Maybe it is a place where you felt challenged or wanted to learn more. It’s up to you.

Students then went around the school, video-recording the spaces that they identified as important to them during the course of their inquiry projects. The purpose of this specific artifact is to give students a chance to describe the spaces that they identify as important to them during their learning, which can then be triangulated with interactional data on videos, their perspectives as gleaned from their interview, as well as their KIC project artifacts (i.e., notes, article, presentation artifact, experiment/demonstration). This piece of data, along with the video data, provides a way for me to map out the spaces used by each of the students (particularly the four focal students) during the KIC projects (see a blank school map in Appendix E.)
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Data Analysis

This research includes a selection of qualitative data analysis methods and tools, used as required to “make new discoveries, insights, and connections about [my] participants, the processes, or the phenomenon under investigation,” which Saldaña (2009) identifies as “eclectic coding” (p. 51). These include preliminary analysis (Glesne, 2011); domain and taxonomic analysis (Spradley, 1980); multimodal interactional analysis (Norris, 2004) with respect to space; descriptive coding (Miles & Hubermann, 1994) with respect to activity system components; and multimodal discourse analysis (Kress, 2010; Kress & van Leeuwen, 2001) for student-created artifacts.

As per Glesne (2011), preliminary data analysis occurs simultaneously with data collection. In this case, analysis began with a) the elaboration of field notes, b) during transcription of the recorded interview data, and c) through the writing of analytic memos throughout this initial three-month period of data collection. I used analytic memos for the purposes of identifying and bracketing my subjectivities, feelings, ideas, and burgeoning analytical thoughts “in order to be open and receptive to what [I] am attempting to understand” (Ely, Anzul, Friedman, Garner & Steinmetz, 1991, p. 50). I used analytic memos and elaborated portions of field notes to help identify initial patterns that I notice during the course of data collection (Appendix F).

In addition to transcribing audio-recorded spoken-word interview data, I identified focal data from observational data. Focal data identification occurred in two stages, first in real time while taking field notes and clearly marking important instances to transcribe later due to the presence of important literacy events occurring in relation to the inquiry.

Qualitative data analysis package nVivo 11, video analysis package StudioCode, and transcription software InQsrieve were used as coding and mapping workspaces during analysis of this large data set.
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projects. Then later on, more episodes were identified while culling through elaborated field notes and noting specific instances where students and/or teachers were engaging in literacy events during inquiry. Seventy-nine instances of interaction were identified in this way across all student and teacher participants. During all transcriptions or mappings of any kind, I wrote memos discussing initial interpretations, speculations, impressions, and issues arising with the data. For annotation of videos for student action and artifact use (adapted from Norris, 2004), I used the video analysis package StudioCode (Appendix G).

Initial coding. After the initial round of data collection was completed in June, I began identifying initial themes around major ideas central to the research questions (e.g., inquiry, learning, space, technologies) using Spradley’s (1980) developmental research sequence for domain analysis. Domains were derived from the data inductively through the marking of identified semantic relationships (e.g., x as y; inquiry as felt; inquiry as self-selected) within sections of data, and searching recursively for those semantic relationships throughout the data. These domains were then hierarchically structured within appropriate taxonomies after preliminary analysis. These taxonomies will help point to resonances and tensions, assisting in the deriving focal and illustrative episodes from the data corpus. This was performed first across teacher and student interviews and then with focal observational data (i.e., episodes derived from field notes, videos, artifacts, and analytic memos). These initial taxonomies, including inquiry, kids, learning, school, space, teaching, technologies, and time (comprised of various domains and semantic relationships) are located in Appendix H.

Additionally, video data were reviewed recursively in order to report on the general ways space and materials were used in the various places within Legacy Elementary for
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teaching purposes through video analysis of teacher minilessons and identified one-on-one interactions with focal students. This video data, along with students’ narrating space videos, were instrumental in mapping the intersections of space, materials, and practices occurring for students across the inquiry projects. Initial analysis also was instrumental in triangulating teachers and students perspectives as well as intentions as indicated in their interviews with the activities, practices, and actions of the activity system. Also, initial analyses helped highlight important places where participants’ voices and actions particularly shone through, which further informed my vignettes and illustrative data.

**Mapping Students’ Use of Space.** Mapping procedures began by transcribing all ten student participants’ narrating space videos for the following timestamped descriptors in order of analytical primacy: a) particular space occupied by student (indicated by ALL CAPS); b) objects of focus (if any; indicated by ALL CAPS); c) shifts in camera angle (particularly zooms); d) student’s words narrating the space, its objects, and what happened in it with them. This transcription occurred in the program InQScribe, which allows for timestamping and easy location of specific instances visually in the video data by clicking the timestamp. An example transcription in InQScribe is located in Figure 3.5 below.
Figure 3.5. An example of a narrating space video transcription (focal student Emma).

**Activity systems analyses.** In order to understand how the KIC projects are situated in the school culture at Legacy Elementary as well as within a burgeoning culture of inquiry, I used activity systems as the primary macro-level unit of analysis. Activity systems can additionally be further decomposed into activities, then (literacy) practices, which are comprised of smaller actions, which were subsequently identified and analyzed. I have defined two main activity systems under study (i.e., KIC project pedagogy and guiding; KIC project learning and doing) which feed into a larger, overarching activity system which is the culture of inquiry at Legacy Elementary. As discussed in Chapter 2, I elected to conceptualize activity systems using third-generation activity theory (Engeström, 2015).

I adapted procedures outlined in Jonassen and Rohrer-Murphy (1999) for defining, decomposing, and analyzing activity systems for its tensions and contradictions, taking into consideration vertical as well as horizontal orientations towards activity and associated rules, community, divisions of labor, and mediating artifacts (i.e., tools, practices, pedagogy, technologies, texts, etc.) (Engeström, 2015; Vossoughi & Gutiérrez, 2010). The following procedures were employed with both activity systems, and I will discuss how this methodology applied to the teachers activity system first followed by the students’ activity system, as this is the way they are presented throughout this research.

**Defining the activity system.** The first step towards defining the activity system is by determining its purpose. This was done specifically by returning to curricular documents, participant interviews, and observational data to find instances of the KIC
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project's purpose being delineated from different standpoints (e.g., code: CHAT – purpose) in the style of domain analysis (Spradley, 1980).

Then, Jonassen and Rohrer-Murphy (1999) suggest “defining in depth the components of the given activity, namely, the subject, object, community, rules, and division of labor” (p. 71). This was done by going back through the interviews, field notes and associated transcribed audio/video data, and researcher-written, analytic memos per each of these constructs, identifying instances where each of these were illustrated from vertical and horizontal orientations (e.g., code: CHAT – rules; CHAT – community). This occurred over multiple iterations across the same data (i.e. interviews, observational data, curricular documents) set once again with each component of the activity system. The definitions of each component of the activity system as described in Chapter 2 guided my analysis and subsequent description of each of these components across the activity systems (see Table 2.1). Note that certain parts of the activity system (e.g., community, rules) were similar between the teacher-oriented activity system and the student-oriented activity system, but foregrounded different aspects while others required additional analysis (i.e., subjects, objects, divisions of labor) as the standpoint shifted.

The recursive nature of analysis, at this point, was revealed in consideration of both activity systems under study here, foregrounding the teachers and then foregrounding the students. For example, considering my initial analysis of mediated artifacts used throughout the KIC project, I did not foreground who was using the mediated artifacts, in what ways, or for what purposes. I was simply identifying them and produced a lengthy list of mediating artifacts. However, it was necessary for me to make multiple passes back through the data to identify who used them for what purposes, and this was often
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necessarily different between teachers and students. These differences in foregrounding are exemplified in Figures 5.8 and 6.7 and their associated sections on mediated artifacts in Chapters 5 and 6, respectively.

Decomposing the activity system into its component parts. Once the activity systems and its components were defined broadly, Jonassen and Rohrer-Murphy (1999) suggest decomposing the activity system into its component parts. Once again, there are two activity systems at play here: 1) KIC project teaching, guiding and pedagogy and 2) KIC project learning and doing. For each activity system, the subject, object, rules, division of labor, and community, as well as tools/mediators were identified and described broadly from both the vertical and horizontal perspectives, as described in Chapter 2. These activity system component descriptions were derived from field notes, transcribed small group or individual interactions, and interviews using descriptive coding (Miles & Hubermann, 1994) with respect to each of the definitions of those components as described in Chapter 2. I also relied on thick description (Glesne, 2011) and my immersion in the space to be able to write knowledgeably and descriptively about each of these components. The teaching activities themselves then required additional decomposition. In this case, these components are the larger activities and their associated practices built up from a) teaching actions or b) learning/doing actions.

Decomposing teaching activities. The main teaching/pedagogical activities as they actually occurred were identified using the log of teacher-stated and enacted objectives for students for each reading, writing, and library media class. Based on this analysis, these objectives fell into each of the following four categories: a) guiding writing; b) guiding design; c) guiding research; and d) guiding and assessing final presentations. Each of these
enacted objectives as sorted within these four categories were then defined as practices. Then, teaching and pedagogical moves carried out by teachers in support of these identified practices were coded within the observational data (i.e., field notes, audio, video) and were then defined as actions. Thus, the chain of activity system decomposition is as follows: teaching/pedagogical activity system → teaching/pedagogical activities → teaching/pedagogical practices → teaching/pedagogical actions. Teacher interviews were used as triangulation, particularly on days where observations were not able to be conducted due to researcher absence (two days total during KIC project). This decomposition is represented in Tables 5.2 through 5.5 in Chapter 5.

Decomposing learning/doing activities. The main learning/doing literacy-related activities paralleled those of the teachers but were framed differently given that they were enacted by the students: a) writing scientific research article; b) designing a visual presentation; c) doing research on selected science topic; and d) giving final oral presentation with visual component. Then, student practices within each activity were identified; while these were associated with the teacher pedagogical practices described in Chapter 5, they were again necessarily different because they were enacted by the students. These practices were supported by identifying actions done by students to support such practices by culling through the observational data day by day and coding for these. Thus, the chain of activity system decomposition is as follows: learning/doing student activity system → learning/doing student activities → learning/doing student practices → learning/doing student actions. As an example of this decomposition, the student activity “doing research on selected science topic encompasses the practice selecting and reading informational texts about specific topic. Within that particular
practices, and actions within the learning/doing student activity system. This decomposition is represented in Tables 6.1 through 6.4 in Chapter 6.

Analyzing activity system tensions. As a final step, Jonassen and Rohrer-Murphy (1999) suggest identifying and fleshing out the interconnections within the activity system. For the purposes of this research, the connections identified and foregrounded are the tensions or “contradictions” which are present across each of the activity systems. These tensions were identified by looking across the bulk of the coded material thus far, including domain and taxonomic codes, narrating space maps, as well as descriptive coding performed for activity systems analysis. Identified tensions were coded and then categorized by the four major pedagogical activities (for Chapter 5). However, identified tensions did not align as neatly across the four major learning/doing activities. Instead, there were tensions which were salient at the level of activity system (e.g., students’ purposes for doing inquiry and learning in school) as well as others which were salient at the level of activity system components (i.e. student perceptions of teachers and their roles, researching science topics, composition medium, designing visual presentations). Notably, there is some overlap between activities and their tensions within and between each activity system. Illustrative cases of the tension-creating pedagogical practices in action were identified and made narrative in the form of vignettes based on observational data (Miles & Hubermann, 1994). Then, the tensions amongst the interrelationships between the particular components of the activity system are named. Finally, these tensions
between these activity system components are further detailed using other data (i.e.,
interviews, video, artifacts, teacher findings) as evidence for each argument constructed.

Multimodal analysis of artifacts. Multimodal analysis of student-designed artifacts
in service of their KIC projects were performed using multimodal discourse analysis (Kress
and van Leeuwen, 2001; Kress, 2010). These student-designed artifacts include the visual
component of students’ final inquiry projects (e.g., posters, Power Points) and their
corresponding planning documents. Artifacts may also be used as a secondary source,
providing triangulation and additional support to the themes surfaced through analysis of
the observational and interview data or as evidence of the teachers’ preparation and the
students’ engagement in inquiry projects.

Trustworthiness

I will take several steps to ensure trustworthiness of this research:

Triangulation of sources. Given the amount and variety of data sources that I plan
to collect during this research, I am able to corroborate evidence from different sources
that support my interpretations and claims. For example, if something is spoken by a
teacher or student in an interview, observations and field notes can be useful in supporting
(or complicating) any claims to be made from that analysis. In this way, triangulating
across multiple sources encourages examination for negative cases or disconfirming
evidence as claims are refined (Creswell, 2013).

Identifying researcher bias. As a researcher who has developed a closeness and
affinity for this space and its people over time, there is a degree of researcher bias that I
cannot help but hold as I work through this project. In addition, as a literacy researcher in
neoliberal times, I carry a degree of skepticism about most educational policies and
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agendas coming forth from large governing bodies in their attempts to hastily smooth over the inequities, difficulties, and oppression in educational research with one-size-fits-all approaches to curriculum, assessment, and accountability of children, teachers, and schools. These two major sources of bias and more will be parsed through the writing and recording of analytic memos (Ely et al., 1991) as well as through member-checking and peer debriefing as described in subsequent sections.

**Member-checking.** Creswell (2013) writes that member-checking in qualitative research includes, “taking data, analyses, interpretations, and conclusions back to the participants so that they can judge the accuracy and credibility of the account” (p. 252). Between five to seven months after the study had taken place, I engaged in member checking with Michelle after doing all transcription of interviews as well as substantial portions of analysis. I met her in person to discuss the progress of inquiry at Legacy Elementary, which informed particular aspects of Chapters 4, 5, and 6. The goal was to send out further member checking surveys to teachers and students' families, but this was not accomplished in the time frame.

**Peer review and debriefing.** Throughout my doctoral work thus far, I have both participated in and facilitated a number of peer writing groups. I worked for one month with a small group of doctoral candidates and recent graduates that focuses on activity theory, where we shared readings and notes regarding our impressions and understandings about this particular analytical framework which is common to us. I had also worked with a supportive group of several doctoral candidates across social sciences disciplines; there, we read each other’s writing for sensemaking and cohesion purposes. Because members of this particular writing and discussion group were in fields related to
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learning, instruction, and literacy but were not necessarily in it directly, they brought about arguments and ideas I may not have considered, being so entrenched in my own writing and disciplines. Finally, I spent multiple months writing closely with three other dissertation-stage doctoral students in a structured writing group. We held debriefings about our data and findings after working for a substantial amount of time. Our conversations opened a space for parsing out our thoughts as we discussed our data, recommended literature, and shared insights with each other. We would also read each other’s writing, engaging in peer review (Creswell, 2013; Glesne, 2011). Peer review and debriefing is described by Creswell (2013) as having knowledgeable peers act as “devil’s advocate” (p. 251) in reading my interpretations and claims. It was an additional way to provide an external check on my subjectivities, which was especially important given my closeness to this space and participants.

Data inventory procedures. Given the large amount of data collected in this research, it was critical to maintain an organizational flow that enabled me to offload and keep track of data in ways that maintained security, integrity, and clarity. All data and writing was (and continues to be) regularly backed up onto an additional external hard drive to ensure there a secure backup available in the case of data loss. I procured another hard drive and used this for audio and video transcription purposes, providing this drive to my transcriptionist to securely transfer data during that time. Second, as there are multiple data points collected during observations (i.e., field notes, audio, video, maps), all data points have been inventoried by date, location, camera angle/recorder positioning (if applicable), and subject tags that reflect some distinguishable characteristic of the data source (e.g., the video shows a potentially good example of collaboration between group
members could be tagged “collaboration”). All interviews transcribed from audio and video recordings have been transcribed and tagged in this way.

**Ethics.** This research has been approved by the University at Buffalo Institutional Review Board (UBIRB) as of February, 24, 2017 and renewed as of January 22, 2018. Permission to engage in this research as delineated here was granted by the school’s principal as of March 13, 2017. All consent and assent documents were collected by March 31, 2017. All participants and locations have been provided pseudonyms in the effort to protect identities throughout this study. The only person who does not have a pseudonym is me, and I am referred to as “Katie” or “Ms. Silvestri” throughout this dissertation.
CHAPTER FOUR:
SPATIALLY CONTEXTUALIZING THE FIFTH-GRADE
KIDS INQUIRY CONFERENCE PROJECTS

The purpose of this chapter is to contextualize Legacy Elementary School and the fifth-grade Kids Inquiry Conference (KIC) under study through the involvement of various spaces as demonstrated in the activity systems described in Chapters 5 and 6. To do this, I provide a spatial history of inquiry at Legacy Elementary through the voices, identities, and practices of the three teachers involved in this study: library media specialist Michelle Stasik, fifth-grade classroom teacher (reading) Kelli Bianchi, and fifth-grade classroom teacher (writing) Mandy Short as well as the ten students involved in this research. Observations of and interviews with all participants surfaced patterns of spatial use which spoke to how space influences what it takes to enact, facilitate, and engage in student-directed inquiry. An overview of the chapter is located in Figure 4.1.

This chapter provides a history of inquiry at Legacy Elementary School, to contextualize the site as a space for inquiry overall. Then, I zoom in to describe the four main spaces across which the KIC project occurred: 1) the library (Michelle); 2) Kelli’s fifth-grade classroom, with a focus on reading); 3) Mandy’s fifth-grade classroom, with a focus on writing; and 4) the science lab (shown in Figure 4.2). Here, I will specifically map out how participants used these spaces over time, especially the characteristics, features, practices and felt experiences involved with these spaces during the KIC projects based on students’ narrating space videos and interviews; teacher interviews; and field notes and video. Finally, I summarize how space and the practices of the KIC projects work together in Legacy Elementary to reveal a culture of inquiry.
Figure 4.1. Chapter 4 Overview
Figure 4.2. Map of KIC project workspaces in Legacy Elementary
The Roots of Inquiry at Legacy Elementary

Inquiry as mode of learning, pedagogical practice, and as a larger culture has been developing over four years at Legacy Elementary School. Library media specialist Michelle Stasik is at the center of this cultural shift. It is evident that she and her library have grown over time to become a critical hub for cultivating inquiry mindsets and practices with students and faculty throughout the school. This is because Michelle possesses the qualities and enacts the practices of a broker (Wenger, 1998), or a person who thrives when they seek out and construct connections between different knowledges, choosing to stay “at the boundaries of many practices than move to the core of any one practice” (p. 109). Further, she has adapted the library over time to become a more flexible space for purposeful learning and creating rather than simply a place for book check-out and shared reading (though it certainly remains this, as well). She has accomplished this at the confluence of her educational background, varied teaching experiences - especially as a special education teacher, as well as continued support from colleagues and administrators.

Michelle Cultivates Inquiry through Brokering

To understand Michelle’s stance towards inquiry, it is necessary to understand her history is as a learner and teacher. Growing up, Michelle describes being “successful as a learner” but having specific struggles with settings with loud noises (e.g., cafeteria, bus). She explains that teachers made a point to “accommodate [her] learning style” and created quiet environments for her to study. Recalling this point in her life, she specifically links this practice of teacher accommodation of her as a learner as a partial reason for moving from becoming a music teacher, to a music therapist, to a physical therapist, and finally making the move to dually certify in general and special education. Before becoming a
classroom teacher at Legacy Elementary, Michelle worked for an adaptive recreation program, modifying sports for children with special needs. In addition to teaching elementary-aged children both as a general and special education teacher, Michelle’s experiences brought her into different district-level roles, including the district behavior specialist, an intervention specialist, and then as the district Committee on Special Education (CSE) chair.

Eventually, Michelle returned to the classroom at Legacy Elementary, but she explains that something felt different and unsettling as she resumed her former position after her district-level special education experiences. She recounts,

When it came time to come back to the classroom, I loved being back with the kids...

But being in a classroom with exposure to a limited number of children did not satisfy me. It was only 20 kids. And I had been out of the classroom prior to that in that special ed role... and in that behavior [specialist] role. I had exposure to schools. It felt constrictive to me, to be only exposed to 20 kids in a classroom. It was a different feel for me. I enjoyed it, but it just didn’t feel the same to me.

This misalignment was felt by one of her colleagues, who had indicated to Michelle that the library media specialist position was opening at Legacy. Michelle was baffled at first, as she was not qualified nor did she hold certification as a library media specialist.

I was like, “Well media, library| wow, why would you...?” “Because, you enjoy all the kids.” They saw me as a fit for this, and I said, ”Maybe you’re right! Let me see.” And it gave me an opportunity to have that whole school exposure again and to be able to work with all the kids, and that really is what I missed.
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It is here, in this new position as the library media specialist, where Michelle begins to bring inquiry into Legacy Elementary School as a whole, emerging as a broker on the peripheries of different grade levels, subject areas, pedagogies, and knowledge bases.

The fluid, boundary-crossing nature of her position is apparent, as Michelle explains on multiple occasions, “I'm not a librarian. I'm a classroom teacher.” As a library media specialist, however, she sees her position as constantly in flux. Rather than relying on a specific curriculum isolated to the library and information sciences, she explains that she “take[s] her lead from the classroom teachers... more collaboration.” This seemingly constant motion in terms of what is expected of her as a library media specialist is one Michelle embraces and feels comfortable with, speaking again to her broker identity. She juxtaposes this with her prior experiences with classroom teaching, stating that “when you’re in a classroom, to say you’re in a time of change is a time of insecurity.” However, she explains that in her library media specialist position, “it is a time of excitement because I feel like the change is good. We’re in this process of better supporting curriculum, [and] not being a place of independence but interdependence.”

Along with Michelle, school and district-level administrators view the library as a flexible, adaptable school space in tandem with her role in it. She describes the history of this seemingly constant “redefinition” of the library space as beginning with her entrance into the position and a conversation she had with the former principal of Legacy Elementary, Mr. Fox:

It’s really evolved. I mean, it started out... four years [ago]. Mr. Fox said to me, "Could you do one [inquiry] thing?" And we started with a weather unit in second grade. It started with one thing in second grade four years ago.
Michelle explains that the library has grown into a multidisciplinary, purpose-setting space: “a science-social studies-enrichment-technology-literacy support... catch-all resource classroom.” When asked about how often she teaches inquiry with students in the library, Michelle responded, “Whenever it’s possible.”

Michelle’s flexibility across these inquiry projects again reflects that positioning of a broker at the peripheries of multiple grade levels, subject areas, and pedagogical practices. At the point of this study, she is responsible for facilitating at least one, large-scale inquiry project per grade level from Kindergarten through fifth-grade. All inquiry projects take place, at least in part, in the library. These inquiry projects cross into multiple subject areas (though Michelle describes that they tend to focus on STEAM), include a “maker” component (student-created artifact), and intersect with traditional literacies (reading, writing, listening, speaking). The number of inquiry projects increase in number as students move into the upper elementary grade levels. In fifth grade during the school year, students do at least three major inquiry projects: a unit in science geared towards earthquakes; a “Discovery Hour” project, which is a subject-agnostic project in which children can choose any topic whatsoever to research; and the Kids Inquiry Conference (KIC), which is a literacy and science unit in which children can choose any topic and question to research linking back in some way to a conceptual science topic. Upper elementary students (third- through fifth-grade) can also participate in afterschool inquiry projects and clubs involving community partners such as local universities and museums, including an engineering and literacy club as well as Junior Docents. All inquiry projects include Michelle as facilitator in some way, with the library as the central hub for where student inquiries and their associated practices unfold.
Theorizing Spaces for Student-Directed Inquiry

While the library and Michelle feel like the apparent “center” of all inquiry projects at Legacy Elementary, the spaces where inquiry is enacted over time was actually spread across the school. During other points of the year, Michelle clarifies that they’ve used multiple spaces for inquiry, discovery, and experimentation with students, including the library, gym, teachers’ lounge kitchen area, the outdoors around the school, and even going to other schools in the district (e.g., high school automotive shop). Michelle thinks that for inquiry, “spaces are unlimited. If you need them, I think we could get to them.” The spaces used in the KIC project even extended beyond Legacy’s walls and into students’ homes, where many students were encouraged to do their experiments and initial demonstrations at home over the Spring break, if possible. Despite this, at Legacy Elementary, four main areas were used for the KIC projects under study here: the library, Kelli’s classroom, Mandy’s classroom, and the science lab classroom.

Though Michelle made a great deal more observations and connections between space and inquiry throughout the study, all three teachers made a point to emphasize the importance of ownership in a shared space and with relative freedom of student movement in these spaces during inquiry projects. These aspects of constructing a shared community space, student movement, and access to materials link directly with the choices available to students throughout KIC and other inquiry projects done throughout the year. Each space used is now discussed as conceptualized by the teachers with relation to pedagogy.

Michelle: The Library as Inquiry Space

Creating spaces for student-directed inquiry learning was and continues to be a primary concern for Michelle in her library and around the school. Once again connecting
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to her special education background, she sees the design of learning spaces as a form of accommodation, so that if a space “didn’t work” for a student, she could “figure out how [to] adapt things to give everybody a learning space or accommodation that could fit their needs.” For Michelle, it is important that the library can “spark” students’ thinking as well as be a place they can “feel powerful in their learning.” Michelle is particularly devoted to how the library supports the choices of her students in their inquiries from the standpoints of access to materials, energies, purposes, as well as aesthetics.

**Providing access to materials.** Michelle is always thinking about how to provide more materials for her students, particularly when it comes to craft and maker supplies. Ideally, she would “love to have a wall of resources that when they go to design, they could just use them,” inclusive of (but not limited to):

...plastics and cardboards and papers and markers and pencils and clay and glues and gluesticks and just lots of different materials, washers and ping pong balls...

foam cups, toilet paper rolls, Styrofoam cups, plastic cups. Any kind of resource they could create things out of.

Though libraries are chiefly known for books and access to databases of information, Michelle sees unfettered access to the aforementioned materials as just as much part of the “spark” that helps children create, think, and inquire. Ideally, she also sees access to such materials in a space as linked with purpose: “When we look around the room, everybody has purpose. Whether they’re on an iPad, a computer, [at] the wall with the resources, they have what they need.”

**Changing the nature of the library space.** Furthermore, the furniture and physical arrangement of the library space are used flexibly by students, which Michelle describes as
being, in part, by her intention and design. This is because the library was not always a
place of such openness and flexibility for movement. Michelle describes that before she was
the library media specialist, “people [kids and teachers] were so engrained” in how they
exited and entered the fishbowl-type library, which had numerous doorways for access.
The library media specialist prior to Michelle had created a rule with accompanying signs
that impressed faculty, students, and staff to enter through one particular doorway and exit
out of another specific doorway – and these were the only points of entry to be used to the
library. This rule was so pervasive in the school space that teachers and their students
would avoid using a closer doorway to their classroom in order to follow the rule. Michelle
took down the signs marking these doors specifically but despite this, “teachers would
show up at one door to drop off and show up at the other door. I couldn't figure it out for
the longest time.”

Michelle began to understand that at that point, the signs were superfluous; the
specific ways of entering and exiting the library was embedded in the very walls, doorways,
and design of the school through practice over time. Michelle said it took “almost half a
year” until teachers and students began using all of the doorways to the library freely and
conveniently. Michelle’s shifting of movement practices in the library made the space more
commensurable with her orientation towards ownership and choice in learning; of the
library, she says “This is our space. This is that room of engagement. So hopefully it always
feels equal. It always feels like, ‘Let’s use it.' We.”

**The library space used as a resource.** Now, the fifth-graders enter, exit, and use the
library flexibly during their class’s library time as well as open library times throughout the
school day. These students use multiple surfaces and seating arrangements in the library.
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Often, students were observed using their free time (what Michelle liked to call “mental recess”) in the library to play games, find videos, and listen to music on the desktop computers. Students working on inquiry projects would often cluster around Michelle’s main “teacher” spaces: the first being her Smart Board area where she led lessons and the second being the book checkout station. This is a testament to Michelle’s aim for joint ownership of the space, as she proclaims not “feel[ing] super confident in owning the space” without the students. Even spaces that she uses most frequently as a teacher (i.e., leading mini-lessons, providing texts to students) are spaces that students feel comfortable in using for themselves without necessarily obtaining explicit permission. A clear example of this was when three children gathered around Michelle’s Smart Board workstation while they took turns finding research for their inquiry projects, which was then projected onto the large Smart Board screen. Pairs and groups of three sat in chairs at round tables, reading, taking notes, or creating graphs for their projects on their iPads. A few students could be seen isolating themselves in between the bookstacks, curled up with their iPads and a pair of headphones while listening to BrainPop Jr. videos or reading. Multiple students moved fluidly from place to place, never stopping to sit but also continuing to work on their inquiry projects. Dimitri, as will be explored more in Chapter 6, is a particularly salient example of a student who used the library space flexibly as he worked and his purposes changed over time. Other students, like James, would hunker down in one seat and sit the entire time working on multiple aspects of his inquiry project, chatting with other students along the way and eventually ending the period by playing a game on his iPad. Students used spaces in the library flexibly, strategically, and purposefully during their inquiry projects.
Student purposes and energies. Michelle allows student energies and purposes to guide use of the space. Michelle understands the feel and ambiance of classroom spaces as largely “what the person in charge is comfortable with.” This helps account for differences in what learning or even “free time” look like across classrooms in a school, specifically distinguishing between teacher-directed energies and purposes and those guided by children (i.e., “kid energies”). Michelle attributes variance in the source and intensity of these energies to the overall feel of a classroom at a given time.

I feel like sometimes, when you go into [a classroom], there are moments where you feel student energy, but a lot of the time, the classroom has to be teacher-directed. It just feels that way. I feel like when you go into an art room, a music room, into the gym, there’s a different feel, cause it’s kid energy. You get them for such a limited amount of time, there’s more doing.

For Michelle, there is nothing inherently problematic with time and spaces that tend towards teacher-directed energies or those which favor students’ energies – they serve different purposes. On the one hand, teacher-directed energies are characterized by clearer temporal and directive boundaries, described as having more specific timing, redirection, and definitive “everybody stop and everybody start” times for working. In spaces with student-directed “kid energies” – the kind she links with inquiry learning – the teacher is constantly moving with “ebb and flow” and “checking in” qualities rather than those emphasizing cut-and-dry, whole-class directing. Michelle explains that she (as the library teacher) is giving instruction on a more individualized basis:

You are more of a check-in, and then you tell them, ‘Okay, you go to the next thing. Oh, you look like you’re ready for this. Alright, you’re here? You go to this.’ You’re
always checking in and moving... you’re always moving from place to place and just kind of tapping them along to the next thing.

When kid-directed energies are guided by their own purposes and further helped along by teachers as necessary, Michelle’s sees her classroom looking less like the traditional, quiet library space and more as what she describes as a bustling “coffee shop” or “college hub” type atmosphere, full of children engaged with their work. She describes that what she perceives to be disengaged student behaviors, such as habitually leaving the room to go to the nurse or visit the bathroom, are incredibly lessened during these times. Instead, students are having conversations with each other or the adults in the room, with “pencils going” and “pointing at screens.” Michelle describes the library functioning at its most optimal during inquiry, noting

[The students] don’t look like they’re bored. They don’t look like they are not engaged. They don’t look like they need anything. They look self-sufficient... it looks like their needs are being met. Whenever I do something right and I step back and I look at the kids, I go, ‘This is it.’ Like, you catch it for a minute. When they don’t need you. It’s that feeling. That’s what inquiry looks like to me. When they don’t need me.

Michelle makes clear that at its most ideal, inquiry is demonstrated by student engagement, autonomy, and self-reliance.

**Spatial (re)design.** Michelle is currently focused on learning how to manipulate her library space in order to better support her students’ varied inquiry needs. While I asked each teacher participant how they saw their space contributing to their students’ learning and what they would change if they could, Michelle seemed especially attuned to how spatial arrangements impacted her students learning. She indicated that she had recently
attended a professional development workshop around designing space for learning environments supportive of inquiry; she spoke at length about changes that she could make. She also showed me maps of the library designed by a handful of fifth-grade students, revealing what improvements they would make to their space if they had the chance. This impacted her thinking around spatial redesign of the library. Finally, Michelle’s own learning experiences helped form her ideas around how she might change the library. When discussing how she would like to fill the library with real-life photographs to spark students' creativity (see Table 4.1 below), she reminisces about her Master’s college course in where “We had to come up with an idea. You must have a problem to solve. And just to spark it, we would just look at magazine pictures.” For Michelle, implementing “real pictures” of “real life” in her space would act as a catalyst to student creativity.

Furthermore, Michelle and I had several productive conversations before, during, and after the inquiry projects about how to potentially create new spaces for different purposes for her students to support their inquiry projects; we even spent the last day of the 2017 school year at Legacy Elementary measuring book shelves and mapping out potential furniture moves that would help facilitate the creation of such new spaces. At one point, Michelle had asked her principal for an additional classroom space (dubbed a “purpose-setting space”) that would be outside of the library for students. This would be a place where she would teach her mini-lessons and provide that initial direct instruction during class library times. The impetus behind this decision was to free up the library for students who had already set their purpose for using the space for their own learning, and ideally entering the space once that purpose was set and requiring minimal to no guidance
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at that point. Table 4.1 reflects Michelle’s ideas for redesigning her classroom spatially and
aesthetically along with the underpinning rationale regarding students’ learning guiding
her decision making.

Michelle’s orientation toward space is one that is reflective and shifting to
accommodate the fluid needs of her students in their research, inquiries, making, and other
creative endeavors. She explains that optimally, she wishes the library to provide “more of
an opportunity for kids to come in here as an alternate place to create,” supporting that
“creative energy... their energy” that students engender as they engage their own self-
directed purposes for learning tenaciously within school spaces.
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Table 4.1
Michelle’s Ideas for Library Space Redesign

<table>
<thead>
<tr>
<th>Aspects of Space</th>
<th>(Re)Design Choice</th>
<th>Reasoning and Desired Impact on Student Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td>Changing library color scheme</td>
<td>To “brighten the place up” and make it more “inviting”</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Changing border around library ceiling to include photographs</td>
<td>To spark ideas and creativity.</td>
</tr>
<tr>
<td>Choice of workspace</td>
<td>Opening up new kinds of areas for students to work.</td>
<td>To give students a sense of relative privacy.</td>
</tr>
<tr>
<td>Materials (books)</td>
<td>Creating visibility for a greater variety of texts</td>
<td>To give students a physical space for their ideas-in-progress in the library.</td>
</tr>
<tr>
<td>Materials (storage)</td>
<td>Cabinet space for multiple grade levels</td>
<td>“Ways for kids to do work and have a place to put it, some kind of cabinet area that if you’re a work in progress, maybe you could put your stuff in a bin and store it [for] when you come back next time.”</td>
</tr>
<tr>
<td>Materials (maker supplies)</td>
<td>Bookshelves around the room filled with maker materials</td>
<td>To make books more visible.</td>
</tr>
<tr>
<td>Mobility</td>
<td>Using furniture and carts to aid repositioning</td>
<td>“I wish that books were able to be more easily seen.”</td>
</tr>
<tr>
<td>Purposeful space (design process stations)</td>
<td>Specific “square” stations dedicated to specific processes</td>
<td>To provide the ability to repurpose the room as students require it.</td>
</tr>
<tr>
<td>Purposeful space (makerspace)</td>
<td>Central location (“square”) for making near supplies.</td>
<td>To provide students easy access to a variety of maker materials.</td>
</tr>
<tr>
<td>Purposeful space (purpose-setting)</td>
<td>Classroom “outside” of library specifically for direct instruction and student “purpose-setting”</td>
<td>“Four bookshelves around the middle and have them all filled, have four narrow shelves, fill them with supplies. Maybe all the way at that end, have another bookshelf filled with supplies.”</td>
</tr>
<tr>
<td>Seating arrangements</td>
<td>Multiple spaces for student work mindful of student bodies and their varied needs.</td>
<td>To provide students easy access to a variety of maker materials.</td>
</tr>
</tbody>
</table>

Kelli: The Reading Classroom as Inquiry Space

Kelli, who taught the reading component of this project to the focal students in this study, conceptualizes her classroom as a space for inquiry as a dynamic and choice-based. She describes that inquiry in action spatially looks like “kids working” with “options so they don’t have to stay at their seats... like quieter spaces, more private spaces.” Additionally, she acts as a facilitator “jumping around the room and helping everybody.” Kelli comes to spatiotemporally contextualize her reading block during the KIC projects as one where...
pedagogical decisions determine both how the space is used and who comes to control it. Her optimal spatial design is one chiefly concerned with creating mindful and open spaces for children’s bodies, increasing student access to materials, and creating an infrastructure to better support increased technology use during self-directed student work.

**Pedagogical decisions as characterizing classroom spaces.** As Kelli describes her classroom from a spatial perspective, she uses two words consistently in describing the inquiry projects: *controlled* and *messy*. Interestingly, these words are not necessarily placed dichotomously with one another, but rather Kelly distinguishes moving back and forth between more and less “controlled” or “messy” times throughout inquiry projects she facilitates with her students, including the KIC project. When she discusses the nature of a more controlled space, she sees this as students “all working” and “more conferring with [her]” independently with respect to their inquiries. Messiness, on the other hand, is related to movement and how the space is used for multifarious, student-driven purposes with “kids all over the place, materials all over the place.” She also relates it to her movement and focus throughout the classroom.

**Control and messiness.** Furthermore, control and messiness are related to specific parts of students’ inquiry, as Kelli explains, “I think it depends on what part of the inquiry they’re at.” When discussing the inquiry projects and space, Kelli identified four components of inquiry: 1) brainstorming, picking out topics; 2) narrowing topics, forming a question; 3) research; 4) presentation development (i.e., “project part,” “end part”). Each of these parts were described by Kelli to not only be pedagogically distinct for her, but also helped to determine the nature of the space in terms of messiness and control as well as collaboration and directedness based on her and her students positioning. Table 4.2 below
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reveals characteristics of pedagogy and space across the different aspects of the inquiry projects.

For Kelli, she often linked “messiness” and activity in her classroom space with complexity on either or both the students’ end or her own as a teacher in different phases. Again, it is worth stating that messiness is not necessarily connected with the degree that which the classroom space is “controlled” – that is, students working quietly, independently, and utilizing practices more aligned with the discourse of school culture on their inquiry projects. Instead, “messiness” is related to movement and focus, whether it is her moving from student to student and needing to think on her feet, or the students doing the same. For example, Kelli (as well as Mandy and Michelle in their classrooms) would make a point to circulate and check in with all students – Kelli used a chart to facilitate this and ensure she touched base with each student at different points of the project (Figure 4.3).

Figure 4.3. Kelli’s clipboard with student chart for checking in on inquiry projects.
### Table 4.2

*Kelli's Connections Between Inquiry Phase (Reading), Pedagogy, and Space*

<table>
<thead>
<tr>
<th>Inquiry Phases (Reading)</th>
<th>Messiness for student</th>
<th>Student mobility</th>
<th>Teacher-directed</th>
<th>Directedness</th>
<th>Facilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Brainstorming [and] picking out topics&quot;</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>&quot;Narrowing topics [and] forming a question&quot;</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Research&quot;</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Presentation development (&quot;project part&quot;)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

**Kelli's understanding**

"But when they're picking out the topics, they're kind of all over the place... We did a jigsaw around the room to get the ideas started and brainstorming, and even trying to form a question, doing that, so it was a little messy that way."

"The beginning part's messy for me, I think, as a teacher. They're all working. It's a little more controlled... when it came time to narrowing it down, it was more controlled and it was more conferring with me to get them to a question that they liked but that would still work, like for KIC, that was testable."

"That's where it got messy. The research part was where everybody's all over the place, and the readability's hard with everything, and so you're going around like, frantically trying to help people, making sure they're getting everything. Do they even know what their question means? ... Are they defining stuff?"

"Cause the project part's loud and messy. Kids are all over the place, materials are all over the place, but it's a good kind of messy. There's talking... they're not being inappropriate, but they're collaborating. They're asking each other for opinions or asking each other for help, or 'Can you get me this? Can you help me with this?' When I was watching kids at the end, when they finished and other kids were not, they were helping them trace over letters with the sharpies, like helping each other. So the end part's super messy for the kids."

However, Kelli would necessarily use her time chiefly to work with students she noticed needed more intensive help with a particular aspect of the project. This was considered "messy for [her] as a teacher" because she would need to shift her gears pedagogically as she addressed individual students’ needs. Because students were at different points throughout the projects and worked at their own paces, this meant that
students’ needs were incredibly diverse throughout and required an emphasis on that just-in-time, on-her-feet guidance from Kelli.

The inquiry projects were “messy” for students when they were engaged in research work and presentation design work. What is evident about both the research phase and the presentation phase – both of which were under Kelli’s purview as the reading teacher – was that there seemed to be a great deal of smaller practices required for students to find success in their goals. These practices are identified below, but these will also be further delineated and explored in Chapters 5 and 6. For now, it is important to note here how such practices are implicated in the way space is used and constructed across this project.

Research. The activity of doing research requires students to engage in numerous literacy practices as described in Table 4.3. While research tends to be more individualistic in nature, feeling more spatially “controlled,” as described by Kelli, it is still complex and messy. Research oftentimes required a great deal of individual or small group guidance outside of the daily mini-lesson taught by Kelli at the beginning of their work time depending on individual student needs. Kelli would meet with students up to eight minutes at a time (though usually less, as she was circulating) depending on the specific needs of the students.
Presentation design. Presentation design also required enacting multiple, complex practices (Table 4.3) in order to create a visual representation of their findings. The presentation design period is both messy in its complexity as well as lacking in that “controlled” feeling, and thus the character of the space is substantially different. It is also an almost entirely student-driven phase of the project. Student desks are no longer possessed by individual children, but rather posterboards can be seen spread across cluster of desks while others are splayed on the rug and the floor tile. Yet other students prop their posters up on chairs or work on their presentations anywhere they can find a space – in a chair, at Kelli’s seat at her desk, on a yoga ball, along the countertops, leaning against the wall with iPad in hand, or sitting on the floor. Students are walking around the
classroom (and sometimes outside of it, to the science lab, Mandy’s classroom, or the library) with drawing materials, iPads, posters, pictures printed from either Kelli’s printer or Michelle’s printers in the library, scissors and glue, and rulers. Students are talking with each other as they work, asking each other questions about their projects, requesting help, practicing their presentations (some even timed themselves) individually or in front of peers, and innumerable more practices and configurations of students working together or apart that unfolded organically and as needed. Teacher direction was at its most minimal during presentation design, and student engagement seemed to be at its most energetically focused. At this point, the teacher’s role was to not to instruct or guide but facilitate technically-oriented tasks like printing, emailing photos or presentations to teachers who could access printers more easily, and troubleshooting technology problems. The energetic intensity, purposefulness, and fluidity of student movement in this space and others during presentation preparation and design spoke to a shared ownership of Kelli’s classroom – the final week of the inquiry projects did feel as though the students “took over” the space.

**Shared ownership of Kelli’s classroom: The students “take over.”** Similar to Michelle’s library space, Kelli sees her classroom as a shared space with her students. The way that she sees this space as both hers and her students is largely due to how students choose to use space for their own needs and comfort while doing work independently. She explains, “I think space and atmosphere are important when working... nobody wants to be crowded.” Her students are permitted to work where they are most comfortable.

They spread out. I let them have free range. I let them work where they’re comfortable, especially on the project time [presentation preparation]... even sometimes... when they’re trying to find something else on the iPad. A few kids
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sometimes need to be away from others, so I let them find different spots in the room.

Kelli not only permits students to “take over” her classroom space flexibly during their inquiry projects but also encourages it by way of offering different seating options in different parts of the room. She describes, “I have different seating in my room, if you haven’t noticed. I have the yoga ball, the rocking chair.” Recalling Owen (Figure 4.4), she pointed to the rug space during our interview, saying, “Well, one kid might go over there and spread out on the ground.” She also described that “some kids might move to the back table,” about a couple children who tended to work at a table in the back of the classroom that was covered in Kelli’s own teaching materials, lesson plans, and supplies. There are multiple other examples of this shared spatial ownership of Kelli’s classroom that occurred throughout the KIC projects, in which the students “take over the space, and they do what they need to do.” This is most apparent when students are working on their presentations, and the classroom space is no longer delineated by individual student desks, teacher tables, rug areas, and floor – instead, every spare space is taken up by students working on their presentations. The array of photos in Figure 4.5 below reveal this transformation of the room as it typically was constructed and how it looked during presentation preparation.
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Figure 4.4. Owen “takes over” the space on the rug and makes it his workspace for the day.

Re-imagining space in Kelli’s reading classroom. Each participating teacher was asked how they might change their space to better facilitate student inquiry projects if they had unlimited resources and means. Kelli chose to focus her imagined redesign on opening space to accommodate student bodies and movement while they worked, including access to technologies and technology support directly in their classroom space. She first described the desire to change the relative smallness of her classroom, directly attributing this to her class size of 25 students:

I think I’d want it more open. It’s just hard because these rooms are so small and there’s so many kids… If I had five less kids, this room would be a completely different place, because I would definitely spread things out more.

Kelli then links the importance of being able to spread out and own a space to the bodily expectations of students enculturated in schools. She explains, “We expect a lot out of these kids, to sit this long and be controlled.” In her time as teacher, Kelli has observed many children who struggle to sit for long periods of time, such as a half-hour or 45 minutes, articulating that, “Some of these kids are just not able to handle a full day of this sitting.” She provided an example of a student who would leave his writing classroom next door
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when he “got up and showed [her] every time he wrote a whole page in his writing notebook.” Kelli sees her student’s act as accomplishing two objectives: 1) he was celebrating his success in completing what was a difficult task for him, and 2) “he was getting up and moving because he probably needed it.” Kelli's mindfulness towards student movement aligns with her demonstrated practice of enabling as much student movement and choice about how their bodies occupy space as possible within the constraints that exist (i.e., physical classroom size; whole-group focused instructional time).

Kelli also sees her current classroom space as needing improvement in terms of her students having immediate access to specific kinds of materials. First, she explains that there are certain technologies that would help better support her students if they could be located in the classroom: “Maybe having more printers – color printers – in the room... More charging stations around the room so they’re not limited to right there (gesturing to the iPad cubbies with attached chargers).” She also notes technology-related time constraints created when students are being unable to print from the iPads (i.e., they must first send it to a teacher to print from one of their connected laptops).
An additional time constraint is created when technology problems arise, but there are no dedicated technology support personnel at Legacy Elementary. Instead, teachers have to “help-desk it” – that is, put in a request for technology help into the district
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technology support – and wait for a response. More often than not, Kelli and Michelle are consulted to create workarounds for technology problems and access.

Provided an unlimited budget, Kelli would also provide increased access to a plethora of design-related supplies, including individual boxes containing a “ruler, colored pencils, crayons, markers, [and] Sharpies cause they always want Sharpies.” Currently, she buys both Sharpies and printer ink out of her own pocket and only has “two resource stations” which supply students with design-related supplies. In her considerations of redesigning her classroom, Kelli seemed most concerned about accommodating her students’ needs for bodily movement and comfort as well as a more unfettered access to technology and other materials for design.

Mandy: The Writing Classroom as Inquiry Space

Mandy was responsible for teaching the writing workshop unit that paired with the KIC projects: a scientific research article. Similar to both Kelli and Michelle, Mandy also saw her space as one shared with her students with an emphasis on space is validated as a resource both for her experientially but also professionally, particularly as linked to student-directed research projects like KIC. She expands on this idea further when she argues that because technology increases access to information, it delimits spaces where research can take place. Mandy’s ideal reconfiguration of her classroom space also involves a mindfulness of how students move and interact while doing inquiry, but she also emphasizes a desired increase in human resources along with the technological to better support her students’ inquiry projects.

The role of permission and validation in shared classroom spaces. All three teacher participants in this research have a similar approach to the materials and spaces in
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their classroom. First, there is an underlying belief that students and teachers share space
and materials, and second, the practices of such a space should be such that children can
move through and use the space as needed while they direct their own learning. For
Mandy, her take on the “shared space” perspective is one rooted in permission and
validation. She describes “space in the room” as one of the most important resources in
inquiry teaching and learning, and that she is intentional about how she “set[s] it up, so that
they’re pretty self-directed in that area.” Part of this is establishing trust between students
and their teacher, subsequently cultivating practices around how students gain access to
materials and spaces in the room as it becomes necessary for them: “I try to put student
supplies in places where they can just go get what they need. They don’t have to come up to
me and ask for things... within reason.” This “within reason” is a tension that Mandy
identifies as part of developing trust and a more open permissiveness on her part as a
teacher. When discussing student choices to sit in places with differing amounts of lighting
or the use of headphones for students to listen to their own music, she adds the caveat that
she is “okay with that as well" and it is permissible

Within reason... as long as they are being productive and not abusing the privilege...
and they’re seeing it as, this is for my learning versus is this is just for fun, which can
sometimes be hard to define, depending on the kid.

Once this trust is developed, there is one less step required for gaining access to supplies or
to a space where they can work best in the classroom. In this way, students are encouraged
to direct themselves and their learning without the help of a teacher. Through permission
to use materials and space with relative freedom, students gain another facet of ownership
of their learning.

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Validation through authentic purposefulness. Interestingly, Mandy expands her conceptualizing of the role of permission and space as related to inquiry from the scope of her classroom to a larger institutional and cultural perspective. Mandy sees school in general as positioned as a space for students to perform being a student rather than a space for authentic thinking and inquiry. She sees any student-directed inquiry projects as challenging this persistent aspect of school culture. She feels that her students “need to understand that the learning is for them – it’s not for anyone else,” and explains that inquiry-based learning is “hard for them” because “so many of them perform in school for their teachers and not for themselves.” Inquiry is positioned as a way for teachers to also attend to such a cultural shift through supporting their students in taking ownership of their own learning through their interests, curiosities, and an authentic desire to know more: “I think that inquiry leads us into wanting them to perform for themselves and taking on this self-directed learning goal for life.” Mandy sees inquiry functioning in school spaces as a way to push back against the typified performance of doing school, following rules, and pleasing teachers. Instead, Mandy sees inquiry as a way for students to “perform” for themselves – otherwise, to engage in authentic learning for purposes that are self-motivated.

Mandy aims to help her students carve out spaces in which they set purposes for their own learning, thus challenging this particular status quo. For example, she has a four-point “Rate Yourself” that encourages students to self-assess their work progress for that day at the end of a given class. She created opportunities for students to self-assess their productivity and provide reasoning for their assessment by saying,
Everyone right now, look up at the ‘rate yourself chart’ and choose a number to award yourself today. Everybody should take a vote right now, give yourself a score, maybe give yourself some half points. Put your hands in the air with what you awarded yourself and why (Figure 4.6).

Figure 4.6. Students using Mandy’s “Rate Yourself” system for work progress (four is the highest; one the lowest)

In answering the “why” part of this question, students who were called on gave answers that were honest in evaluating their progress that day, such as “I gave myself a 3 because I wasn’t working the whole time, but I still got work done,” and “I gave myself a 4 because I finished paragraph five and went back to paragraph three.” This promotes a space where students have the opportunity to reflect on their own work, considering what was successful and what could have been done better – and perhaps, what could be done even better tomorrow when they come into Mandy's writing classroom.

Validation from institutional powers. Mandy’s understanding of how space can and should be used to support student learning is one that is informed by her own
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experience working with children using the workshop model as well as during these inquiry projects over time. However, Mandy supports her own assertions about student self-directed learning and their flexible use of space during such times (i.e., choosing seats around the room that enable them to do their best work) with validation from professional development and district administration. Like Kelli and Michelle, she notices that “some kids prefer just laying on the mat.” And while she admits that she has gone “back and forth” on that particular issue, professional development has provided her with support for her decision to be flexible with how students use her classroom space to work.

The consensus [professionally] has just been what works for some kids doesn’t work for others, so if that kid always wants to go to that mat and they’re doing their productive work there and they’re happy and they’re not bothering anybody else, why not? Why can’t they be laying on the mat doing their work? So I try to be open to what the kids want and need in that moment.

In a similar fashion, she notices that student-directed learning is garnering more and more support at the district-level, and this empowers Mandy in her decision-making around her classroom space. She explains that students using classroom spaces to collaborate and converse around projects is now being encouraged, defining this as an evolution “away from the traditional forms of teaching and learning.” She explains that administrators have imparted to teachers,

We don’t expect your room to be quiet when we walk in. We do want a constant lull and buzz. We want the kids to be self-directed. We want to see that they are talking to teach other. We want them to have many opportunities to reflect and discuss.

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This validation from the administrative level is valuable to Mandy, as she explains that “having like-minded colleagues helps a lot with the expectation of all of this.”

**One-to-one technology as opening space.** A critical observation made by Mandy in her discussion about space during our interview was how each student having their own iPad actually served to expand use of space, particularly as students were doing research. Without the mobility of the internet-connected iPads in the hands of each student, inquiry projects would become spatially limited to the library because “that’s where research materials are.” She describes that “Without internet, without the use of iPads, we probably wouldn’t be able to take on an inquiry project of this nature. It’d be more limited. It could not be a unit of study because we’d only be able to do it during library time.” Furthermore, she links this to student-directedness, explaining that the projects “wouldn’t be as authentic and meaningful” for the students because their access to resources about their chosen would be limited to what is in the library – which could theoretically impact topic choice if the library does not have relevant books about specific subjects. While Mandy offers the workaround of “living off an [iPad] cart and sharing” to provide that one-to-one device access, she acknowledges that the cart system is more time-consuming – student access would not be as immediate and as firmly entrenched in their daily practice as what working with one-to-one devices throughout most of a school year has provided to the fifth-graders. Mandy explains that “there would be less time for inquiry” and “students wouldn’t be able to delve as deeply and get fully immersed in their topic areas.” In short, use of the iPads enable students to do their KIC projects anywhere in the school on virtually any topic of their choosing, though Mandy also describes major tensions regarding this affordance, which will be discussed later in Chapter 5.
Re-imagining space in Mandy’s writing classroom. For Mandy, when asked how she would redesign and reorient her space to better support her students in their inquiries and self-directed learning, she, like Kelli and Michelle, foregrounded the importance of student bodies as they moved through space, as well as the importance of having access to human resources as well as digital technologies. She mused about the prospect of stand-up desks and different types of seating “to encourage more movement” rather than seatedness default body positioning for her students. Mandy theorizes that “inquiry projects need movement to just keep going,” and wonders if “ball chairs” or “wobbly chairs” could be an alternative to traditional, stationary seating.

In addition to creating new opportunities for movement and physical activity in her space as supportive of her students’ inquiry learning, she emphasizes the need to bring more teachers and support staff into their space in the effort to guide students. In addition to “hiring more teachers to support the [inquiry] work” because “we always have students in need of guidance,” Mandy inquires about more support staff as well as photographers as documentarians to focus on each of the children. The purpose of this would be to tell the stories of the students’ individual and collective journeys throughout the inquiry projects, culminating in “a slide show and have an end product that showed their process as well.” Furthermore, similarly to Kelli, Mandy sees the importance of expanding students’ access to digital technologies beyond the iPads; in this case, she finds that laptops afford more stability than iPads without sacrificing much in the way of portability. In the way of restructuring her classroom, Mandy, like the other teacher participants in this study, tends to focus on creating more opportunities for movement to promote student engagement and self-directedness in their inquiry projects.
Theorizing Student-Guided Spaces for Student-Directed Inquiry

Students: The Science Lab Classroom as Inquiry Space

The science lab is a classroom adjacent to Mandy’s fifth-grade classroom. Under typical circumstances, the science teacher teaches topical science units in this space. However, during the inquiry projects, this is not the case. What distinguishes this space from the other three spaces already discussed during the KIC project is that typically, there was no dedicated teacher monitoring this space constantly. Instead, teachers and other professionals (i.e., teachers’ aides, myself) circulated in and out as students worked to check in with their progress, the door to the room is kept open, and students are trusted to use the space to work on their projects. The student-directedness created a different kind of energy (what Michelle called “kid energy” earlier) in the science lab during this project, thus impacting the character and feel of this space. In addition to being identified by students as a place where they gave their final presentations (many student participants happened to present in the science lab on KIC conference day), the science lab was also described as a place stocked with materials where students could conduct experiments, spread out with their presentations, and work more effectively, whether on one’s own or in collaboration with others. The space also seemed to make acceptable more out-in-the-open social conversations alongside conversations relating to the KIC projects themselves compared to the other classrooms. However, students’ actions consistently revolved around designing and constructing their presentations, frequently leading to collaborative work on projects between classmates (i.e., in the same homeroom) and grade-mates (i.e., in the fifth-grade).
Conducting experiments. While the research, writing, and presentation design components of the KIC project were mostly done at school, teachers asked students to do their experiments or demonstrations over Spring Break at home. However, the teachers understood that this would not be the case for many students. Mandy explained in her interview that “some of the kids decided, ‘Well, my experiment is going to require me to test a bunch of kids in the room’” or “some of the kids don’t have supports at home” to do science experiments. Teachers instead “set aside their own time to spend with the kids, whether it be after school or during a lunch, during a planning period.” Oftentimes, such teacher-facilitated experiments and demonstrations happened in the science lab. This was particularly salient to the students who were also English Learners, according to Kelli. Toward the beginning of the project, she worked with a handful of the ELL students in her class with the ESL teacher on their selected topic of plant growth in different conditions (Figure 4.7).

Figure 4.7. Kelli (left) labels her ESL students’ plants for their KIC project experiment in the science lab.

Other teachers who had students that were unable to conduct their experiments or demonstrations at home gathered three of these students together in the science lab. They
did this all in one day to make sure students had this opportunity while also fitting into the
teachers’ limited schedules during the school day. The science lab contained all of the
materials needed to create the demonstrations they needed for their research topics (e.g.,
composite volcano demonstrations required a cup or bowl, cornstarch, and a small weight).
Because students were expected to somehow show their experiment or demonstration for
reference during their presentation, the teachers documented these demonstrations on
their phones or iPads through photographs and video.

Yet other times, students conducted their experiments or demonstrations in the
science lab without explicit teacher guidance. I observed two students who worked alone
on demonstration kits owned by the science lab which related to their topics (e.g., electrical
circuits). These students also were encouraged to capture their demonstrations in some
way, so they rearranged the science lab in order to take clear video or time-lapse footage of
their demonstrations in action. The space was relatively easy to manipulate in this way
because the desks were movable and no one else was using them at the time.

The science lab provided an open area for students to do messy, time-consuming,
and/or noisy work without disrupting the work of other students in the classrooms. Other
advantages of using the science lab included its proximity to the fifth-grade classrooms (i.e.,
it was podded together with the fifth-grade classrooms) as well as its lack of use by other
teachers and grade-levels at the time of the KIC project. The fifth-grade teachers and
students had basically unfettered access to this opened space during those weeks for the
purposes of doing experiments and demonstrations.
The social and academic together. The science lab was most frequently used by the same handful of students from Mrs. Bianchi’s class, including Owen, Aiden, and Fatima. When these children worked in this space, the talk ranged from academic topics (e.g., asking a friend about where he should put his pictures on his KIC poster or how to spell a word) to joking and teasing (e.g., “Why did the golfer change his pants? Because he got a hole in one.”) as well as posturing and messing around (e.g., one boy saying to the others he was going to beat them all up, eventually changing his tone of voice from serious to silly and causing the boys in the room at the time to laugh). What was interesting is that during most of this time, the boys were all engaged with working on some aspect of their presentations. Occasionally, two students would work together to solve a problem or to share a video. For example, one of Owen’s classmates found a video about his topic of waterspouts, queued it up, began playing it, and then walked over to Owen to show him at the table where he was working on his presentation. The boys struck up the following conversation (Figure 4.8):

Classmate: Look at this! Watch this.
Owen: (turns attention to video) Daaang!

[both watch the video for about three seconds together]

Classmate: Right there. They can turn into waterspouts. (points to the screen)
Tornadoes can turn into waterspouts. And then waterspouts can turn into tornadoes.
Owen: (looks back at his iPad) I’m about to turn|
Classmate: Well, never go to Lake Erie.
Owen: Why?
Classmate: There is Lake Erie! (points at his screen).

[Owen turns his attention back to the video]

Classmate: And I’m never going to Florida, either!
Owen: Why not Florida?
Classmate: Cause they got| uh, tornadoes| yeah, they have tornadoes and waterspouts, also!

[Owen turns his attention back to his iPad]

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8 Emma did not use the science lab except for presenting during the KIC Conference Day.
Classmate: (tapping Owen on the shoulder) Look! Look! Watch the stages. See, look – watch this.

**[Owen looks over to the video again]**

Classmate: So this is... where they start.

Owen: Aw, hell no. (sing-song voice) HELLl nooooo!

**[Owen turns back to his own iPad while XXXX continues to watch the video]**

Classmate: All "heck" break loose.

What is striking about this exchange was his classmate’s insistence to share the video with Owen, even if Owen seemed to be preoccupied with his own Power Point presentation design. It is also important to note that his classmate had already viewed this video previously and was eager to point out conceptual aspects of waterspouts (i.e., they are related to tornadoes, occur in stages, occur in nearby Lake Erie). Furthermore, both boys had outward, loud, emotional responses to the video. Throughout this study, I noticed that this particular boy was frequently assisted by teachers and positioned often as a disengaged learner in absence of extensive teacher scaffolding – by teachers as well as students. In this space, Owen’s classmate was able to openly demonstrate deep engagement and understanding of his KIC topic in absence of a teacher, exemplifying his authentic interest and desire to share knowledge with others. In spaces with a classroom culture in which students may not be able to share their thoughts and feelings as openly, it is possible that experiences like the one observed here may not occur as readily.
All of the students were at different steps, working with different materials, media, tools, and devices. Despite the social, joking nature the space tended to take on when no teachers were present, the students in the space maintained consistent attention to their projects and made progress on their presentations across the boards. There was a particular moment in which one boy working on a poster asked another boy working on a power point about where he should place the written elements of his trifold poster. The boy turned from his computer and clearly stated, “Both. Put them on both sides, right there. The side that you just pointed to and on the other side. Yeah, you should probably do more pictures on the one side and writing on the other side, if you need room. Write on both of the sides.” This is just one example of many which demonstrate a direct appeal for help (or at least an opinion of what to do) from one student to another in terms of their KIC projects. This reveals that students were able to provide guidance and advice as a teacher would in a typical classroom scenario.

Teachers and the student social dynamic of the science lab. There were times where teachers would enter the space, particularly Mandy, whose classroom was right next door. Adults in the space usually changed the nature of how students communicated with each other. With an adult present, the joking and teasing was set aside, though the talking did not necessarily cease between partners. Students maintained focus on their projects while a teacher was in the space as they did when they were joking around. Mandy, for example would circulate around the room, tending to focus her attention on students that she was “worried about” in terms of time. In some instances, this led students out of the science lab momentarily, such as the one directed at a student below:
Alright, can you come with me? (touches a student looking at his iPad on the shoulder). Cause I’m worried about your time... come with me. We’re gonna go pick out some colors that you like to decorate this (tapping his poster board) and then we'll print out the rest of what you want on there.

Teachers would also tended to call students out if they were needed in the classroom or thought to be disengaged. For example, Mandy took two boys out of the science lab when she noticed they were not working on their posters while in that space – they had left their posters in her classroom, so they were perceived to not be on task.

However, there were also times where teachers in the space seemed to take on that kid-energy alongside their students, engaging partially in the discourse involved with joking and messing around. This was especially salient when teachers were helping students conduct their demonstrations and experiments. For example, Mandy and the other fifth-grade teacher were helping students with their volcanoes, and they engaged similarly in joking and kidding around alongside the academic aspects of the KIC project. At one point, the other fifth-grade teacher exclaimed, “I got cornstarch on my butt!” and loudly squeals with laughter when the students make an enormous mess repeating their composite volcano experiments again and again. The use of language, laughter, and volume similar to what their students used in this space frequently reveals a distinct difference to how these teachers acted in their classrooms during literacy blocks. The space is one that provided flexibility and fluidity across discourses and practices, keeping a focus on the KIC projects alongside that kid-energy of joking, laughter, and messing around.
Students in the Science Lab

A space for student-directed doing: Fatima collaborates in the lab. Fatima was a student who actively enjoyed collaborating with others in the science lab on the KIC projects. Fatima found the science lab a fascinating and special place. While she ascribed value in being able to get work done in the lab, there were also moments where she appeared genuinely captivated by the presence of experiments, projects, design materials, and technology. When describing the science lab as one of the spaces she used during inquiry, she said it was, "very quiet, so we were able to get a lot of work done, and all our materials were right in here, so we didn't have to get out." After finishing her own project, Fatima spent much of the final days dedicated to the KIC project helping and guiding her friend who was finishing her presentation (see Figure 4.9 below). During a day when Fatima and her friend spent over an hour in the science lab working, Fatima said to herself, "I love this place. It’s amazing!" She frequently wandered about the space, touching materials and exploring other students’ projects, alternating this with helping her friend. Fatima spoke at length about this day, saying that

When we were working in the lab, when science wasn't in session, it was really much easier because you had all the materials in there, so we really didn’t need to do anything. The only thing we didn’t have there was a printer, which really is okay because we got the printer over there (points into Kelli’s classroom in the fifth-grade pod). Very simple. I really liked it.
Fatima and collaborating with others in the lab. For Fatima, the science lab was a place for her and others to collaborate purposefully on their KIC projects and articulated at multiple points the importance of collaborative work. This was especially important to her as an early finisher with her own KIC projects; she sought a position where she could move the KIC project as a whole along by helping others finish faster. She believed that working together with classmates is “actually a huge advantage for them because then they actually have some help, and that will help them finish faster than working on] by themselves” and wishes it would happen more often during the school day. As such, it is unsurprising that when students working in the science lab noticed Fatima, she would clarify that, “this is not my project though. I finished a week ago, so I’m helping whoever [is still] doing their project.”

Fatima’s collaboration with her friend did not occur exclusively in the science lab, but she preferred to work in that space than to the classroom. She valued the ability to spread out on the larger tables with a single project instead of being crammed into a space in the corner of her classroom. She also described the desire for fewer distractions and interruptions, explaining that the science lab “wasn’t that loud” though some people were
working and talking while she was in there. In fact, there were multiple times where Fatima would ask students to quiet down if it got too rowdy so they would not “get kicked out” of the science lab; what’s more is that her classmates consistently heeded her warnings. Fatima favored the relatively unfettered access to materials, the ability to hear and be heard during collaboration, as well as openness of the space and surfaces for the purposes of working together with others. There are straightforward visual comparisons between the day she worked in the science lab with her friend to a day where she collaborated with her in Kelli’s classroom, notably on the day before the KIC projects were due. In Kelli’s classroom, there were more students, fewer surfaces for spreading out, and substantially more noise. Figure 4.10 shows the side-by-side comparison of each space.

Owen works independently in the lab. Owen used the science lab as a place to work with relative independence on his KIC project. As described previously, Owen was very conscious about the spaces where he worked, often choosing them with the intention of being able to do his best work. Owen tended to choose spaces where he was isolated
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from others as well as where he could spread out (i.e., corner desk in Mandy’s classroom; the rug in various classrooms; at a desk by himself in Kelli’s classroom). Considering this reoccurring pattern over the KIC project, it seems Owen requires a certain sense of ownership of his personal space to work well. The science lab provided this in a way that was similar to the spaces in other classrooms, but also necessarily different in specific ways. While he was in the lab, he did not often interact with others around his project, except to ask for help. Given the more social quality of the science lab compared to the classroom spaces, Owen did respond to other more social conversations as well as joke around from time to time the other boys. However, most of Owen’s attention was intensely focused on his iPad, engaging in multiple actions surrounding the literacy practice of constructing a power point slide showing the materials of his KIC project. Owen spent 20 meticulous, intentional minutes on this aspect of his project, occasionally participating in the less academic conversations around him with his classmates.

Owen’s need for personal space with a sort of buffer between him and other students was facilitated by the openness of the lab, fewer students working in that space, and the availability of large tables rather than small desks pushed together into clusters. Though Owen tended to stay in one spot in the room, he would occasionally get up to stretch and move around at his desk. Owen would also hum or sing to himself, read aloud what was on his iPad screen, and sometimes talk himself through his actions. For example, when he was choosing a particular font for the text on his power point slide, he stated to himself, “I need, like, a bold | I need it bold. I need another font. I need it, like, bold.” As he said the word, “bold,” Owen gestured emphatically with his hands. Owen’s movements, self-talk, and gesturing seemed to orient him towards the task at hand, and it did not seem to
faze other students who were working in that space. In fact, multiple other students in that space engaged in similar kinds of task-related self-talk, singing, or humming.

**Owen’s social engagement in the lab.** Interspersed between curating and selecting "cool" images of his materials (see Figure 4.11 below), tweaking and repositioning the sizing of images, and adding labels to each of these in specific fonts, Owen engaged briefly in other more socially-oriented conversations, jokes, and banter. Once, he burst into the introductory lyrics to Sir Mix-a-Lot’s classic *Baby Got Back*, upon which another student yelled to him ("Don’t say it!!") before he could say the word “butt.” Another time, he commented when another student said the word “dope” and Owen responds saying, “Don’t say dope! Don’t!” to which statement both boys begin to laugh. This speaks to a common feature of this space of students pushing boundaries of speech that is usually taboo in schools (e.g., swearing or curse words; gross-out or toilet humor; trash-talking; words with sexual connotations), and then other students calling them out on it directly. What is ultimately fascinating (and demonstrated by Owen time and time again) is that these minute interjections into the socially-oriented do not entirely derail students in their work, nor are the conversations occurring in the science lab entirely socially-oriented. These are juxtaposed with talk relating directly to students KIC projects, topics, and processes that support presentation design.
Figure 4.11. Owen’s design work on his power point slide

Aiden “in a room without a teacher.” Aiden provides a compelling example of how a given space can transform the way children work on a project. In the classroom, Aiden tends to work quietly with a laser-like intensity at his desk. In writing, he occasionally speaks to friends at his table, but generally speaking is tightly focused on generating as much writing as possible, often from a competitive standpoint. Being in the more socially-open and student-energetic science lab opened up a space for Aiden to joke around with his friends while also working hard on his own project. Aiden, who reportedly holds himself to a rigorous academic standard and is observed to be highly emotionally invested in his school performance, shows a much more complex demeanor in the science lab. It is here he reveals a more joking, playful side interspersed with that of the serious academic I tended to observe elsewhere. Aiden is also the only student who directly identified the science lab as a space typically without adults. While he remains engaged in finishing his writing and creating his poster, he also goofs around in front of the camera with his classmates, jokes around, emotes positively in relation to his own work, and offers to help others. Figure 4.12
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reveals Aiden working in parallel with his classmate and friend on similar parts of his project (e.g., typing and printing out content to affix to posters; bubble lettering their titles on the poster).

Figure 4.12. Aiden: “I worked at a table next to another person while writing on my poster and typing things out on my iPad”

Aiden is one of the students who chose to work in the science lab frequently when that option was available to him. On the first day, he worked in the lab on his poster presentation, Aiden looked around the room and said aloud to no one in particular, “Finally, we’re in a room without a teacher.” Before and after this point of recognition, I observed Aiden move back and forth between his ultra-studious behavior (typified in his classrooms) and something that could be characterized as more open, humorous, and fun. Aiden did accomplish much design work in the time he spent at his iPad and poster (20 minutes on the first day and 20 minutes on the second), including a) dictating his research question into his iPad and printing it, b) cutting apart and deciding where to put printed components on his poster, and then c) titling his poster with bubble letters when the printer could not print it out large enough (with all of these actions and decisions conducted purposefully). However, like Owen and other children in the teacherless science lab, he jokes around with his partners (i.e., fart humor, playful banter), goofs off for moments in front of the camera.
(i.e., surreptitiously spins his fidget spinner in front of the camera as he strolls by), and sings to himself.

**Aiden’s shifts in emotion and practice in the lab.** Furthermore, the only time that I noticed Aiden positively emoting about his own work aloud was in the science lab. At one point, when he is relatively alone in the room, he placed his research question on the poster board, looked it over, and then exclaimed, “This is gonna be great!” and subsequently clapping his hands over his head, smiling. He proceeded to gather materials purposefully as he joked around casually with his tablemate. It is also in the science lab that I witnessed the only time Aiden offers to help another one of his classmates. As he made his own bubble letters, he verbalized that he thinks he makes them well, and stated to the other boys in the room, “If anyone needs to do bubble letters, I can help,” and a few minutes later, “You need help, just ask. I’m really good at them.” Finally, I noticed that while Aiden worked, he persistently continued to sing the nonsense phrase “Bloobity bloobity” repeatedly to the tune of the “Charge” fanfare commonly played at baseball and hockey games. While he did this, it caused his tablemate to laugh and asked, “Why do you sing bloobity bloobity over and over again?” And Aiden simply stated, “Cause it’s fun!”

This is notable because in other classroom settings, Aiden was observed to work alone, remain generally quiet, adamantly following directions and rules. Teachers spoke of his intensity, incredibly high standards for his academic work, and his overarching desire to succeed in school. Here, I saw a boy who was consistently engaged with his work for his own purposes while also having a positive outlook on his own work and fun with his classmates while helping them and joking around. Aiden’s change in demeanor (though not
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in engagement with his KIC project) is a yet another testament to the power of space and the associated social practices that are imbued in the walls and materials that compose it.

Summary

The spaces used during the course of the KIC projects could be characterized as open, flexible, and fluid for different purposes and at different project points. From the teachers’ standpoints, there was an overarching attention towards how the movements and placement of students’ bodies tied in with choice and agency – all three participating teachers enabled students to have options about how they situated their bodies while they worked on their inquiry projects. There was also an attention toward co-ownership and sharedness of the classroom, even in spaces that typically would be claimed exclusively by the teacher (i.e., the teacher’s desk area; whole group minilesson chair area; Michelle’s book checkout station). Students were able to “take over” spaces – “within reason” (in Mandy’s words) – as they worked on their inquiry projects. This meant in terms of use of not only where their bodies occupied space but also in terms of access to materials and supplies useful to their research, writing, and presentation preparation.

Classroom spaces and how they were used also depended on the phase of the inquiry project. More teacher-directed aspects of the KIC projects (i.e., minilessons, writing, certain aspects of research) gave classroom spaces a more “controlled” feel similar to what one would typically consider in a school classroom (i.e., quiet, students working independently, students located where teachers have asked them to be). The tenor of the classrooms spaces generally changed once students were entirely in command of their projects, most saliently at the presentation preparation phase. At this juncture, students took their fullest advantage of the general flexibility and openness of these spaces to their
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advantage. This was most authentically realized in the space of the science lab, which was often occupied and used only by students.

There are tensions created with the ways teachers and students used classroom spaces during the KIC projects and how school spaces have tended to typically be used, namely the attention toward student agency and directedness of their own bodies and how they choose to use space as a resource. All three teachers made multiple points to trouble the typified teacher-student dichotomy in relation to school spaces by emphasizing movement and motion, flexibility, fluidity, and co-ownership of the classrooms, library, and science lab. Students took advantage of this opportunity for choice by selecting different places to work for different purposes and leveraging the power of these different spaces to be successful during the course of their KIC projects. Whether that meant working in the science lab to have more ready access to an array of materials (like Fatima) or choosing to work isolated in different classrooms (like Owen), students made distinct choices of how to use space as a resource.
Figure 4.13. A representation of both activity systems under study within the spatial context of Legacy Elementary (to be animated at this dissertation defense).
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CHAPTER FIVE:

THE KIDS INQUIRY CONFERENCE: AN ACTIVITY SYSTEM

OF PEDAGOGY AND GUIDANCE

The next two chapters are laid out in parallel (chapter overview located in Figure 5.1), as they represent two major activity systems which were interwoven and occurring simultaneously during the KIC projects: teachers instructing/guiding students and students doing/learning inquiry. I will begin each chapter by broadly identifying and outlining the components and mediational artifacts in each activity system and providing a visual illustration of these (Figure 5.2). Then, I will identify the four main activities of this activity system, along with the literacy-related practices and pedagogies identified across observations throughout the duration of the KIC projects. These observed pedagogies are triangulated with student artifacts, teacher interviews, as well as curriculum documents. Then, to show how the components of the activity system work together, I will identify and describe key interrelationships in action through moments during the inquiry projects, particularly surfacing tensions between vertical and horizontal kinds of practices and knowledges when they intersect. Such tensions will be further explored in the final chapter of this dissertation.

There are two important assumptions to consider when reading the following chapters. The first is that while these are two activity systems involved in the culture of inquiry at Legacy Elementary School (specifically conceptualized from teacher-as-subject student-as-subject perspectives with the KIC project), there are innumerable more that could be illustrated here. For example, there are other inquiry projects that could have been studied which are also activity systems in similar ways (e.g., Discovery Hour, Darwin-
Martin House Junior Docents). In addition to other projects, other activity systems analyzed could have focused across inquiry projects taught in different grade levels in order to reveal the culture of inquiry and how practices develop over time, treating each grade-level project as its own activity system.

I chose the subject (rather than grade level or multiple projects) as the pivot point around which to conceptualize these activity systems because these are clearly delineated, institutionalized subject positions from a school culture perspective. My findings have and will continue to reveal that during the KIC project (and the ever-growing culture of inquiry at Legacy Elementary), these institutionalized subject positions are necessarily and importantly complicated by space, task, and the student-directedness of this project.

Though these are complex and intertwined systems (and subjects), Chapter 5 focuses on the activity system with teacher as subject and Chapter 6 focuses on the activity system with student as subject.

The second assumption to consider is that both of these activity systems are not actually separate but in fact unfolded simultaneously over the duration of the KIC project. They are being teased apart here for the purposes of understanding the literacy activities, literacy practices, and their associated pedagogies involved from the perspectives of the institutionalized subject positions available in this space. They are not to be thought of as dichotomous but instead two sides of the same coin. As such, there will be overlap between these systems, but the findings will be foregrounding teacher perspectives and practices and student perspectives and practices, respectively.
Activity System Components:
Teachers as Focal Point

Literacy Practices as Mediation (Tables)

Guiding research | Guiding writing | Guiding presentation design | Guiding final presentations

Activity in Action:
Tensions between Components

Guiding research | Guiding writing | Guiding presentation design | Guiding final presentations

Figure 5.1. Chapter 5 Overview
Figure 5.2. Activity system components with teachers as focal point
Activity System Components with Teachers as Focal Point

Subjects

The subjects in this activity system specifically are the teachers involved with this project, specifically Michelle Stasik (library media), Kelli Bianchi (reading), and Mandy Short (writing). There is also another fifth grade teacher as well as two district, elementary-level science teachers who came in on the last day of the KIC project to facilitate presentations. While these individuals will figure into this analysis, the three teacher participants above are those who worked with the focal student participants on a daily basis throughout the KIC projects and are thus the subjects.

Vertical orientations of subject. From the vertical standpoint, these teachers are in charge of enacting the KIC projects as set forth by the curricular documents, which are guided by the Common Core Learning Standards and specifically selected “Indicators of Understanding” selected by the district for this project. To a certain extent, these teachers are each responsible for working towards these objectives in their own classroom spaces with their classes of students. They are also responsible for helping students achieve specific targets on rubrics derived from these standards and indicators for the presentation as well as the research article. These rubrics are shown in Figure 5.3 below. These are considered to be “vertical” aspects of the subject and their various positions in this activity system because they involve the reinforcement of institutionalized practices and reified frameworks (which are discussed further in the Rules section of this chapter). That is, the use of a state standards-based unit of study, numerical grading, criterion-based rubrics, and a focus on the overall product are frameworks that are known within a typical school culture which these teachers serve to reinforce in this activity system.
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Figure 5.3. Presentation rubric (left) and research article rubric (right).

**Horizontal orientations of subject.** However, from a horizontal standpoint, the teachers are not simply working to achieve these goals and use such frameworks individually but do so in collaboration with each other. Mandy, who represents the most recent addition to the collaborative KIC project as the writing teacher, characterizes this collaboration between the fifth-grade teachers and Michelle as what makes the KIC project possible:

We do meet about it. We do talk about it. We are in good communication. The fact that it's across curriculum and they're responsible for the reading part, I rely heavily on the fact that they've instructed them in the reading portion so that when I get to the writing, we can focus more on that, with the understanding that a lot of writing workshop, especially in the beginning, is used for more of the reading and research work, anyways.
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Mandy’s quote as well as the collaboration between the fifth-grade teachers and Michelle embodies the three tenets of horizontal learning in an activity system defined by Engeström (2015): coordination, cooperation, and reflective communication. Taken together, these teachers – both individually and in interaction – are the subject of this activity system.

**Objects and Outcomes**

*Shared outcomes.* The diagram above reveals a shared set of outcomes for the students and the teachers as the “fifth grade KIC project 2017 as a part of a culture of inquiry.” It is important to note here that are both specifically shared aspects of these outcomes (i.e., curiosity and sharing knowledge with others as a purpose for inquiry like KIC) as well as differences in outcomes between the students and teachers. For teachers, these differences involve influences of the shaping of the inquiry projects, including the specific objectives involving different kinds of informational texts, influenced by learning standards as well as the scope and sequence of their curriculum. Students were motivated to engage in inquiry for multifarious reasons, including wanting to get good grades, pleasing their teachers by following instructions, and competitiveness with other students engendering a sense of pride. Student purposes for doing inquiry in school is further elaborated upon in Table 6.5.

However, what is pertinent in the alignment of these outcomes is that while the teachers and students took up these different roles along the division of labor which influenced their interactions with the object (i.e. teachers *tended* to be facilitators, guides; students *tended* to take up roles of the learner, following teachers’ directions), the teachers and the students shared a desire for students to purposefully research topics of their own
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curiosity and ultimately share what they had learned with others on the KIC conference
day. These outcomes will be further elaborated upon in the subsequent “Object” section in
Chapter 5 and the corresponding “Object” section in Chapter 6.

Object. An activity system has an object(s) which correspond with the subject(s),
which is the intended outcome provided that the subjects spend engage with the activity
system. In this space, the objects are the students completing all components of the KIC
project, which is comprised of students successfully a) writing a research article
delineating their topic of study and research question; b) designing a visual presentation
describing their inquiry project that pairs with c) giving an oral presentation on their
inquiry project.

Vertical orientations of object. From the vertical standpoint, these objects are, in
part, transformed into the outcome by how the students are guided by the teachers into
fitting into the framework created by the curriculum, objectives, and rubrics. The object is
also impacted by the date set for the KIC conference – this is an inflexible deadline for most
students. Except for extenuating circumstances, all fifth-grade students were expected to
present with their peers during the one-day KIC conference.

Horizontal orientations of object. From the horizontal standpoint, there is
flexibility in terms of how teachers guide students to make choices about going about their
own learning within established parameters. This is described aptly as “freedom within the
framework” by both Mandy and Kelli. Such freedom within the vertically-structured
framework is enabled by teachers responding to student needs on a daily basis. As Michelle
explains, “We look at the schedule of where we’re gonna lay it out and loosely, because it
really is led by the students and the progress that they make, but we have a loose schedule around it.”

This is easily exemplified in teachers’ lessons and talk within their mini-lessons. For example, while each writing mini-lesson had a goal for students in mind, rarely did Mandy expect all writers in her classrooms to be on the same step at the same time. In fact, she would often provide multiple paths for success in her classroom on a regular basis. On a day where she teaches a whole-group mini-lesson on editing and revising, Mandy offered options for working as a writer towards their article:

You might be re-writing, working on paragraph 5. You might be working on paragraph 3 and doing more research. You might have drafted everything and are now going back to revise. If you are going back to revise, after your revision work, your option is to freewrite. You may freewrite in your iPad on Notability.

Mandy is evidently working within the framework of the research article rubric (see Figure 5.3 above). However, there are clearly options for students to work successfully, rather than forcing students to work on editing and revision when it may not be what they deem to be the best of use of their time.

This sort of flexible guidance towards the presentation is demonstrated by Kelli’s guidance during a mini-lesson, as she draws examples on chart paper (Figure 5.4):

Step two is planning out what it looks like. If it’s a poster board, what will you put on it? . . . You need to plan before you start otherwise it could turn into a big mess. IF you are doing a power point, you could write the slides, you could write a question, picture, maybe some facts, a video, maybe you want to plan out what you’ll say... I’m being very generic right now. That means I’m just giving you options of what you
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can do with not much detail. Obviously you should have more detail than this. If you are doing a video of yourself, you need to plan out what you’ll do, what you’ll say, maybe you do a demonstration. Maybe explain your demonstration and some facts. And that’s going to be step two.

Figure 5.4. Kelli’s drawn examples of what could be included in visual presentations. Once again, Kelli is providing multiple, open pathways toward success in their presentations. Michelle taught a similar mini-lesson on creating graphs to represent data. While students were expected to “play with” the different kinds of graphing tools on particular websites (i.e., “click on them, put in your information, see what it looks like”), she made explicit that this kind of graph may not work for everyone: “Maybe your information doesn’t fit in this graph. It’s not the right graph for you.” There remains flexibility in how students represent their information for their presentation. In each of these scenarios, the joint object of the students’ research, articles, and presentations stemming from their
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inquiries is one that undergoes transformation in a flexible, open way, leaving room for student agency and choice, facilitated by teachers working within a structure towards the common, interrelated outcome of building a culture of inquiry.

Rules

The rules involved in this activity system have been touched upon when discussing the nature of the subjects and objects in teaching the KIC project. The rules of an activity system “guide (at least to some degree) the activities acceptable by the community” (Jonassen & Rohrer-Murphy, 1999, p. 64). As described before, vertically-oriented rules specific to the KIC project would be those which are provided by an existing framework of curriculum, standards, and institutional practices already common to school culture. The horizontally-oriented rules are reflective of in-the-moment decisions which unfold and determine what acceptable practice in a space is at a given time, usually in consideration of the socioemotional, interactional, and interests of the participants and interests. A more ambiguously oriented rule would be characterized by flexibility or choice provided within a normally more rigid rule, or the reverse, where there is less flexibility or choice in a normally less rigid rule.

Ambiguity in rules from vertical and horizontal standpoints. As expected, KIC project rules do not fall neatly into horizontal and vertical categories. There are rules that are involved with the KIC project which lean vertical, lean horizontal, or are more ambiguous in terms of their verticalness or horizontalness based on their presence (i.e., frequency of reference or enactment) throughout the KIC project. When looking across data relating to teachers and pedagogical decisions (i.e., interviews, observations,
interactions with students), the rules which comprise the KIC project are summarized in Table 5.1.

_Institutional forces shaping rules._ Another dimension of the rules of this activity system is their contingency on different kinds of institutionalized forces (i.e., at the project, discipline/subject area, curricular, grade, building, district, and national standards levels) reified through policy and curricular documents at these different levels. Overarching the project are rules which create a sense of rigidity and vertical orientation, which are made visible through teachers’ pedagogical practices from the start through to the end of the project. These documents are: which are a) the KIC project curriculum, standards, objectives, and performance indicators (Appendix I), which is enacted by all four elementary schools in the Legacy district; b) presentation and research article rubrics (Figure 5.3); and c) calendars with projected lessons (Figure 5.5).

For example, there are grade-level expectations of what students “should be able to do” in terms of their KIC projects. These are derived from the KIC project curriculum
document, which itself is guided by district guidelines, which are influenced by New York State’s adoption and modification of the Common Core State Standards. This trickles into the literacy classroom through KIC. For example, when Kelli is explaining synthesizing information from multiple sources, she tells her students, “Writing down and copying stuff is not enough for fifth-grade, that’s second-grade. You need to synthesize what you read.”
### Table 5.1

**Rules in KIC Project Activity System: Pedagogy, Teaching, and Guidance**

Defining kinds of rules and providing horizontal, vertical and ambiguous examples

<table>
<thead>
<tr>
<th>Kind of Rule</th>
<th>Definition</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class interactional rules</strong></td>
<td>Explanations for student-student, student-teacher interaction</td>
<td><strong>Michelle (library):</strong> “Isn’t that nice how you just communicated with each other? Aren’t you so happy I have patience? What if I was like you guys and made all those faces and had no patience, would you love it or not? What if I did that?”  <strong>(horizontal, teacher attending to feelings, emotions in communication)</strong></td>
</tr>
<tr>
<td><strong>Class movement rules</strong></td>
<td>Explanations for what purpose and how students move through school spaces</td>
<td><strong>Mandy (writing):</strong> She moves to the front of the room and holds her hand up, waiting for nearly one minute. She continues to hold up her hand, waiting for students to attend to her and quiet down. When they do, she says, “I wanted to give you an opportunity to finish your conversations.” <strong>(ambiguous, students voices honored, also teacher-directed)</strong></td>
</tr>
</tbody>
</table>
| **Choice-making rules** | Explanations for students making choices during their projects            | **Kelli (reading):** Kelli turns toward Aiden who is talking in an otherwise quiet classroom. She says, “Aiden, are you still talking? Go flip your card. It looks like you won’t be seeing the track today.” **(vertical, reinforces silent classroom norm through punishment)**  
**Michelle (library):** (observation) I noticed multiple students starting to get up and grab headphones while Mrs. Stasik was talking to go on their iPads without asking. This feels like normal practice, as it did not seem to bother Mrs. Stasik. **(horizontal, student-directed)** |
| **Class seating rules** | Explanations about where and for what purposes children place their bodies in school spaces | **Mandy (writing):** A boy moves to a different space after Mandy suggests, “That’s probably not the best space for you to learn right now.” **(vertical, teacher-directed)**  
**Michelle (library):** “If this is not right for you, that’s okay. There are other ways to take your data put it into here to share for your board” **(horizontal, design choices are in students’ hands)** |
<p>|                     |                                                                          | <strong>Kelli (reading):</strong> Students are choosing what presentations they would like to see on KIC conference day. “There are three classrooms and the science lab, 13 spots in each... If you get to three or four [people in a session], it’s off, it’s closed. Does that make sense?” <strong>(ambiguous, students have open choice based on interest but only as that option is; guided by teacher)</strong> |
|                     |                                                                          | <strong>Mandy (writing):</strong> “We have 40 minutes of writing today, not talking, if you need to move to a better learning space, please do so.” <strong>(vertical, teacher-directed student choice)</strong> |
|                     |                                                                          | <strong>Mandy (writing):</strong> Multiple students ask, “Can we go to the science lab?” Mandy allows a good chunk of students to go to the science lab, a highly student-directed space with very little teacher interference. <strong>(horizontal, students are allowed to choose where they work on their projects even if it is out of the teacher’s immediate space)</strong> |
|                     |                                                                          | <strong>Mandy (writing):</strong> She talks to the kiddos as they pack up, explaining that it was an off-day probably due to the testing, but then mentions that “We can’t make excuses for ourselves in the future, which means we might need to sit by different people.” <strong>(ambiguous, students still have a choice, but one that is heavily guided by the teacher)</strong> |
|                     |                                                                          | <strong>Kelli (reading):</strong> The desks are spread out everywhere as students were working on their posts. The desks are typically in groups. “Put desks back the <strong>right</strong> way, one person from each group” <strong>(vertical, student seats have a “right” configuration in this space)</strong> |</p>
<table>
<thead>
<tr>
<th>Behavioral (emotional) rules</th>
<th>Technology rules</th>
<th>Student self-directedness rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectations about treatment of self and others in terms of how it could make a person feel related to those actions</td>
<td>Expectations about interactions with digital technologies in school spaces</td>
<td>Expectations about students working independently</td>
</tr>
</tbody>
</table>

**Mandy (writing):** “Owen, I can tell you are feeling stressed out because you missed a day yesterday. (to Owen and class) “Is it okay that you are behind if you miss a day? Yes, as long as you use your time wisely, you’ll be fine. We will meet and talk.” (horizontal, student emotions guiding her instruction and project expectations)

**Kelli (reading):** “You are technically supposed to spend 10 minutes up here talking – that’s a really long time. It’s understandable if you get nervous. If you come up and say my questions are blah-blah-blah (she seems to be mimicking reading something verbatim very quickly), that’s not gonna work. Nervous or not, you are gonna have to learn how to talk in front of people.” (ambiguous, student feelings are addressed but the needs of the assignment/life skill are foregrounded as more important)

**Michelle (library):** Michelle is discussing rules with the iPads and how they should be treated during the course of the project. “Remember? I respect everyone and everything.” She then recites the school honor code. “We say it every day!”  (vertical, invokes the reified text that is the Legacy Elementary school honor code)

**Michelle (library):** James wants to print pictures but can’t do so from his iPad, so he asks, “Mrs. Stasik, what’s your email?” Without skipping a beat, Michelle provides her email to James. (horizontal, students and teachers digital correspondence is typical as the project requires it, flexible as needed)

**Mandy (writing):** “Mrs. Stasik offers the library printers for printing purposes. Sometimes the technology is difficult, but if you need pictures or one picture printed, I am happy to do that if you email it to me, but please don’t send me three billion emails.” (ambiguous, Mandy offers her email to her students, but with a caveat that they should not abuse this privilege)

**Kelli (reading):** “I’m gonna give you back your iPads. We’re gonna have a fresh start. Remember that it’s a tool, not a toy. I don’t wanna take it away from everyone, but I will if you are misusing it, playing game when you are not supposed to, and if I catch you doing those things, I’m going to write you up and you’ll go to Mr. Banach (principal).”  (vertical, technology as a privileged tool in which the teacher is gatekeeper for its usage)

**Mandy (writing):** Owen asks if he can take the iPad home to finish his PowerPoint presentation. Mandy says, “You’re not allowed to take the iPad home. That’s a school rule – I would work on the your iPad stuff here.” (vertical, school rules supersede needs of the KIC project and student)

**General observations (across writing, reading, library on one day):** There are children at all different phases now, and that’s okay by the teachers. They are meant to use this time to do what they need to do, and at this point, most of the students are totally self-directed. (horizontal, students are all at different stages of research, writing, and presentations)

**Mandy (writing):** She comes over to me with a smile on her face, letting out a sigh and gesturing with flat palms, “Ahh, this is what it’s supposed to be like. Finally, it’s getting back to normal.” She is indicating the quiet in the writing space in tandem with the self-directed productivity. (ambiguous, students are self-directed, but the space is “normal” because of its quiet rather than students working in a self-directed manner)

**Kelli (reading):** Students are choosing where they would like to attend their presentation, which is (mostly) open choice. Kelli sits down in her chair and says aloud, “I gotta sign up for the other kids.” She then sits down in the chair at the front of the room with the sheets and signs up students with a pen quickly. (vertical, student self-directedness and choice is undermined by their lack of presence in the room and is taken over by the teacher)
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There are discipline-specific rules (i.e., reading, writing, design, science) which vertically guide teachers’ pedagogical decisions and are represented in the reified curricular documents as “indicators of understanding.” When teachers invoke the role of scientists, writers, and readers (as they frequently do), this is usually followed by teaching a common rule of thumb or action specific to the discipline which students are expected to adhere to in the parameters of the KIC conference. For example, when students are writing up their results in paragraph five, Mandy asks, “Is it okay to be wrong about your hypothesis? Yes. When scientists’ hypotheses are wrong, it causes more questions, and that’s okay.” This calls attention to what is deemed acceptable in science and scientific writing. Mandy also spends time referring to her students as “writers” and guiding them in multiple ways to develop and “try on” the practices involved in the identity of a writer.

Teachers in this activity system make pedagogical decisions guided both by rules which are more rigid and institutionalized as well as those which develop organically based on the needs of the students over the KIC project. These can sometimes be contradictory. As I will explain later in this chapter, tensions often arise between the rules and some other component of the activity system.

Community

The community involved in this activity system is larger than simply including the fifth-grade teachers, their students, and Michelle as the library media specialist – this has already been described in the subject and object sections, respectively. Though these are the major participants in this research, there were multiple others in this space sharing a set of social meanings as a community in regards to the KIC project. Thinking vertically and horizontally about community members is largely contingent upon what their work in the
activity system serves to uphold at a given time. For example, students are able to choose their own KIC topics, which involve members of the community acting with a horizontal orientation. However, teachers and families must provide “approval” for students to participate in their chosen KIC project topic, which reveals a vertical orientation in interactions between community members.

**Additional teachers and support staff.** First, there are the other teachers who interacted with the teachers and students, including the aforementioned science teachers, English as new language (ENL) teachers, ENL teacher assistant, special education teachers, and other adults, such as Owen’s mentor who worked with him each Friday. These adults may not have taught the initial mini-lessons during classes during this project, but they were instrumental in guiding students along the way as they required it. The ENL and special education teachers particularly gave guidance to their students in very specific ways (e.g., helping students on a deeper level with respect to language that the classroom teachers would not have done).

**Administration.** It is also important to include in this community the administration at both the building level (i.e., the principal, Jeff Banach) and district level (i.e., the superintendent). Administration has been described as “very supportive” of the KIC projects by the participating teachers. This support is namely shown through validation of the KIC projects (and other inquiry projects like it) done at Legacy Elementary, positioning these projects as an example of good inquiry teaching and learning. Michelle explains

I think [district administration] are very happy with the [inquiry project] model and the level of engagement... when they see the sharing that we have when we’ve done
the share of the projects, they’re happy with what the kids are producing, and particularly at the level of engagement through the process and the end product. I know that the district is looking for more of a common experience [of inquiry] across the four buildings at the elementary level.

**Families.** In this activity system, another integral aspect of the community is the students’ families. First, students’ parents or guardians must “sign off” on their child’s research question and topic once it is chosen (Figure 5.6 below). Second, the expectation was that, if possible, students should conduct their experiment or demonstration while at home over Spring break with a family member assisting, if needed. While there were multiple students did not or could not do their experiments or demonstrations at home for a variety of reasons (e.g., on vacation, limited access to materials, not enough time for a full experiment to be conducted), many student participants (i.e., Owen, Dimitri, Hudson, Saabira) spoke about how their parents or other family members were helpful during the experiment.
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Figure 5.6. Research question approval form to be signed by teacher, parent, and student.

**Entire fifth-grade class.** Finally, it is important to consider the fifth-grade class as a whole as a part of this community, not simply the focal students under study here. There were multiple times during this study where the fifth-grade class at Legacy Elementary were implicated as a whole, usually for consequences of their behavior in spaces like chorus or gym class, where they met together. Sometimes, poor behavior in chorus (i.e., a large number of students skipping chorus) meant that the iPads were taken away from all fifth-graders as a consequence. This stalled out the KIC projects for two solid days, since students were unable to use their iPads for research. There were also multiple times during the final week of the KIC projects that the fifth-grade students as a whole crossed classroom lines and worked with students who were not in their homeroom to finish up their presentations and articles. For the final day of the KIC projects, students presented
across the fifth-grade classes, which were again mixed, as students were able to freely choose which presentation “sessions” they wanted to “attend.”

**Division of Labor**

The division of labor, defined as “which members of the community engage in which types of actions using which tools” (Foot, 2014, p. 333) in this activity system are complex and dependent on multiple factors. This chapter will focus specifically on the teachers, who are expected to engage in the activities of a) guiding writing; b) guiding design; c) guiding research; and d) guiding and assessing final presentations. From a vertical orientation, teachers are responsible for enacting these in relation to curricular objectives and learning standards, using these and associated rubrics as guidelines for pedagogical decision-making.

While all teachers begin each class with direct instruction through mini-lessons, the pacing and content of these mini-lessons are necessarily guided by students’ progress through the inquiry projects. Because of the elements of student agency emphasized throughout this project, the teachers must think more horizontally within the established framework. Teachers must adapt their instruction accordingly in order to help students achieve the object of full participation in all parts of the KIC project, leaving room to check in individually with students regularly and providing just-in-time instruction on a case-by-case basis. This kind of work is relatively improvisatory, unplanned, or unable to be planned in advanced. There are several tensions that are highlighted along the lines of the division of labor in a student-directed school project such as KIC, which will be discussed specifically later on in this chapter.
Mediating Artifacts

Artifacts are objects used throughout the activity system for different purposes; the use of the artifacts can shape the activity system as a whole as well as each of its components. The artifacts themselves can also be shaped by their use in the activity system. There are multiple kinds of artifacts used for enacting the KIC projects from a pedagogical perspective, and these are described in sets below. It should be clear that while these artifacts are mediators, they in and of themselves are not the sole arbiters of mediation. It is how they are used in interaction with other parts of this activity system that we see how such objects actually shape teachers’ pedagogy and guidance of the KIC project. Figure 5.7 below reflects the foregrounded kinds of artifacts and their inter-relationships used in this activity system for pedagogical and guiding purposes.

Materiality of mediating artifacts. The materiality of artifacts dialectically shape how users implement them and also are shaped by those users which have access to and power over those artifacts. In the case of the artifacts used here (e.g., the digital tools such as the iPads and their apps in particular) the materiality of these mediating artifacts are influencing how teachers guide students to engage in literacy activities such as researching, writing, and designing presentations. That is, participants’ mediated actions needed to research, write, and design presentations (or guide the process of these) are necessarily shaped by the kinds of apps which are available to them, which are preselected by the district and loaded onto the iPads. Though the tools afford a great deal of openness and access to the internet, there are constraints which also close off avenues of access.

However, it is important to note that teachers and students pushed against these material barriers of access when they became apparent. For example, teachers would
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enable students’ access to district-blocked websites (e.g., YouTube videos) after reviewing them with the student and deciding if they would be pertinent to research. Other students would work with tools less foregrounded that they had experience with at home. For example, while many students used Power Point to create their slides presentations, Fatima argued for the material affordance of portability that Google Slides offered through cloud-based access to documents across mobile devices.
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Figure 5.7. Kinds of artifacts and their inter-relationships in the teaching-pedagogy KIC activity system

Key:  Thicker black line (no arrow): connecting categories hierarchically
      Thinner grey line with arrow: shows interrelatedness and influence upon

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Vertical and horizontal orientations of mediating artifacts. The vertical and horizontal perspectives in terms of mediating artifacts can be thought of in terms of teachers and students making choices (or not) about how those artifacts are operationalized. If artifacts are operationalized with respect to the curriculum as established, this is a vertical operationalization. Examples of this would be that teachers expect all students to fill out the KIC packets (Appendix J) to complete the project, or that teachers must address all learning standards listed in the scope and sequence of the KIC curricular document (Appendix I). The artifacts are operationalized from a horizontal standpoint if there is choice and flexibility about how those artifacts are used. For example, students are able to choose the medium of their visual presentation (e.g., Power Point, poster, video) in the course of the KIC project. Consequently, teachers shaped guidance for students around such choices both in terms of whole-group instruction as well as on an individual basis. Students doing a poster necessarily needed to make different kinds of design decisions and work with different materials in comparison to those students doing slide-based digital presentations. A brief description of each of the foregrounded set of artifacts follow, though literacy-related “pedagogical actions” throughout the inquiry project will be fleshed out later in the chapter.

Educational policy documents. Artifacts in activity systems can sometimes become rules “that govern the subject’s interaction with members of the community in addition to or instead of functioning as tools” (Foot, 2014, p. 336). This can be said for the educational policy documents that vertically guide how teachers teach and guide students during the KIC projects. These documents give voice and power to multiple, overlapping institutional forces. At the federal and state level, as New York State as a whole has adopted
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the Common Core Learning Standards, the KIC project itself must align with the CCLS. At the district level, the KIC project curricular document that each elementary school in the Legacy district uses, works to align those learning standards with the interdisciplinary learning objectives that they - as a district - would endeavor for fifth-graders to be able to accomplish as a function of the KIC project. This curricular document also lists those specific actions students should be able to execute in order to demonstrate that they have achieved this objective, as well as a possible scope and sequence for the enactment of the KIC project and suggested mini-lessons for teachers. Finally, at the level of the schools, there are numerous teacher-created policy documents which guide engagement with this activity system, including a) research question and topic contract-type agreement, b) the KIC packets that specific what information children need for their projects to be successful, and c) the final rubrics for assessment of the written article and the oral/visual presentation on KIC conference day.

Digital technologies. All teachers used school-provided MacBook laptops for purposes of creating documents (i.e., sign-up sheets for KIC sessions, student programs for KIC conference); modeling or helping students with research; connecting to email; as well as printing pictures and documents that were sent to them by students, as student iPads did not link to any printers. LaserJet, high-capacity, black-and-white printers were located in the library as well as in Kelli’s classroom. Kelli also had access to a color printer, which she got out specifically for use for student photographs for the KIC projects. A specific, older model MacBook was required for Kelli to operate this printer. All teachers had access to a document camera in their rooms with a pull-down screen, though this was used infrequently by Kelli and even less frequently by Mandy. Michelle, however, had access to a
document camera as well as Smart Board, which she and her students used for almost all lessons in the library. Each teacher's classroom was equipped with charging stations and cords for iPads.

**Non-digital maker materials.** Kelli and Mandy frequently used chart paper and markers in order to create anchor charts relevant to the KIC project. Mandy tended to prepare her anchor charts ahead of time and use them in her mini-lessons, whereas Kelli tended to create them with student input as a part of her mini-lessons. Michelle had these kind of materials at her disposal, as well as anchor charts hanging in her classroom, but she tended to use digital technology as the main visual information during the inquiry project. All three teachers provided non-digital maker materials for their students for KIC purposes, including red folders for their KIC work, notebooks, lined and blank loose-leaf paper, white-out (though this was eventually taken away when it was overused), and poster-boards, as well as writing, coloring, and affixing utensils. These have already been discussed more in-depth in Chapter 4.

**Time/space configurations.** Also having been discussed in Chapter 4, it is critical to stress the importance of time and space as mediators during the KIC project. Teachers specifically noted this in their classroom design: having uncluttered space around counters and rugs so there were more seating options, quiet music on or off, differently lighted spaces for students choose from, and easy-to-access maker materials. In terms of time, the teachers commented on the importance of common planning time for collaborative purposes during this interdisciplinary inquiry project, so they could plan the overall schedule for KIC and touch base throughout the project as needed. Michelle especially noted her flexible schedule and what this afforded for inquiry projects:
I work in a building that is very flexible with my schedule. The teachers are very supportive of my needing to move classes to get into classes. They're very wonderful about that. My open times during my day are when the fourth and fifth grade teachers have their inquiry times, so I can push into their classrooms during those times. My planning is first thing in the morning, so I can push in during my planning. And I am pretty flexible with giving up my time to go in and work with them too.

Michelle’s time was instrumental in mediating interactions within this activity system, since with such flexibility, she was able to get more face-time with teachers and students in support of the KIC projects.

**Texts.** The students were engaging with different kinds of texts around their individual topics in terms of modality (i.e., print, image, video, audio) while they engaged in information gathering. As such, the teachers worked flexibly with all manner of texts alongside their students with their books, periodicals, articles, YouTube videos, websites, and photographs. Teachers also had to guide students in generating texts from the information gathered from their inquiries (i.e., searching for relevant literature about their topic, describing their experiment and what was learned) to create print, visual, and spoken word representations of these.

**Teacher-generated texts.** Teachers created their own texts used to guide students through different parts of the KIC project. Mandy and Kelli created anchor charts to use during their mini-lessons. The fifth-grade teachers and elementary science teachers as a district created and shared all of the KIC project documents, including: a) research question and topic “application” agreement (students, parents, and teacher sign), b) the KIC packets
TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

themselves, c) sign-up sheets with titles of each presentation for each “session” as
organized by the teachers, d) the KIC programs for the final day, and e) the rubrics used for
assessment of the written article and the oral/visual presentation. During writing in
particular, Mandy often created calendars that showed the projected focus for each day of
the KIC project (see Figure 5.5, this chapter for an example).

Professional supports. The KIC project has a great deal of administrative support
at the school (i.e., principal) and district levels (i.e., superintendent), as described in the
section regarding community. Teachers have also been provided with professional
development opportunities regarding the use of space, student bodies, and the physical
learning environment. Michelle reports to have gone to a day-long professional
development seminar called “Learning Spaces,” which addressed the different facets of a
learning space (i.e., light, acoustics, color, visuals, seating, system tolerance) as well as the
inclusion of student voices in designing learning environments. This was highly influential
not only for Michelle in terms of her classroom space but also in terms of her involvement
with this study. As described in Chapter 4, Mandy also describes professional development
opportunities where she learned about opening up student movement and flexible seating
in classroom spaces, which also involves student voice and choice in their learning
environment.

Teachers also rely on human resources in the course of the KIC project – these
individuals and groups are a part of the community within the KIC project activity system.
Aside from their collaboration with each other, Michelle, Mandy, and Kelli commented on
the importance of technical support when using technology to the degree that they do
(which is to say almost constantly during the KIC projects). Michelle has also brought in
adults in the community (i.e., professionals like mechanics, parents) who can help provide insider knowledge about a specific topic of inquiry when necessary.

**Literacy-Related Pedagogical Practices as Mediation**

While the previous section described the different components of the activity system broadly, this section delves into the activities themselves which are a part of the KIC projects. The following is a decomposition of the pedagogical practices enacted by teachers in service of students achieving the literacy objectives of the interdisciplinary KIC project. There are four literacy-oriented pedagogical activities in this activity system: a) guiding writing (Table 5.2); b) guiding design (Table 5.3); c) guiding research (Table 5.4); and d) guiding and assessing final presentations (Table 5.5). There are numerous practices apparent under each of these four activities that are undergirded by interactions observed during the course of the KIC projects in multiple spaces. Support for these practices are also triangulated with teacher interview data, analysis of artifacts as described in previous sections (e.g., educational policy documents), as well as student data (i.e., interviews, artifacts). Tables 5.2 through 5.5 show the decomposition of these activities into practices and events, also pointing to the data sources which identify the evidence supporting the enactment of these practices.
**Table 5.2**

*Activity: Guiding Writing*

Decomposing activity into smaller practices, associated pedagogical actions, and data sources providing evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Pedagogical Actions</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paragraph 1</strong></td>
<td>Listing narrowed ideas</td>
<td>• Short Interview 2</td>
</tr>
<tr>
<td>Write why you are doing this experiment</td>
<td>Writing about narrowed ideas</td>
<td>• Final written paragraphs; KIC packets</td>
</tr>
<tr>
<td>Narrowing topics (also research)</td>
<td>[did not see]</td>
<td>• Observed objectives (4/6/2017; 4/7/2017)</td>
</tr>
<tr>
<td>Paragraph 2</td>
<td>Explicit instruction about meaning of “variable” and types</td>
<td>• Short 2017.03.31</td>
</tr>
<tr>
<td>Write variables of experiment in paragraph form (descriptive writing)</td>
<td>Modeling writing about variables using anchor charts with sentence stems and examples</td>
<td></td>
</tr>
<tr>
<td>Paragraph 3</td>
<td>Circulating/conversing with students about their variables during writing</td>
<td>• Observed objectives (4/19/2017)</td>
</tr>
<tr>
<td>Use the SW+H questions as framework to ground experiment/demonstration in prior knowledge (“literature review”)</td>
<td>Turn and talk as a way to discuss ideas as writers*</td>
<td>• Short 2017.04.07</td>
</tr>
<tr>
<td>Providing parameters/expectations for literature review paragraph</td>
<td>Using a web to organize ideas from research</td>
<td>• Short 2017.04.18</td>
</tr>
<tr>
<td>Paragraph 4</td>
<td>Eliciting information learned from students while researching</td>
<td>• Bianchi 2017.04.24</td>
</tr>
<tr>
<td>Write steps taken to conduct experiment in paragraph form (procedural writing)</td>
<td>Explicit instruction in purpose of paragraph three</td>
<td>• Observed objectives (4/21/2017)</td>
</tr>
<tr>
<td></td>
<td>Modeling synthesis of information across articles, adding more information</td>
<td>• Short 2017.04.07</td>
</tr>
<tr>
<td></td>
<td>Modeling using citation phrases using anchor charts with sentence stems and examples</td>
<td>• Short 2017.04.18</td>
</tr>
<tr>
<td></td>
<td>Reading paragraph three example aloud (students point out relevant details)</td>
<td>• Bianchi 2017.04.21</td>
</tr>
<tr>
<td></td>
<td>Modeling citing sources in-text</td>
<td>• Bianchi 2017.04.24</td>
</tr>
<tr>
<td></td>
<td>Circulating/conversing with students about their content during writing</td>
<td>• Observed objectives (4/19/2017)</td>
</tr>
<tr>
<td></td>
<td>Turn and talk as a way to discuss ideas as writers</td>
<td>• Short 2017.04.19</td>
</tr>
<tr>
<td></td>
<td>Explicit instruction in purpose of paragraph three</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explicit instruction in baseline expectations content in paragraph three</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Circulating/conversing with students about their content during writing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turn and talk as a way to discuss ideas as writers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distinguishing between writing about the content and writing about the experiment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turn and talk as a way to discuss ideas as writers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explicit instruction in purpose of paragraph four (results)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modeling use of transitions to guide writing in paragraph four</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reading paragraph four example aloud (students point out transitions)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Encourage students to take picture of transitions anchor chart for use at their seats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explicitly teaching/modeling use of commas with transitions (grammar)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facilitate peer sharing/workshopping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distinguishing between writing about the methods of the experiment and its results</td>
<td></td>
</tr>
</tbody>
</table>
Smaller Practices
(Teachers guiding students toward...)
Paragraph 5
Write results of experiment/demonstration in paragraph form (descriptive writing)
Paragraph 6
Write about inference based on results of experiment/demonstration (i.e., implications)
Making in-text citations for research used during this project
Making references page for research used during this project (MLA style)

Pedagogical Actions

- Turn and talk as a way to discuss ideas as writers
- Explicit instruction of purpose/contents of paragraph five
- Distinguishing between quantitative and qualitative data
- Reading paragraph five example aloud
- Turn and talk as a way to discuss ideas as writers
- Explicit instruction of purpose/contents of paragraph six
- Modeling using anchor charts with sentence stems and examples
- Modeling citing sources in-text
- Circulating/conversing with students about their content during writing
- Turn and talk as a way to discuss ideas as writers
- Providing sentence stems for citing sources
- Explicit instruction in MLA style of citation (ordering of name, date, title, publisher, etc.)
- Modeling MLA style of references list.
- Reading in-text citations and citation information aloud (students point out parts of MLA citation)
- Circulating/conversing with students about their content during writing
- Turn and talk as a way to discuss ideas as writers

- Observed objectives (4/20/2017)
- Short 2017.04.20
- Observed objectives (4/24/2017)
- Short 2017.04.24
- Observed objectives (4/25/2017)
- Short 2017.04.18
- Bianchi 2017.04.26
- Observed objectives (4/26/2017)
- Short 2017.04.26
## Table 5.3

*Activity: Guiding Design*

Decomposing activity into smaller practices, associated pedagogical actions, and data sources providing evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Pedagogical Actions</th>
<th>Data Sources</th>
</tr>
</thead>
</table>
| **Choose presentation medium** (i.e., power point, poster, explain everything, Prezi) (multiple acceptable ways of presenting visually) | • Provide options for presentation medium (generated with students)  
• Represents presentation medium in print & pictorially  
• Modeling choosing a presentation medium based on project factors (i.e., best way to show information)  
• Circulating/conversing with students about their choices  
• [ENL STUDENTS – all do poster boards based on adult decisions]  
• Modeling different kinds of sketches/plans (depending on the medium)  
• Represents different kinds of sketches/plans pictorially  
• Providing examples verbally of what a sketch/plan could contain  
• Explicit instruction in expectations for visual presentations  
• Show exemplar, sample boards  
• Identify content expectations of boards (i.e., titles, research question, research/facts, experiment procedures and materials, results, data displays, photos)  
• Identify multimodal components of layout on boards (i.e., size and relevance, white space, color, borders, folds, etc.)  
• Provide examples of use of models/demonstrations/videos along with presentation  
• Guiding use of images (i.e., finding, printing) | • Observed objectives (4/26/2017)  
• Bianchi Interview 2/1  
Bianchi 2017.04.26 |
| Sketch out presentation regarding content and physical placement on/within the presentation | • Explicit instruction in expectations for oral presentations  
• Provide examples verbally of what could be contained in the oral presentation (i.e., problems with experiment)  
• Provide space to practice oral presentation in front of trusted someone (student or adult)  
• Explicit instruction in changing one’s voice for oral presentation purposes  
• Listening to and providing feedback to rehearsed oral presentations | • Observed objectives (4/26/2017)  
• Bianchi 2017.04.26  
• Bianchi 2017.04.28  
• Observed objectives (4/27/2017 – Stasik; 4/28/2017 – for both teachers)  
• Stasik Interview 2  
• Bianchi/Stasik 2017.04.28  
• Stasik 2017.04.28  
• Short 2017.04.28  
• Observed objectives (4/28/2017) |
## Table 5.4

*Activity: Guiding Research*

Decomposing activity into smaller practices, associated pedagogical actions, and data sources providing evidence

<table>
<thead>
<tr>
<th>Smaller Practices (Teachers guiding students toward...)</th>
<th>Pedagogical Actions</th>
<th>Data Sources</th>
</tr>
</thead>
</table>
| Determine research question                             | • Conferring with students (1-on-1)  
• Determining feasibility of RQ + research topic  
• Defining open (testable) and closed (yes/no) questions (i.e., making closed questions open)  
• Students “apply” for RQ  
• Question students about their RQ + topics  
• Distinguish what is and is not a testable question  
• Confirm all research questions                      | • Observed objectives (3/31/2017; 4/3/2017)  
• Bianchi Interview 2/1  
• Bianchi Interview 2/2  
• Short Interview 2  
• Stasik Interview 2  
• Stasik 2017.03.22  
• Bianchi 2017.04.26 | |
| Narrow topics of study guided by research question      | • Conferring with students (1-on-1)  
• Determining feasibility of RQ + research topic  
• Anticipating research/project problems  
• Generating ideas with students  
• Question students about their RQ + topics  
• Guide students in database use for resources         | • Observed objectives (4/3/2017)  
• Bianchi, Interview 2/1  
• Bianchi, Interview 2/2  
• Short Interview 2  
• Stasik Interview 2  
• Stasik 2017.03.22  
• Bianchi 2017.04.26 | |
| Create a research plan around smaller topic of study    | • Determining feasibility of RQ + research topic  
• Guide finding **reliable** resources for RQ and topics  
• Guide students in database use  
• Explicit instruction in identifying science topics related to research questions  
• Distinguishing between searching for research question and searching for related science topics  
• Modeling non-example of how to search for science topic  
• Modeling examples of how to search for science topic with students’ research questions  
• Modeling example of research plan (1. Research question; 2. Science topic to search for)  
• Circulating/conversing with students about their research plans  
• Turn and talk as a way to discuss ideas as researchers | • Observed objectives (3/31/2017)  
• Bianchi, Interview 2/2  
• Stasik Interview 2  
• Stasik Interview 3  
• Bianchi 2017.03.31 | |
| Design experiment, model, or demonstration to be conducted | • Anticipating research/project problems  
• Providing time, space, supervision for experiment  
• [ENL STUDENTS] Conducting experiments with children in school  
• Guide students in knowing the science topic before doing the experiment  
• Distinguishing between inquiries that are experiments, inquiries that are demonstrations, and inquiries that are models  
• Providing students time to talk through experiments (i.e., turn and talk as a way to discuss ideas as scientists)  
• Circulating/conversing with students about their experiment plans | • Observed objectives (3/31/2017)  
• Short Interview 2  
• Bianchi 2017.03.31  
• Short 2017.03.31 |
TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

Smaller Practices
(Teachers guiding students toward...)
Searching specifically for 5W+H questions as framework for understanding the science behind the experiment/demonstration (becomes "literature review")
Metacognition check: doing further research if students are not aware of what they are currently reading about their topic (esp. vocabulary)
“Research leads to more research”

Pedagogical Actions

- Guide synthesizing information across notes
- Modeling organizing research about topic by the 5W+H questions
- Distinguishing between 5W+H questions that are and are not relevant for certain topics
- Modeling note-taking scheme (2-columns) to facilitate synthesis
- Turn and talk as a way to discuss ideas as researchers
- Conferring with students (1-on-1)
- Modeling examples of not knowing something and returning to research to find out more
- Distinguishing between copying information into notebook and actually understanding what is written
- Explicit instruction in defining unknown words about the science topic
- Using morphemic analysis to help students define unknown words
- Turn and talk as a way to discuss ideas as researchers
- Modeling note-taking scheme (2-columns) to facilitate synthesis
- Explicit instruction in defining synthesis (i.e., “explain what you know”)

Synthesizing information across multiple sources
Make inference based on results of experiment/demonstration

Pedagogical Actions

- Teacher-guided as needed
- Explicit instruction in what an inference/conclusion using anchor charts
- Modeling making an inference/conclusions based on teacher example KIC
- Explicit instruction in suggesting future experiments, questions
- Modeling suggesting future experiments, questions using verbal examples and sentence stems

Data Sources

- Observed objectives (4/7/2017)
- Short Interview 2
- Bianchi 2017.04.07
- Observed objectives (4/7/2017; 4/19/2017; 4/21/2017)
- Bianchi 2017.04.07
- Bianchi 2017.04.19
- Bianchi 2017.04.21
- Bianchi 2017.04.24
- Observed objectives (4/24/2017)
- Bianchi 2017.04.07
- Bianchi 2017.04.24
- Observed objectives (4/24/2017)
- Bianchi Interview 2/1
- Short 2017.04.24
### Table 5.5
Activity: Guiding Final Presentations

Decomposing activity into smaller practices, associated pedagogical actions, and data sources providing evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Pedagogical Actions</th>
<th>Data Sources</th>
</tr>
</thead>
</table>
| **Check-in day:** Teachers spend time addressing individual students’ needs so that students are closer to finishing on the final day | • Meet with each individual student to determine progress in KIC project  
• Ask individual students what they need from her to help their KIC progress in research, experiment, and writing  
• Question and guide students about various aspects of their project (i.e., KIC packet, experiment, hypothesis, research)  
• Offer students potentially helpful resources (i.e., database, materials for making models)  
• Provide space for students to re-orient themselves and plan for next steps in terms of the KIC projects  
• Turn and talk as a way to discuss ideas as researchers, writers  
• Explicit instruction in expectations for all aspects of KIC project (oral and visual presentations, written article) based on rubrics  
• Help students print items for poster boards  
• Point students to different materials and technologies useful for designing and making presentations  
• Identifying and highlighting different spaces for students to work on their KIC projects  
• Listening to students orally rehearse their presentations  
• Troubleshoot technology issues when they arise  
• Ask individual students what they need from teachers to help their KIC progress  
• Help students with physical construction of posters  
• Help students with finding content for their posters | • Observed objectives (4/18/2017 Mandy & Kelli; 4/21/2017)  
• Bianchi 2017.04.18  
• Short 2017.04.18 |
| **Presentation Preparation:** Teachers take on a facilitative role to help students as needed on all parts of project (incl. experiment, research, article, or presentation) | • Explicit instruction in procedures for selecting sessions (1. Can only choose one room per session; 2. If you are presenting that session, you don't pick)  
• Read aloud all projects occurring in each room for each session before students choose | • Observed objectives (4/28/2017; 5/2/2017; 5/3/2017; 5/4/2017)  
• Bianchi 2017.04.28  
• Short 2017.04.28  
• All classes 2017.05.02  
• All classes 2017.05.03  
• All classes 2017.05.04 |
| **Presentation Preparation:** Create schedules for each student for KIC conference day  
Final oral and visual presentations are given by the students | • Assist students in setup of visual presentation (i.e., hang posters; access digital presentation)  
• Introduce students and their KIC projects  
• Troubleshoot technology issues when they arise  
• Ask questions of the presenting student (e.g., What worked? Any problems? Conclusions? Questions related to scientific content) as well as of the group  
• Facilitate demonstrations with science lab materials  
• Ask individual students if they require assistance during the presentation  
• Praising students on what was done well  
• Explaining that a student may have information incorrect/confused  
• Prompt students to ask questions of the presenter after each presentation culminates  
• Facilitate discussion around science topics related to student presentations | • Observed objectives (5/5/2017)  
• Bianchi Interview 2/1  
• KIC Conference 2017.05.05 |

Students expected to question presenters
Activity in Action: Interrelationships and Tensions between Components

The next section provides a discussion and illustration of the aforementioned pedagogical practices in action within each of the four activities in service of supporting students in their development of specific literacy skills and strategies for engagement in inquiry. Because I am interested in moments and places where tensions are manifested through the interactions and interrelationships between components of the activity system, I will a) provide a brief vignette of the pedagogical practices in action; b) identify the interrelationships at work as it pertains to the activity system, and then c) describe the tensions which are at play between these components of the activity system.

Tensions in Guiding Research

Identifying and searching for a science topic.

Kelli\(^9\) is teaching her mini-lesson, using her chart paper and a set of different colored markers to create an anchor chart. She explains to the fifth-graders in front of her, “So, we are at the part of your reading and writing that we’re going to start doing research. And you guys did an awesome job with this,” gesturing to a part of the anchor chart that says “Question.” She continues saying, “But something we need to work on is once again... is this part right here.” she gestures to the words, “Research Plan.” Kelli explains, “Some of you, for your research plan, what you tried to do was write down materials for your experiment.” She writes the word “materials” down in the box labeled “Research Plan.” Kelli continues, “And guess what?” subsequently crossing out the word “materials” energetically.

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\(^9\) All vignettes are based on elaborated observational field notes and video; vignettes are presented in italics.
Kelli picks up another colored marker saying, “Some of you also tried to do this,” and writes the words “how to do the experiment” in the box labeled “Research Plan.” Owen interjects with, “It’s not about the experiment, it’s about, like... how, like...” Another student picks up saying, “What you’re doing your experiment on.” Kelli finishes writing the phrase and says, “And once again, I’m gonna cross it out.” Kelli makes an X through this phrase, as well. “Not how to do your experiment.”

Kelli picks up yet new color and explains, “Your research plan...” She takes the marker and draws an arrow from the words “Research Plan” to the spot where she is about to write on the chart paper. “Your research plan needs to be your science topic.” She writes the words “science topic” on the chart paper.

“You take your question and think, 'What science topic am I actually going to learn about?’”

This was one of the first challenges facing the teachers (particularly Kelli) when it came to guiding research of students chosen inquiry topics. This tension involves the subjects (teachers), mediating artifacts (texts; pedagogical practices), objects (students and their progress towards KIC presentations), and the division of labor (teachers teaching based on student needs). This is particularly an issue of division of labor, as Kelli did not initially intend to re-teach this mini-lesson, but did as so many of her students struggled with making the link between their scientific activity (i.e., experiment, demonstration, model) and the actual science content underpinning this. As described in the vignette above, students tended to start internet searches on the materials they needed or the steps of the experiment they intended to do. Much of Kelli’s whole group and
individual guidance after research questions were formed and scientific activities were selected involved helping students determine this link.

Some students had more difficult topics than others, and most students started with identifying an interesting experiment or demonstration they wanted to replicate rather than a science topic they were interested in. Mandy describes this in an interview, stating I think a lot of the students value, “What am I gonna create? What’s my experiment going to be that’s really cool?” I think they focus more on that than the actual research involved…. Knowing that they get excited about that part, we try to marry the two so that they’re excited about both parts.

This is precisely the aim that Kelli, Mandy, and Michelle take with them as they guide students in determining their topics to be researched. For example, Kelli and Emma have the following exchange:

**Kelli:** Do you know what a particle is? And a molecule? A chemical bond?

(both laugh)

**Kelli:** You have a really hard topic, now are you realizing that? You|

**Emma:** Yeah.

**Kelli:** Because yesterday, you said something really funny. . . you said to me, “It’s an easy experiment but a, a really hard science [topic].” I agree.

Emma’s experiment was how temperature impacts the bounce height of balls made of different materials. As such, she needed to understand how temperature impacts matter at the molecular level. While Emma was able to construct an emergent understanding how temperature impacts matter throughout the KIC project, she struggled throughout to identify exactly how she ought to search for such topics. This also impacted her progress in
independently finding enough resources which supported her science topic. Both Kelli and Mandy provided her with scaffolding at multiple points during the project in identifying which topics and terms to search for as well as finding additional articles to cite in support of her writing.

Aiden also required substantial guidance in what topics to research alongside his project, which dealt with air pressure. Because his experiment involved upending a cup filled with liquid covered by an index card, he assumed that his experiment dealt with water pressure. However, what became clear to Aiden, through Kelli and Mandy’s help, was that his project actually dealt with air pressure and meteorology. Both Kelli and Mandy sat down with him to identify these at different points during the project. Mandy’s exchange with him during writing class is below, after Aiden has explained that what he thought his project was about (water pressure) does not seem to be what he is finding in the articles he is reading about:

Mandy: So are you talking about what you thought to begin with, your hypothesis? Is it bad if you were wrong? No! Didn’t that make it more exciting for you as a scientist to say, "Wait a minute, I thought this was gonna happen, and then this happened!" But do you understand WHY it happened?

Aiden: Well...well the (unintelligible) air is vibrating in the water

Mandy: Okay...

Aiden: The water is (unintelligible) still pushing (unintelligible) cause I thought the water would be stronger than before... and it actually| the water stayed.
Mandy: So, in your research, did you...study both air pressure and water pressure? Because maybe that would help you explain you think that happened.

Aiden: (acknowledges)

Mandy: Okay, so maybe, with the extra time we're gonna have next weekend, you're gonna want to study more about the air pressure and the reason why that remained unbalanced. Why did you get that result? . . . You could leave it blank and write yourself a little note: need to research water pressure or depth, research water pressure versus air pressure, what's stronger, what conditions make one stronger than the other.

Even once students have identified their science topic, students still experience difficulty once relevant articles has been searched for and found. Mandy explains that even if students find the right article, it can be difficult for them to independently locate the relevant information. This is one of the reasons why both Kelli and Mandy do lessons on answering who, what, when, where, why, and how questions about the topic under study. However, this also plays into another major tension. Mandy describes that her students often, “don’t know that [a specific part of the article] is not where they get information from. They need to read between lines, have those inferential skills, but the articles are often so high above their reading level.” The tension that pairs with that of finding one’s science topic is that of text readability.

**Readability of Available Texts.**
Kelli sits down next to Owen, who is sitting cross-legged on the rug writing in his notebook. Owen has been doing more research on acceleration, which is a part of his core topic of Newton’s Second Law of Motion. Owen types “linear acceleration” in his browser and watches his screen as the results load, Kelli also peering over at the screen. After results populate, Kelli shares an anecdote describing that she studied linear acceleration in college, and she subsequently suggests that Owen should type in “for kids” in the search bar. Owen does not do this and instead pulls up an article from the current results. She explains to Owen, “[Those articles] are really tough. I don’t know if you want to read that. You might want to read that, but it’s not easy.” Owen’s eyes scan the screen. His face turns puzzled as he looks over the article he’s pulled up. “What?” he says in disbelief, as he scrolls through the rest of the article. Kelli, who has been skimming the article reminds, “Research is not easy! Even as an adult, I type in ‘for kids’ so I can find something I can understand.” Owen says, “Yeah, I think I’ll do that,” and types “for kids” into the browser. The results load. Owen sighs with relief, “There we go!” Kelli and Owen lean in together over the iPad screen. Owen scrolls slowly while Kelli points toward specific words. Owen zooms in towards that text with finger and thumb. Kelli reads, “It’s right there, it’s one type of...” Kelli trails off, reading quietly to herself. Owen’s eyes follow the text, shaking his head while he reads. Kelli asks, “So what do you think? Did that help?” Owen responds, “No.” Kelli then asserts the key point of multiple mini-lessons: “Do you think that research leads to more research? It’s not a one or two day thing. You get a word that looks like
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this, and it leads to looking at different sites?” Kelli asks Owen if she could take
his iPad for a moment, which he hands over to her. She finds a site called
“Physics for Kids.” They work through this website together, redefining
acceleration and velocity in Owen’s own words, and making goals about where
they will pick up tomorrow, as reading is about to end.

The vignette above reflects a tension that involving the subject (teachers),
mediating artifacts (texts; iPads; pedagogical actions), rules (student choice); and
object (students plus their KIC projects). Each participating teacher discussed in their
interviews and difficulties faced in terms of text readability during teaching of the KIC
project, particularly in terms of a) the challenges of increased access to text as opened
through digital technologies and b) finding useful, appropriately challenging texts on a
variety of topics for a wide range of fifth-grade readers.

Technology provided increased access to more [challenging] texts. All three
teachers commented on the difficulty of the articles students found on the Internet using
their iPads. Though the iPads enabled student choice among a greater variety of topics than
possible were they limited to a single school library’s non-digital print texts, teachers
recognized that the readability of many online written texts were well beyond the
established reading levels of many (if not most) of their students, oftentimes being written
for the college-level. Kelli describes this intersection between students’ inquiry topics, the
texts they were researching on their iPads, and her class’s wide range of reading abilities as
“messy,” stating “everybody’s all over the place, and the readability is hard with everything,
and so you’re frantically trying to help people, making sure they’re getting everything.”
Further, when working with some students working who researched complex physics
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topics like Owen above, Kelli found herself asking, “Do they even know what their question means? They wrote the word ‘velocity’ in there, typed it. Do they know what it means?” Despite her tension with students’ access to comprehensible texts, Kelli does manage to find her way through this discomfort and frustration by maintaining persistent contact with her students. She describes her current method as

Going around and checking in with them, obviously, and sometimes doing lessons about [what happens] if you get stuck. Try this, this, and this before you ask an adult. Trying to give them strategies for what to do with the struggle. And then you go around and check in on them again.

*The challenge of finding “good fit” texts for all readers on all topics.* Mandy also had tensions with the prospect of text readability with her students. While she stated elsewhere in interviews that the iPads were “the number one resource” necessary for open inquiry, she also found them to be “the biggest, most frustrating part” the projects. Mandy explains that “when the students have to go and research, they struggle to find articles and resources that are appropriate for them at their given level that they can actually understand and take something from it.” Mandy goes on to describe the difficulty of meeting the needs of all students, who have a wide range of reading abilities as well as a wide range of inquiry topics. This tension is captured saliently as she clarifies:

We have such a wide range of reading abilities in the [fifth] grade level... anywhere from Kindergarten to fifth-grade reading ability, so that poses a challenge. Not only do we need iPads, but we *still* find it hard to find specifically scientific resources that can explain complicated topics in friendly ways at a certain level of text.
In this sense, while student choice of inquiry topic was opened substantially through iPad use, the topics chosen often did not yield comprehensible print-texts for students except with substantial scaffolding from teachers, who would oftentimes struggle with the complex content themselves.

The issue of readability was particularly stressful for Kelli and Mandy, who are classroom teachers and thus tended to position themselves as teachers of reading (i.e., teaching decoding, reading comprehension, and fluency), whereas Michelle, the library media specialist, did not see herself in that role and thus felt less limited. For her, the readability issue was more linked with access to resources which can bring content to children who have difficulties reading complex printed word texts. While Michelle does describe the tension of readability, stating that this is "the limitation for kids, when you get to that piece that they don’t have the literacy skills to access [the text]," she immediately offers solutions to this through the use of videos and databases with text-to-speech capabilities. She describes that, “We have some wonderful databases that read to them, and that has really opened my eyes to it. We use PebbleGo and we use BrainPop Jr., and that’s been great.” She also notes that images, picture books, as well as guest speakers can also help her students’ access complex content.

However, it is also important not to discount the difficulty of reading images and other representations of data. For example, Owen approached me with three graphs around the acceleration, velocity, and distance as related to time. He asked me, "You know what this means, at all?" While I explained that each of the graphs show how the two ideas are related to each (e.g., What happens to velocity as time passes?) and explaining how the line in the graph represents that, this was a very difficult topic to scaffold for a student on
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the fly, even with a visual instead of printed text or equations. It is not safe to assume that because a visual is presented to a student instead of words that the student will be able to read it more readily. Either way, teacher mediation as a scaffold between the text and the student is key for understanding, particularly with difficult scientific topics.

The readability of available texts is a tension that seems to be generalized issue with student self-directed inquiry projects, but one which is amplified with the use of iPads and internet. The iPads provide far greater textual resources for students, but they are not always useful because they are written at a great complexity than what students can handle in the time constraints of this inquiry project. Each teacher finds ways to mediate this tension, by providing direct instruction in searching as well as with content, reading with students, or finding non-print resources which can convey content in ways more readily accessible by students.

Source and citation expectations.

On April 25, Emma is frustrated because she needs a third source and can’t find one easily, waiting on Mrs. Short to provide her the overriding password so she can gain access to another article that is blocked for some reason. The following exchange happens:

Katie: Hey, Emma, how’s it going?
Emma: Mm, difficult.
Katie: Difficult? So, what’s happening?
Emma: Because I’m trying to find a third site...
Katie: Okay.
Emma: Because Mrs. Short said we needed three sites for paragraph three, and I can’t find a website that has information I haven’t used.

This is the first time I’ve really seen her visibly frustrated with any part of this assignment. She keeps her cool, but under the surface there is quite a bit
of nervous energy. Her iPad is open to a presentation with links available on
her lap. I ask her to talk about her other two sources and what they offer her.
Emma tells me that she has sought out resources showing other people
presenting on something similar and is looking out for their resources.

By Kelli’s class the next day, Emma did not find that second source. Kelli
works with her to find this third source on April 26, at first suggesting heavily
that Emma finds another source. After looking over Emma’s notes and writing,
Kelli then shifts, stating, “Okay. No, you’re probably fine. As long as they’re both
cited in there and that we know where your information came from, that’s
really all. Let’s just leave it at that, okay?” However, it seems that Emma
eventually finds a third source, because she has three sources listed on her
poster the day she presents, citing three sources in her written article.

This particular tension involving use of sources and number of citations involves the
subject (teacher), mediating artifact (texts; pedagogical decisions), rules
(curriculum; standards), division of labor (teachers leaning on standards and
curricula); and object (students plus their KIC projects). This tension is one that
overlaps from reading into writing, since the students’ third paragraph (essentially a short
literature review about their science topic) is rooted in synthesizing big ideas across the
sources they researched. There are multiple occasions where Kelli and Mandy directly
explain that, as per “fifth-grade standard,” students are supposed to use and cite at least
three sources in their research and writing.

And our responsibility as fifth-graders is to have at least three sources of
information, okay? It shows that we did our research. We didn’t just look at one
website. We didn’t just look at two websites or two articles. We went to three or more, okay? (Mandy, Writing, Whole Group, April 25)

Well, we’re asking for three [sources] because it’s a fifth-grade standard. (Mandy, Writing, with Owen, April 25)

You can’t just copy information off the internet unless you say it’s coming from somewhere. It was our goal to get you to use three forms of information [for the KIC projects]. (Kelli, Reading, Whole Group, April 26)

What is interesting to note here in both teachers’ discourse is the vertical sense of orientation towards responsibilities (rules), goals (objectives), and standards (in bold print above). It’s an authoritative stance towards these vertically-oriented, preset tenets of the KIC project. While synthesizing and appropriately citing across multiple sources within a project is described, the number of “three” sources seems like a teacher-agreed upon standard. Nowhere in the actual curricular documents, learning standards employed for fifth-grade, or even the KIC written article rubric itself is this rule of three sources specified for students.

In addition to Emma’s vignette above, two observed episodes (juxtaposed below) also demonstrate the tensions within this rule.
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Owen with Mandy (April 25)

Owen: So - do I have to really put an extra [source] in?
Mandy: Mm-hm. Well, we're asking for three because it's like a fifth grade standard. So what we'll do is after you've drafted this all our, we'll see, "Is there any other information that we're leaving out for the reader?" Or is there some cool information that when you're asked that. Maybe we could research and add on, to create even more understanding. Okay?

Owen: Got it.
Mandy: Okay.

Emma with Kelli (April 26)

Emma: Is it okay if there's more information?
Kelli: Yeah, that's fine. You only used two sources altogether?
Emma: Yeah.
Kelli: I would suggest getting another source.
Emma: Okay.

(Kelli is glancing over Emma's paragraph three and her notes)

Kelli: Um, do you have enough| how much information do you have?
Emma: Um... (flipping through notebook and showing Kelli her notes, of which there are pages worth) this is one article and this...
Kelli: Okay. No, you're probably fine. As long as they're both cited in there and that we know where your information came from, that's really all. Let's just leave it at that, okay? You're fine.

While it might be easy to state the rule and rely on its authoritative power unquestioningly with students as a “fifth-grade standard” (as Mandy does with Owen), there can be exceptions to the rule (as Kelli does with Emma). In a project where there is so much openness and flexibility, it can be difficult to create concrete, immovable parameters such as this rule of three sources when students have compelling reasons to not follow these rules. In Emma’s case, she has used two sources exhaustively for information, having structured much of her writing around them. While Emma does eventually find another source, Kelli has given her permission to simply use two. Mandy adheres more so to the teacher agreed-upon number of three. The tension here is with the general flexibility of the project versus the relative rigidity and fluidity of adherence to the rules between teachers – particularly when the writing teacher (who will assess the written work) is the one more rigidly adherent to it.

Tensions in Guiding Writing

Student choice and providing examples of science activity type.
Mandy is conducting her mini-lesson on paragraph five of their written article, which is the paragraph students are expected to state their findings from the science activity they chose to do. Mandy references an anchor chart that states these expectations in bulleted form, as well as providing a written example of paragraph five. The written example begins with the words, “After conducting my experiment…” (Figure 5.8)

Mandy explains “[You should] provide evidence from your observations or test so you explain to me, what you did you see happen? What did you write down in your chart? What occurred? And if you’re a person who didn’t do an experiment but were demonstrating something, you tell me, how you will show that to people? What will it look like?”

Mandy continues: “Two people in the last class are demonstrating how crystals form. Their evidence is not based on a test but what materials were used to show how crystals formed. They explained that to me.” Despite this brief verbal example about what to include, I notice that children doing demonstrations or models do not have an anchor chart or example paragraph five which provides them with helpful transition words and a structure to use to guide their writing. There are multiple students in this class who are doing either models or demonstrations instead of experiments.
The tension between student choice of science activity and availability of specific tools providing guidance, structure, and examples involve the following activity system components: **subject (teacher)**, **mediating artifacts (texts, student choice; pedagogical decisions)**, **division of labor (teachers teaching based on student needs)**, and **object (students plus their KIC projects)**. In short, students who chose to do experiments had substantially more whole-group direct explanation of guidelines, written examples, and anchor texts geared towards them when compared to students who made demonstrations or constructed models. This is critical because of the theoretical rootedness of demonstrations and models rather than the empirical, “testable” orientation that experiments have. That is, while all students had a question for their inquiry projects, students doing demonstrations or constructing models had less of a “testable question” and more of an opportunity to demonstrate or model scientific theory in action. For example,
James used boiling water; a soda can with some measure of very cold water; and tongs as a demonstration of the collapse of a star into a black hole.

There are specific aspects of the written article that have less pedagogical support compared with students writing articles about science experiments, namely paragraph two (i.e., involving variables, which would not be present in a demonstration or model), paragraph five (i.e., results, which would be discussed differently in a demonstration or model), and paragraph six (i.e., which reflects making an inference about the results and future research, which would be necessarily different in a demonstration or model). During her mini-lesson about writing paragraph six, Mandy tailors her talk toward those students who conducts experiments rather than demonstrations and models:

In paragraph six, we say “We as scientists are never really done,” so we want to show what we would do if we had more time. We get to suggest future experiments. For example, I would like to test other brands of diapers, including cloth diapers to find out if Pampers are still the most absorbent.”

This is also accompanied by an experiment-specific anchor chart (Figure 5.9).

Figure 5.9. Paragraph six anchor chart for the KIC written article.
While this lack of guidance appears to be more of an oversight on Mandy's behalf rather than intentional privileging, it is evident that certain student choices are not always as well-pedagogically supported as others. This tension among student choice is not isolated to these incidents with writing. As will be discussed later in this chapter, students' decisions regarding presentation medium and representation can also impact how much instruction and guidance is truly relevant to their choices.

**Competing intentions and expectations for student talk.**

*Mandy’s classroom is abuzz with student voices talking quietly at their tables. Some students are totally independent and writing in their notebooks. Other students are talking animatedly across their tables. Yet others are leaning together in pairs around an iPad. Mandy mentions, at this point, that she notices the tables that are behaving as “self-directed learners” and calls them as such explicitly. Most students are working in this self-directed fashion in some manner. One group that includes Owen is quite talkative. Owen and another boy are talking about variables, which was the topic of Mandy’s mini-lesson today. The other boy leans over and points to Owen’s paper, saying, “That’s the variable.” They continue to go back and forth about this, pointing to each other’s papers. This seems to be the embodiment of what Mandy described earlier in her mini-lesson about having a “scientific mindset.” This means that “we share ideas, ask for help, and work as a team.”

A minute later, Mandy addresses the class: “Boys and girls I still many hear people still talking to each other. I need you to use your research time wisely. We will be able to share at the end.”
This particular tension of intentions and expectations for student talk during writing class is one that intersects **subject (teacher), mediating artifacts (pedagogical decisions); rules (class interactional); community (invoking discourse of scientific community); and object (students plus their KIC projects)**. Based on weeks of observation in multiple classroom spaces, the fifth-grade students rarely worked in total silence during the KIC projects. In the main three classrooms (i.e., Mandy’s room, Kelli’s room, Michelle’s library), quiet talking was not only permitted but expected, though reprimands are given if this becomes out of control or entirely off-task. Analysis revealed a distinct tension between Mandy’s interview responses and real-time pedagogical actions and words. Mandy’s tension between intentions and actual expectations involving classroom talk was not constant – the example above demonstrates that she clearly allowed class time for student talk about their projects. Yet various data sources revealed that Mandy highly valued a quieter, more independent self-direction.

Mandy explained in her interview that doing inquiry projects like KIC provided holistic opportunities for students interact with content and each other authentically: “[Inquiry learning] is more focused on the whole child, teaching the whole child. It provides more flexibility. **It encourages talk and cooperation.** I think it helps open up those students who have a hard time.” Mandy supported this further by discussing the role of collaboration in inquiry projects from the writing perspective, stating that she sees the classroom as needing to be “quiet, not silent. There’s a constant buzz.” She envisioned the ideal writing classroom as collaborative between students as they read, research, and compose:
We keep talking about what the collaboration level should be, even in independent writing... You are not supposed to be alone in the work. You are supposed to rely on others and want to bounce ideas off of other people and feed off the energy of other people, even if it’s not within the same topic, even better because then you have open mind and perspective. I think... if kids are sitting at tables, I would expect that they’re, now and then, going to talk to the people at the tables. I expect that they’re even gonna get up and walk across the room to another person and go see them.

It seems clear that Mandy was supportive of a collaborative writing classroom – one that openly permit talk between students about writing.

However, multiple times during the writing portion of KIC, Mandy appeared to be heavily managing and redirecting student talk, even if such talk was following precisely these collaborative parameters. In addition to the example above, Mandy seemed to reinforce the typical “silent classroom” when she instructed her students, “We have 40 minutes of writing today, not talking, if you need to move to a better learning space, please do so.” Here, she directly placed being a good writer in opposition to the act of talking. She stated this after a group of boys were talking aloud, attempting to figure out how much time they had to work before class ended. While this particular group of boys wasn’t whispering with the quietest voices, they were certainly discussing aspects of writing class.

After this point, the class was extremely quiet, with the only talking occurring between students and teachers as Mandy and ESL teachers circulated to students.

There were also moments where students working extremely quietly and independently were outwardly praised by Mandy in a way that similar to when their collaborative talk was praised in the vignette above. During one of the last full days of
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writing class, after reviewing with students the expectations of paragraph three (i.e., the literature review), Mandy spent most of the time circulating to nearly every student within the class period. Towards the end of the period, Mandy walked over to me with a smile on her face, let out a sigh, and gestured around the room with flat palms, “Ahh, this is what it’s supposed to be like. Finally, it’s getting back to normal.” She seemed to be indicating the quiet in the writing space in tandem with the students’ (and her own) productivity.

However, it is critical to stress that for as many instances that Mandy demanded near-silence in her classroom, she went out of her way to create scenarios for student-student talk around their KIC writing. First, every single writing class mini-lesson ended with an opportunity for students to turn-and-talk about their goals for the day (e.g., “Today, you’ll try on three sources in your third paragraph AND come up with another plan. Turn and tell your partner what you’ll be doing today.”). Other times, she prompted students to share with a peer what they worked on in a given moment, such as she did on this day when students were working on paragraph four – the procedural/methodological paragraph about their science activity. At that time, she asked students mid-way through class, “If you’re a writer who feels they are ready to share some writing, stand up.” Then, she directed students to look around the room at others who were standing to find a person to swap writing with for feedback purposes (e.g., Owen calls Fatima over and asks her to read his paragraph). Students frequently had spaces to discuss their writing and seek feedback with peers in Mandy’s classroom – it clearly was in the process of becoming common practice during all parts of writing.

This discrepancy between intentions and actual expectations around classroom talk remains a tension for Mandy, as her practice around classroom talk is not yet consistent
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with her ideal goals. She could be construed as sending students mixed messages during classes when on-task peer talk is initially positioned as acceptable but is subsequently considered to be rule-breaking minutes later. Despite this tension, it is evident that Mandy’s pedagogy around classroom talk is one that she believes to be situated more within the realm of student collaboration rather than that of isolation.

Tensions in Guiding Design of Students’ Final Presentations

Student choice and providing instruction in, examples of presentation medium.

Michelle and her students are in the library, situated at tables and on the rug around the Smart Board, which is projecting photographs of older posters created for inquiry projects like KIC in past years (Figure 5.10). Michelle is specifically teaching the students about aesthetic qualities of poster design, such as white space, borders, use of print text and photographs, and layout of the poster in general. She flips to a photograph, saying, “Here are some of the pictures [of posters] gathered before... people are gonna come up to your board.”

Figure 5.10. Michelle showing Kelli’s class example poster boards in the library.
A student in the room asks Michelle aloud, "Do you have to do a poster board?" Earlier in the week, Kelli made a point to emphasize student choice of presentation medium, inclusive of not only posters but Power Point, Explain Everything, Prezi, or even a video. Michelle responds to the student, saying, “No, it’s your choice.” Michelle turns back to the Smart Board projecting the poster and launching back into her instruction: “If you’re doing the board, remember, you want people to come to your board, feel invited, drawn in to it.” She continues, critiquing the board on the screen, saying, “I don’t know if it you think this one has too much white space. Sometimes people use borders, sometimes they use colored paper behind writing. Sometimes it draws you in…”

Nothing was said about design of Power Point presentation or of creating videos.

The tension between student choice of presentation medium and teacher-provided guidance, structure, and examples of each involve the subject (teacher), mediating artifacts (example texts; student choice; pedagogical decisions), division of labor (teachers teaching based on student choices and needs), and object (students plus their KIC projects). Similar to how children doing experiments received more guidance and examples around how to write about their chosen science activity, children electing to create posters ultimately were the only students who were shown examples of the visual texts they chose to create for KIC. Students who were using presentation slides, the program Explain Everything, Prezi, or video were not shown any sort of exemplar text of what their chosen presentation medium could look like during the KIC project during any classroom observations.
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This was especially pertinent during Michelle’s teaching in the library, as most design-focused mini-lessons for the KIC projects were under Michelle’s purview. To Michelle’s credit, she helped students attend to multimodal aspects of design, including color, white space, borders, use of images and print text, and general principles of layout that help visual displays “draw you in” or “pop off the page.” She often invoked the school’s art teacher, stating “Think of everything you learned [in art class] about materials to use... you want to make people come to it.” She provided all sorts of examples of posters that adhere (or not) to such design principals. For example, Michelle called attention to use of border in the poster in Figure 5.11, stating, “Notice how they have white paper and they frame it with construction paper so it pops out?” She also pointed out instances of posters that might be less visually appealing for specific reasons, such as when she observed that Figure 5.12 has “a lot of white space.”

Figure 5.11. Michelle’s example of good use of border in visual KIC project design.
Figure 5.12. Michelle’s example of a poster with small print and “a lot of white space.”

However, despite her relatively in-depth multimodal treatment of poster board design conventions and possibilities, the same could not be said for any of the other media students chose to use for the visual component of their presentation. In fact, as students were guided to plan out their visual presentation designs in her class, she geared this specifically towards bi- or tri-fold poster designs. Michelle explained:

"There is a piece of paper on your table, take a minute, fold it into thirds, sketch out what you see in your head, or on a notepad or picture page on your iPad, draw a picture of what you see in your head. What is the picture in your head of what you're going to show people, your steps, where are you gonna put your data?"

Students in Michelle’s class who were not doing posters were not encouraged to specifically draft out their Power Points, Explain Everything, or script out their videos.
While it also could be construed that Michelle kept her instructions vague enough so that all students could participate in the activity, it remained that her entire mini-lesson was constructed around poster design principles.

This was further reinforced in Mandy’s classroom, once writing instruction had finished and all remaining time was to be used on presentation design. Mandy explains that once students finished editing and revising their KIC article, they would be able to “get your poster materials.” Mandy further provided instruction to all students working on posters (as opposed to other media for visual presentations) as she continued:

We are suggesting you stay in pencil more for your poster, in case what you plan for doesn’t come to fruition. We only have about 35 minutes of working time today. If you are working with your poster, I suggest you spread out on the mat.

Students who worked on Power Point, Explain Everything, and videos were not addressed at all.

This became problematic when Owen, a student who created a Power Point, was confused about expectations. During a whole group mini-lesson geared towards presentation creation and preparation, Mandy told the class, “I would focus on your posters” today. Owen raised his hand and spoke quickly, a note of panic in his voice, “But I’m just doing my presentation!” Mandy addressed him, clarifying, “Okay. And some people are doing presentations on their iPads. That’s fine, too.” Mandy moved on to field other students’ questions, but Owen’s confusion about presentation expectations felt warranted, considering how much the posters had been the focus of mini-lessons around design and presentation preparation during the KIC project relative to the other presentation media students chose to work with.
While a majority of students did create posters as their visual representation, a substantial portion of fifth-graders chose to create through a different presentation medium and were largely unsupported. The only time specific multimodal design considerations were discussed in relation to either slide presentations or videos were in Kelli’s classroom (see Figure 5.4 above). Kelli directly states that “if you are doing a Power Point, you could write the slides. You could write a question, picture, maybe some facts. If you are doing a video, maybe you want to plan out what you’ll say.” She draws several “slides” represented as small boxes on the chart paper, writing a question mark, the word “picture,” and the word “facts” inside each of these small boxes. This is the extent of how Power Points are taught as a medium from a design perspective during the KIC project.

**Student choice and providing examples of representation tools.**

Michelle teaches all three fifth-grade classes a mini-lesson on creating data displays in the form of bar, line, and pie graphs. She also provides three different tools for her students to use when creating graphs – tools “you can use to put in your information.” This information, she intimates time and time again, is the numerical data that was collected during students’ experiments, if they chose to do an experiment. Such numerical data is positioned by Michelle as very important and more reliable than anecdotal evidence. Michelle describes to Kelli’s class, “When you watch a commercial...or you buy a product/when you buy something, or you see something, do you want to buy it because somebody says to you, ‘Well, it’s kinda good...well, it kinda works...’” While Michelle is stating the final sentence, she uses an unsure tone of voice while shifting her weight from foot to foot, evoking uncertainty. Then, Michelle
...or do you want [to buy] it because there's PROOF that it works? And how do we prove that something does something? Do you prove it with an opinion or do you prove it with numbers? Or do you prove it with pictures?"

The students are generally quiet, while one student tentatively comments, “Pictures?” Michelle takes a new tack, offering, “How about when we do laundry detergents? You ever watch a commercial on TV, and it says ‘Nine out of ten times, Tide was able to get grass stains out of the clothes?’ They show you, right? They show you, and they back it up with numbers.” Michelle brings back the anecdotal evidence to compare to the numerical data: “If they say to you ‘Well, sometimes, this can get the stains outta your clothes,’ are you gonna buy it?”

The students answer more confidently now, “No.” Michelle echoes them, exclaiming “No!” and another student responds with, “You need proof.” Michelle emphatically revoices this student, “WE NEED PROOF!” She continues with the rationale of the experimental aspect of the KIC projects, saying, “So that’s why we have you test out what you’re saying, and we have you prove it to us. Now these graphs, these bar graphs, are the proof. You’ve done it, that’s why you test out what you’re doing, okay?”

The tension between student choice of data display representation (including use of digital tool) and teacher-provided guidance, structure, and examples of each involve the subject (teacher), mediating artifacts (example texts; student choice; pedagogical decisions), rules (invoking the discourses of scientific objectivity); division of labor.
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(teachers teaching based on student choices and needs), and object (students plus their KIC projects). Once again, students are guided in a specific way towards tools and orientations that may not actually be useful (i.e., graphs) for them given their choice of science activity and/or data collected without similar guidance in other kinds of data displays (i.e., pictures over time, drawings, maps, charts, etc.). If students did not collect numerical data – which students doing demonstrations and models did not – graphing is not a useful tool for students.

To Michelle’s credit, she is acutely aware that many students will choose to use the three graphing tools that she presents to them in this particular mini-lesson. Instead, she sees herself as giving students “lots of resources” so they don’t have to “search all over the place saying, ‘I don’t know how to make a beautiful graph.’” In fact, Michelle describes this particular library class as an opportunity for students to decide how they are going to show the information they’ve collected. This was meant to be a time for students to play around with the graphing tools and select one if it was relevant to their data. Some students did, in fact, create graphs during this time.

However, multiple other students struggled with this and didn’t understand the impetus to use a graph in the first place for their own data set. For example, Fatima asked Mrs. Stasik outright about whether or not she needed a graph or not in the exchange below:

Fatima: Um, my experiment, I’m doing electromagnets versus um, regular magnets, so... would I need one?
Michelle: Well, we have to figure out - what if you - what kind of information have you collected? . . . Are there numbers that you measured?
Fatima: Yes.
Michelle: Did you have different magnets?
Fatima: Uh, I only had one normal magnet [bar magnet].
Michelle: So one bar magnet, and then you had different things that you had distances away?
Fatima: Yes, I had (unintelligible).
Michelle: So could you measure the strength, or would it be shown better with pictures?
Fatima: Pictures, I think.
Michelle: So then you’d have pictures and description... as long as you have a way to show me what you’ve collected.

In this instance, based on her previous assertion that numbers provide the best kind of proof, Michelle actually gleans from Fatima that her numerical data could actually be graphed. However, when asked outright if a graph or pictures would be better, Fatima immediately answers “Pictures.” What is ultimately ironic is that the picture Fatima uses is actually numerical data (i.e., a chart showing the amount of paperclips the bar magnet and the electromagnet picked up), but in this instance, the point of using the graphs seems to be lost on Fatima, held in tension with Michelle’s positioning of Fatima as having agency and choice over her representation type.

Another student, Saabira, faced a similar issue of graphing, verbalizing her lack of understanding about how the graphs would work for her data set, which involved plant growth comparisons in different locations (i.e., full sun, lightbulb “sun,” and basement darkness). Saabira was dead-set on understanding graphing as well as using a graph as her data display. Michelle sat with Saabira for quite a length of time during library (i.e., over nine minutes of a 45-minute period), questioning her about the kinds of data she collected, and helping her to determine whether or not a graph would be a useful data display. Once Michelle figured out that Saabira’s data is actually non-numerical (i.e., photographs taken over time; visual observations of the plants) and thus cannot be plotted on a graph, Michelle explains the following:

If you can't graph it, this might not be the way you’re gonna share your data. You might share your data with pictures. Okay? So that's what you decided today. That
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this is not the way I'm going to share my information. Okay? Is that what you found out today? That this is not your way?

Michelle is providing the opportunity for students to try and understand graphing, like Saabira did, but along with this, she is providing space for students to make decisions about their data displays.

The main tension here is that the entire mini-lesson is about learning how to use different kinds of graphing tools rather than showing examples of and/or demonstrating data displays beyond graphs. Also, the expectation was that students "play with" graphing tools even though they may not have collected numerical data. While this eventually was discussed in the context of small group or individualized work with Michelle as she circulated from group to group, having a non-numerical data display was certainly not considered to be the most reliable or trustworthy kind of data within the mini-lessons. This, again, creates tensions with students who chose not to collect numerical data to begin with. It also reinforces the scientific objectivist position that the best kind of data is numerical data serving as absolute proof, which is a belief highly entrenched in discourse of science coming from a post-positivist angle. However, it is also one that is, in this case, being laced through the discourses of school learning as well as those surrounding inquiry in this space. This is a troubling notion, especially considering my own perspective as a qualitative educational researcher.

Tensions in Presenting Final Presentations: Whose Voices are Heard?

With all projects completed, students began sharing their presentations.

Two district science teachers were brought in to assess the projects and to help guide presentations. On this day, under the guidance of two district science
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teachers in the science lab, Aiden has just finished up his final KIC project presentation to an audience of his classmates. His presentation dealt with concepts about air pressure as demonstrated by holding liquid in a cup turned upside down with an index card on the rim of the cup. Aiden is now fielding questions from his classmates. Owen raises his hand and Aiden calls on him. Owen asks, “Is there other things for/ is there other work/ Does air pressure only happen in the atmosphere?”

Aiden responds with, “It’s everywhere on Earth.” Aiden pauses and then continues with, “OH! You mean like that. Because the geosphere’s not really in the air. It’s kind of like on the ground.”

One of the science teachers interjects immediately with, “Geo is like geology. Land. So atmosphere is that air.”

Aiden follows up her statement with, “Yeah, it’s, like, high.” Aiden is about to continue his explanation but is cut off by the science teacher once more. She says, “Hydrosphere/ hold on one second, I’m sorry/ what do you think the hydrosphere would be?”

Aiden goes to say the answer (“water”) but covers his mouth up with his hand before he blurts it out entirely. Then the rest of the students answer chorally in response to the teacher, “Water.” The science teacher addresses the class saying, “Yep. Water.” She turns to Aiden and says, “Sorry.”

Aiden also responds by saying “Sorry,” before moving on to his explanation. “Okay. So I also wrote that when you get higher in the atmosphere, the air pressure decreases...”
The tension created by different kinds of teacher guidance throughout the KIC student presentations involved the following activity system components: **subjects** (teachers), **mediating artifacts** (student presentations as texts; pedagogical decisions), **rules** (student self-directedness expectations); and **object** (students plus their KIC projects). During guidance of the presentations, there was a distinct difference in how student presentations were handled by certain teachers in terms of guidance and whose voices were foregrounded.

At this juncture, it is important to restate that there were two science teachers guiding final presentations who were not involved with the day-to-day teaching practice of the KIC projects when compared to fifth-grade classroom teachers Kelli and Mandy. The science teachers evaluated all presentations that occurred in the science lab, whereas Kelli evaluated all presentations located in her classroom, Mandy did the same in her classroom, and the other fifth grade teacher not participating in this study did the same in her classroom. As such this particular tension stems from a deeper issue dealing with the relationship between product (i.e., the science content presented) and authentic engagement with the inquiry process (i.e., students going through all steps of the KIC project with varying degrees of choice and authenticity). In short, it seemed that the science teachers were more concerned with guiding in terms of science content, whereas Kelli and Mandy were more concerned with guiding the inquiry process and ensuring student voices remained at the forefront of the KIC presentations.

As evidenced in the vignette above, the science teacher capitalized on Aiden’s presentation, taking advantage of a small teachable moment regarding that particular science topic. She disrupted the flow of question-and-answer occurring between the
students for the teachable moment, even though Aiden later on demonstrated after her interruption that he was perfectly capable of adding more to his initial response to Owen’s question. While it was not inherently problematic that this teacher took advantage of a teachable moment in dialogue with her student’s research project, it became an issue when considering that one of the main points of this project is student choice, voice, self-directedness, and demonstration of knowledge. She silenced the presenting student in order to create room for her own voice and knowledge. What is additionally concerning in this instance is how quickly Aiden silenced himself so the teacher could speak, subsequently apologizing for his actions. While it is unclear if the apology was just Aiden reflecting the science teacher’s language back at her, the notion that he apologized for something he did not do (which she did – interrupting his presentation) is disconcerting.

In addition to interrupting students, this particular science teacher also engaged in a) rushing students who experienced failure during their experiments, b) asking questions in spaces where the student-audience should have been the ones asking questions, and c) occasionally moving from her usual seat at a side-table to a more lecture-type, front-of-the-class position while speaking to the students during student presentations. Such practices were incommensurate with the activities within the activity system as established by the teachers and students over the KIC project up to this point.

In contrast, Kelli and Mandy tended to talk very little during student presentations. The classroom teachers enabled their students to maintain that self-directedness, usually speaking only to introduce students’ and their presentations or to mediate student presentations if a student appeared to require some kind of assistance. For example, one student presenting in Kelli’s classroom on circuits was visibly nervous and struggled to
discuss scientific topics related to electricity and kinds of circuits. A boy knowledgeable about the topic in the audience shot question after question at him while he was presenting, oftentimes answering the questions before the boy presenting had a chance to respond fully. The boy presenting was beginning to stumble upon his words. It was at this point that Kelli stepped in and asked the presenter quietly and discreetly, “Hey, do you want me to help you at all, buddy?” Once the boy presenting took her up on her offer, Kelli stepped up to the demonstration table alongside him and started to help him put together his circuits while he fielded questions, addressed problems he had with his demonstration, and discussed his knowledge about circuits more in-depth than he could while he was attempting to put together the circuits by himself. In this case, Kelli provided scaffolding on the level of practice in ways which were commensurate to the established activity system. Her scaffolding was such that it did not stifle the presenter or the audience member’s voice but instead enabled a more productive and knowledgeable conversation. She maintained much of the integrity involved when engaging with self-directed inquiry as a whole for all students in that moment.

This is not to say that the science teachers did not ever provide helpful guidance that assisted in generating productive student discussion around the topics at hand, nor did they fail to guide students who were struggling while giving their presentation. As an example, one of the science teachers helped guide Owen substantially during his presentation while he had difficulty explaining some of the numerical discrepancies on his slides. After an arduous time spent between a) Owen attempting to explain why the numbers in his chart did not seem to be adding up correctly, b) Dimitri attempting to explain for Owen why his numbers might not have added up correctly, and c) James coming
in to question Dimitri’s defense of Owen’s math, the science teacher stepped in to provide
Owen a space where he could speak knowledgably about his challenging science topic of
acceleration. Consider the following exchange between the science teacher and Owen
below:

**Science Teacher:** What kind of background knowledge going into this? Like
what| where did you even come up with this?

**Owen:** I came up with this because um, I... I knew acceleration had to
do with basketball because there a move called a hesitation| it’s where you stop| you just plant (Owen demonstrates this
with his body), and just go. And so I knew it had to do with
acceleration, so I had to figure out what| what topic goes with
this.

**Science Teacher:** Right. Anything else you discovered along the way that you
didn’t know before?

**Owen:** Uh, what I didn’t know was, um... most all of it (laughs).

**Science Teacher:** So you learned a lot!

**Owen:** (Smiling) Yeah, I learned a lot.

**Science Teacher:** Sounds like you’re even still learning, because guys, this is a
hard concept. This is, like, physics. This is... middle school high
school type ideas in physics, and it’s not easy to understand.
There are a lot of formulas that go into it and calculations. It’s a
tough one.

In this instance, the same science teacher who cut Aiden off for the teachable moment uses
her authority to create an opportunity to Owen to speak to his background knowledge
about his topic. This reveals a conceptual understanding and application of acceleration
through a basketball move called a “hesitation” or “hezi,” which would not have been
revealed through discussion of either the results table or the graphs that Owen and the
other students were fixating on. In this case, the science teacher acted responsively to
Owen’s needs, giving him not only a voice but a space for demonstration of his scientific
conceptual knowledge.

The deeper tension at play here when guiding students’ final presentations involves
the conceptual basis for the KIC project itself. The science teachers tended to foreground
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accuracy of science content rather than student self-directedness during student presentations. The classroom teachers generally strove to preserve authentic student interactions and demonstrations of student discoveries during student presentations. While both positions could be argued to be equally as important, I turn specifically to the district curriculum document, which states the following:

Students will embark on a journey through a learning process that will push them to ask and answer a testable scientific inquiry, plan and conduct an experiment, gather and interpret data and communicate their findings to a larger audience. Students will be working through the reading and writing processes in tandem with science, thus blurring the lines of each discipline. The culminating KIC conference will showcase weeks of effort, trial and error, synthesis of study, and questions for future scientists in an engaging presentation. . . This unit is intended to show the never-ending cyclical process that scientists embark on and provide a venue for students to celebrate setbacks along the way. After all, failure is simply the discovery of what did not work; they eventually lead to success and questions for further learning.

Even in this vertically-oriented, highly structured curriculum document, student self-directedness, choice, and voice were foregrounded, even in the face of failure and “discovery of what did not work.” My interpretation of this curricular document is such that while scientific content and accuracy is important, what teachers ought to consider first and foremost is the learning and literacy processes involved with student self-directed inquiry learning.
Summary

This chapter examines the teacher-as-subject activity system occurring during the KIC project by a) broadly delineating the components of the activity system, b) defining the four major literacy pedagogical activities of the activity system (i.e., guiding writing, guiding research, guiding design of visual presentations, and guiding final presentations), and b) teasing apart tensions observed between activity system components during these four activities. The observed tensions in this chapter come together to reveal larger tensions between the KIC projects as a part of an unfolding culture of inquiry at Legacy Elementary and more typified, traditional ideas about schooling and education that remain pervasive at this school. I will identify these briefly, though they will be discussed at length in Chapter 7.

The first major tension is revealed when new challenges ensue as students are able to take agency in their own learning when ever-more choices and options become available to them, especially in terms of topic choice and text. Teachers unanimously found the most difficult aspect of the project to be navigating not only the breadth of students' science topics and science activities selected but the issues of readability that paired with this. Because their fifth-grade students reflect a wide spectrum of development in terms of language and literacy strategies, teachers are consistently needing to attend to individual student needs flexibly and on-the-fly throughout the KIC projects while balancing this out with students working in a self-directed fashion. KIC project teaching around research and finding good fit texts is generally done in the moment. As such, teachers’ interactions with students - and even their roles as teachers – necessarily shift.
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Another major tension also relates to pedagogically supporting student choice within the KIC projects. While students are allowed to choose their kind of science activity, visual presentation medium, and representations of data displays, the teachers tended to teach exclusively around specific kinds of science activities (i.e., writing around experiments excluding demonstrations and models), presentation medium (i.e., posters excluding digital slide presentations and video), and representational tools (i.e., graphs and quantitative data displays excluding qualitative and descriptive data displays, such as photographs). This reveals (very likely unintended) privileging of certain kinds of student choices over others in terms of pedagogical support over others.

Finally, there are tensions between interactions of students’ voices and intentions and those of the teachers. This is most salient during the KIC presentations themselves, when the science teacher sometimes overtakes students’ voices in order to teach science content in a didactic fashion. This contradicts the nature of this inquiry project, which foregrounds literacy processes such as writing, research, and giving a visual and oral presentation of students’ experiences working with science content. Another time where students are silenced is during work in the classroom, particularly in Mandy’s class. Students are often encouraged to work together and share ideas with each other, and Mandy demonstrates this in both observations of her teaching as well as confirms this in her interviews. However, she also contradicts herself when she instructs students to then work silently, even if children are talking in earnest about their KIC projects. This reaches into an even deeper tension in regards to school culture and whose voice is usually foregrounded (i.e., the teacher’s), and how Mandy is caught between upholding that norm and also pushing against it by opening spaces permitting student conversations.
Figure 5.13. A representation of both activity systems under study within the spatial context of Legacy Elementary (to be animated at this dissertation defense).
CHAPTER SIX:
THE KIDS INQUIRY CONFERENCE: AN ACTIVITY SYSTEM
OF LEARNING, DOING, AND DESIGNING

This chapter is laid out similarly to the preceding chapter, except that this time, the
students as subjects are placed in the foreground, and the larger activity system is analyzed
with an emphasis on their various activities, practices, and actions (chapter overview
located in Figure 6.1). It begins by broadly identifying and outlining the components and
mediators in each activity system and providing a visual illustration of these (Figure 6.2).
Then, I will identify the four main activities of this activity system, along with the literacy-
related practices identified across observations throughout the duration of the KIC
projects, triangulated with student artifacts, student interviews, as well as curriculum
documents. Then, to show how the components of the activity system work together, I will
identify and describe key interrelationships in action through moments during the inquiry
projects, particularly surfacing tensions between vertical and horizontal kinds of practices
and knowledges when they intersect. These tensions in relation to the previous activity
system analyzed (i.e., Chapter 5) as well as the spatial-material context (i.e., Chapter 4) will
be further explored in the subsequent final chapter of this dissertation.

Activity System Components with Students as Focal Point

Subjects

The subjects in this activity system are the students involved in this project. For the
purposes of this study, I will focus on four focal students – Aiden, Emma, Fatima, and Owen
– who were all in the same homeroom class (Kelli Bianchi). These students rotated
together from teacher to teacher within the same classroom unit during the KIC project,
moving to Kelli Bianchi for research and presentation preparation, Mandy Short for writing and presentation preparation, and Michelle Stasik for research, design, and presentation preparation. Data from these four focal students (i.e., observational data, interviews, student-created artifacts) are chiefly informing these findings, though these are also triangulated with student actions from the non-focal participants (i.e., Ameena, Chimin, Dimitri, Hudson, James, Saabira) as well as non-study participants’ (though these students will neither be identified by pseudonym nor portrayed in images).

**Vertical orientations of subjects.** From the *vertical* standpoint, students are expected to adhere to teachers’ directives as set forth by their verbal and written directions as well as teacher-created documents, such as the KIC packet, KIC research article rubric, KIC oral and visual presentation rubric (Figure 6.3). These expectations of the subject are considered “vertical” in nature because they involve the reinforcement of institutionalized practices (e.g., following teacher directions; following directions in packets) and reified frameworks (e.g., adhering to expectations outlined on rubrics guided by learning standards).

**Horizontal orientations of subjects.** From the *horizontal* standpoint, students are provided spaces for agency throughout the KIC projects, and this is done through choice and enactment of their interests. Vossoughi and Gutíerrez (2010) write that horizontal perspectives draw attention to the opportunities for learning that emerge as people, tools, practices, and interests move across settings *and* across the social contexts or activity systems that constitute any given setting. Documenting the ways people leverage everyday knowledge is instrumental to understanding both what is
cultural about learning, as well as how everyday knowledge is central to deep and consequential learning (p. 610)

Figure 6.1: Chapter 6 overview.
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Figure 6.2. Activity system components with students as focal point.
These students are able to bring those interests into school settings through the KIC project. With some caveats, students have choice in terms of kind of science activity (i.e., experiment, demonstration, model) and ensuing research topic, research path (i.e., kinds of texts used for research), visual presentation modality (i.e., poster, Power Point, video) and ensuing design choices, and writing modality (i.e., paper-pencil, iPad-typed, computer-typed, voice dictation-input). While students are expected to adhere to the more vertically-oriented expectations and to achieve within specific, already-set parameters, they have an array of opportunities to get there successfully through their interests and funds of knowledge. Furthermore, students discussed the importance of interest-based choice in positive but varied ways. For example, Fatima spoke to the importance of students

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10 Students who are designated English Language Learners and certain students designated as receiving special education did not choose their project in the same way as native English-speaking students. This will be further discussed as a "tension" in the final section of this chapter.
choosing their own research topic, stating, “You'd have to choose a topic that you really like... if you don't choose one that you like the most, then you're not gonna work as hard.”

Owen also provides an example of leveraging his own funds of knowledge and interests to find a motivating science topic and experiment. He explained in an interview that he “wanted to do something with my favorite sport, basketball,” but was initially frustrated because he was not sure what science topics and experiments he could match together with the sport which he devotes so much of his time to. “But then,” Owen described excitedly, “[my mentor and I] found something going with acceleration, and I knew... there's a basketball move called a Hezi [hesitation] and you stop but then you go, and that's acceleration.” In this case, Owen’s interests substantially drove choices in his research topic and experiment, and with guidance from his mentor, he shaped his research topic, testable question, and ensuing experiment to fit the parameters of the KIC project.

The students – acting as agents of their own learning within the concrete, vertical parameters of the KIC project – are the subject of this activity system, both in interaction and individually.

**Objects**

An activity system has an object(s) which corresponds with the subject(s), which is the intended outcome provided that the subjects spend engage with the activity system. The objects for the students are similar to that of the teachers, to an extent: student endeavor to complete all parts of the KIC project: a) writing a research article delineating their topic of study and research question; b) design a visual presentation describing their inquiry project that pairs with c) an oral presentation on their inquiry project.
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**Vertical orientations of objects.** These objects of this activity system are affected vertically by adhering to KIC project expectations (i.e., curriculum manifest through teachers and teacher-created documents), time constraints (i.e., final KIC project date for giving presentations), getting good grades, and seeking teacher validation (i.e., teacher-pleasing). Students were held to expectations through the use of a graded rubric as well as guided by the KIC packet for science activities.

**Horizontal orientations of subjects.** However, the horizontal standpoint provides an opening for other student-described objects which drove students to engage with the KIC project outside of the more vertically-oriented, culture of schooling framework provided by curriculum, deadlines, earning good grades, and pleasing the teacher. Most saliently, all ten student participants described curiosity or the desire to know more about a topic of their choice as one of the most important aspects of the KIC projects. Five out of ten students articulated the significance of learning how to work on their own projects independently, particularly if they are inquiring about topics they have an interest in. Other students also commented about engaging with the KIC projects as an opportunity to share what they learned and did with their peers and teachers. Finally, there were a few students who explained the importance of doing inquiry projects on important scientific topics for their own futures, whether they related that to their well-being, academic careers (i.e., high school, college), or their desire to pursue STEM-related work (i.e., scientist, engineer). More ambiguous along horizontal and vertical lines was the desire to succeed amongst certain students, which were both related to grades and school success (vertical orientation) as well as the overall emotionality (i.e., pride, feeling self-worth) of the students (horizontal
orientation). Given the tensions apparent within this specific component of the activity system, the object for students will be discussed further in this chapter.

**Rules**

As stated in Chapter 5, the rules of an activity system “guide (at least to some degree) the activities acceptable by the community” (Jonassen & Rohrer-Murphy, 1999, p. 64). Given that the community between both the students’ and teachers’ activity system is largely shared, the rules which were delineated for the teachers also hold for the students during the course of the KIC projects. This is due to the rules, as defined by the teachers, being *for* the students toward the general aim of students successfully completing their KIC projects. These KIC project rules retain their vertical, ambiguous, and horizontal orientations for the students.

However, there are additional rules that are more student-centric or even student-created throughout interactions in the space of the KIC projects. These rules also have vertical, ambiguous, and horizontal qualities. As described previously, vertically-oriented rules tied to the KIC project are provided by an existing framework of curriculum, standards, and institutional practices already common to school culture. The horizontally-oriented rules are more flexible and derive from in-the-moment decisions which unfold to determine acceptable practice in a space at a given time in consideration of socioemotional, interactional, and interests of the students. Rule ambiguity is characterized by flexibility or choice provided within a normally more rigid rule, or vice versa (i.e., less flexibility or choice in a normally less rigid rule). These three student-centric rules could be

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11 Table 6.5 provides examples of the range of vertical and horizontal orientations toward the object identified by students in this activity system.
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characterized as a) when you are finished, find someone to help; b) messing around is okay as long as you keep working; and c) if we get out of control, we lose the option for choice.

**When you are finished, find someone to help.** During the KIC projects, especially during presentation preparation, students could be found helping other students who needed it. Generally speaking, this happened when students had already finished the entire KIC project in terms of writing, visual presentation design, and oral presentation preparation. One of the most common forms of students assisting each other was by listening to each other’s oral presentations, though this was also eventually a teacher-directed move. From a *horizontal* perspective, students offering to help a classmate with their project without being prompted is inherently, authentically cooperative, if not collaborative. However, there were *vertical* perspectives informed by school culture that spoke through the children’s words and actions towards each other.

For example, Fatima help her friend with formatting her article as well as helping her design her poster for days in a row, as Fatima finished her KIC power point the week prior. However, Fatima made it clear to her friend that she could only help in specific ways that ensured the knowledge-specific parts of the work were done by her friend:

**Classmate:** Um. I have a question. Can you write the words that I say for that?
**Fatima:** What do you want to put for the “why?” You’re the one who has to write it, because you’re doing 75% of this project.

**Classmate:** Ughh.
**Fatima:** I’m just gonna help you cut out and do stuff. I’m not gonna tell you what you’re gonna write down. Cause that’s me.

Fatima wanted to make it especially clear that she could help her friend on a regular basis, but not on anything more than smaller, more perfunctory tasks (i.e., cutting, gluing, printing) that did not involve any actual production of work rooted in the content of her friend’s project (i.e., writing, design). Fatima clarifies this to me in her interview as well,
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stating, “I just helped her print out pictures and I kinda checked over her work on her iPad and helped her print that out, and then help get materials and stuff.” Emma also discusses this caveat of helping others, addressing times she helped her classmates during the research process: “I think I worked trying to help others research, and when you're helping others researching, it could add an extra hand, but it didn't really do the work for them.” While it is important for students to help others during the KIC projects, there is also value placed on completing one's academic work independently.

Dimitri and Hudson also helped students, having been observed assisting their classmates in the library after they had created their data displays (i.e., graphs) on their iPads. One of his classmates asks Dimitri, “What do we do next?” in making the bar graphs on the iPad. Dimitri takes the boy's iPad and says, “Look and see…” while maneuvering around the website (Figure 6.4).

Figure 6.4. Dimitri (right) helping his classmate (left) with graphing tools in the library.

After the boys had circulated throughout the library and helped multiple children with graphing, they explained to Mrs. Stasik, “There's nobody to help.” Being a helpful person is a part of what happens in this space when children are finished with their own tasks.
This offering to help others, as Dimitri and Hudson did above, was an important practice in this space, but not one without some ambiguity and complication around students’ feelings. Emma notes that “walking around and asking people for help is a good thing,” but it is also crucial to recognize that not all students want help. She stated that “it’s not always good when you just see people struggling and you just walk up to them. They probably don’t want your help, but it’s good to ask them if they want your help... if they say ‘Sure,’ you should.” Conversely, Emma continues to explain that if someone reaches out and needs help, they should not be ignored:

But if you ignore them, that’s not really good. It’s not a good thing for you because someone’s still finishing their project... If they say, "Can you help me?" and you just walk away, that’s a hurtful feeling. Like, you have a bad feeling inside of you.

Emma’s reflection of such ambiguity reflects attention toward how students might feel in situations where they might ask for or offer help. This is particularly worthwhile to attend to, as it is clear that in these spaces during the KIC project, students help other students regularly and with clear intentionality.

**Messing around is okay so long as you are also productive.** This rule is largely observed and embodied in student-centric spaces such as the science lab and (to a lesser extent) the library. This was already a topic discussed at length in Chapter 4 as a function of space, but it bears repeating here as a kind of student rule – one largely unspoken yet observable through repeated actions. When students worked in a space like the science lab,
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the messing around talk coexisted with academic talk, ranging from making jokes, teasing, posturing, and maintaining playful banter\(^\text{12}\).

However, there were also examples of students reprimanding other students if their actions were to get too out-of-control or distracting, or if a particular student was off-task and disruptive to others as they worked. A salient example was during a presentation preparation session in the science lab, as students were spread about the room making their posters and power point presentations. A classmate of Owen's and Aiden's from Mrs. Bianchi's homeroom began playing with a yardstick. At first, he was doing this away from most other students, as the space was only occupied by nine other boys. There was no comment from the other children from this until the classmate began encroaching on other students' space and materials, whacking the yardstick on binders and notebooks. At this point, multiple students reprimanded the boy and implored that he stop hitting their things. (e.g., “Please, stop, please,” and “Please don't hit my binder!”). The boy with the yardstick moved away from the boys that were asking him to stop. While he did not put down the yardstick, he stopped hitting it against things and students were able to continue working on their projects.

In another science lab example, Aiden notices that a student (Classmate) has finished his poster early, and that classmate is discussing his findings with me. Interest piqued, but maintaining the humor he was using with another classmate (Classmate 2), both boys jump into the conversation:

\(^{12}\) Examples of these can be found in Chapter 4 under the subheading "Students: The Science Lab Classroom as Inquiry Space."
Classmate: Once a total solar eclipse is complete, there’s a giant flash once it covers 98%.
Katie: And then you can see the sun again?
Classmate: No, it'll probably last the entire day, but if you look at that giant flash. You'll go blind. Right away.
Katie: That would be a problem. So, it’s good that you’re putting a warning.
Classmate 2: What flash?
Aiden: What flash? Is it the Flash who's so fast?
Classmate: Once a complete solar eclipse is complete...
Aiden: When do they even occur?
Classmate: There's only a total solar eclipse August 28th.
Classmate 2: There is?
Classmate: I think.
Aiden: So if you look at the solar eclipse you'll go blind?
Classmate: Um, the only time you'll go blind is|
Aiden: If you look at the sky?
Classmate: No, during a solar eclipse|
Aiden: You have to look at the sky to get blind?
Classmate: No|
Aiden: Where do you look to get blind? Cause I wanna get blind.
Classmate: Can you please stop?! (pacing, slightly breathless) When you look at a solar eclipse| when a big| once it covers| once the moon covers up 98% of the sun’s light and completes the solar eclipse, it'll be a huge flash, and if you look at it, you will go blind.
Aiden: Where? Which is where? Where's the flash?
Classmate: It’s going to be in the sky this summer.

Aiden, in this case, is messing around with his classmate as he tries to explain his point by peppering him with questions. Aiden's rapidfire questioning and playful banter above (i.e., “What flash? Is it the Flash who’s so fast?” and “Where do you look to get blind? Cause I wanna get blind.”) is similar to the kind of talk he was engaging in with his tablemate (Classmate 2) previously. However, the classmate in question was very serious about the discussion of his topic and implored Aiden to stop messing around (i.e., “Can you please stop?!”) as he was likely being distracting. In this case, Aiden changed his mode of communication, quieted, and allowed for his classmate to finish his point before jumping in with his questions. Once being asked to stop, Aiden ceased the messing around quality of

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13 “The Flash” is a popular comic book, movie, and TV superhero character known for his powers of superhuman speed.
banter and adjusted to fit the needs of his classmate who was discussing his science topic purposefully.

Finally, there is an important caveat to this rule of messing around while working in student spaces: generally, if an adult enters into a student space (e.g., the science lab), messing around should stop for the time being. Teachers or adult staff entering into student spaces adds a vertical orientation to the students’ rule, as their physical presence in that space brings about the feel of being monitored typified in teacher-student relationships (i.e., observing, circulating). For example, there was an extended period of time in which Mandy worked with a student at a table in the science lab. During this time, students were substantially quieter and kept to themselves, occasionally talking across the room to ask or answer a question to another student about their projects. This was much different than the character of the space when adults were not present, generally speaking.

*Getting too rowdy means student choice privileges get taken away.* This rule is a kind of specific application to the rule above regarding messing around while working in student spaces, and as such, has also been briefly discussed in Chapter 4. Students would provide verbal reminders and reprimands to other students who were becoming too loud or rowdy, so that they would not lose student choice privileges (i.e., choice in where to work) as a whole. The precedent all students of one grade level losing privileges due to poor behavior was set when a large number of students skipped chorus class and the entire fifth-grade lost iPad privileges. As such, students would occasionally take up the role and

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14 There were exceptions to this rule, particularly when the teachers were doing experiments with the students (as described in Chapter 4) or when I was in the room. Despite being an adult and teacher in the space, I did not make a point to disrupt their interactions unless a student was harming another student, which did not happen in the time I was present in the room.
voice of a teacher, telling students what they ought to do. This gives this rule a vertical sense. However, this rule is also horizontally felt, as students providing reprimands were acting in order to preserve and protect students’ autonomy. This was especially salient in terms of the loss of working in student-centric spaces, such as the science lab, with Fatima as the chief enforcer of the rule.

When Fatima and her friend worked together in the science lab, there were multiple times where she asked students to settle down lest they “get kicked out” of the lab. The first time, her friend spotted a drum in the science lab along with a couple of boys. She exclaimed for the boys to “Get the drum! Get the drum!” which they did. The boys took up her phrasing "Get the drum" and turned it into a song. Another boy advocated loudly for a "drum circle." The friend grabbed the drum, and after Fatima tapped experimentally on it, her friend took it, put it on the table, and started playing rhythms loudly on it. Multiple students implied that Fatima’s friend should stop playing (i.e., “That’s getting annoying.”), but she did not. It wasn’t until Fatima told her friend sternly, “We’re gonna get kicked out,” that she put away the drum and began working on her poster once again.

Another time, Fatima implored that same friend to stop her actions when she began throwing cornstarch from earlier experiments onto her twin sister. Fatima watched the exchange (and voice volume) escalate briefly, but once the sister started squealing, “Stop!” Fatima got involved. Fatima cried out, “She said stop! We’re gonna get kicked out if you do that.” Fatima added on, “Please. I don’t wanna get kicked out because I don’t wanna go back to the classroom. The classroom is so loud.” Fatima’s investment in working in the student-centric space with her friend was clear by her reprimands to her friend. The space was
special not only to Fatima but also to the other students working inside of it who were also electing to work outside of the louder, messier classroom spaces.

Students in this activity system were not only held to the rules created for them by teachers but also abided by rules they established for themselves as students engaging in these self-directed KIC projects. Helping and interacting with others (especially friends) as well as maintaining autonomy and student choice were important to students. Student rules were also necessarily influenced by the extant rules and norms of school culture (i.e., be quiet, do your work), and thus both had vertical and horizontal orientations.

Community

The community involved in this activity system is the same as the one described in Chapter 5. This is inclusive of the following individuals or groups: fifth-grade teachers; focal fifth-grade study students; Michelle (library media specialist); science teachers; special education teachers; ENL teachers; ENL teacher assistant and other support staff (i.e., Owen’s mentor); principal Jeff Banach; district-level administration; students’ families; and the fifth-grade class as a whole. However, the students foreground different aspects of the KIC project community when compared to their teachers. Students emphasized their teachers, classmates, and their families in this community when discussing the KIC projects.

Teachers. During their interviews for this project, students were asked to discuss the roles and their expectations of their teachers specifically. Teachers were perceived at different times by students to be a) direct instructors (i.e., making expectations explicit and teaching students how to do specific processes like paragraph structure or grammar; giving direct answers); b) guides or facilitators (i.e., helping students become independent
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learners, leading students to resources but providing no direct answers; providing options); helper or assistant (i.e., helping children print pictures, find requested resources); and d) supporter (i.e., helping students socioemotionally; providing encouragement; assisting students when they encounter roadblocks and frustrations). Examples of students identifying and describing their teachers in these ways is delineated below in Figure 6.5.

Figure 6.5. Examples of students’ perceptions of teachers in their KIC project community.

Peers. During the interviews for this project, students were asked to discuss working together with their peers (i.e., other fifth-grade students) specifically. This has been discussed from the object as well as the rules perspective, as working with peers seemed to be normal student practice (see Table 6.5 later in this chapter). In addition, students specifically described working with others as a key component of their community during the KIC projects. Peers were perceived at different times by students to be a) capable, resourceful helpers (i.e., when students would help other students with various aspects of KIC projects such as design, research, and writing); b) challenges (i.e.,
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students working together and having disagreements about a part of the project); c) teachers (i.e., students feel as though they are learning new information from their peers); d) listeners (i.e., students can listen purposefully to their peers in service of providing feedback or asking questions); and e) distractors (i.e., students get distracted by working with other students. Understanding peers and how they were perceived in this way also intersects with the division of labor, given that students were not only working toward their own KIC projects but also taking on that work with their classmates and friends. Figure 6.6 provides examples of how students perceived their peers during the KIC projects.
Family members. Students were not asked direct questions about their families in their interviews, but family and specific family members nevertheless frequently made their way into our conversations. Multiple students described family members as being influential in the KIC projects and inquiry in general. For example, Hudson described that "my brother and me and my dad like science because my dad is actually a scientist" and "my brother and me and my dad like science because my dad is actually a scientist." Additionally, Hudson and his brother would frequently do science experiments and competitions together, explaining that their home inquiries were "more than school." For at least three months long, both Dimitri and Aidan noted older siblings who influenced their ideas about science inquiry and inquiry projects in general. Owen particularly sees his school performance in general as "representing how my family and I work;

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about students’ research questions and experiment (i.e., Chapter 5, Figure 5.6), family members were described prominently in student interviews as highly influential in inquiry-type learning.

Some students described family members directly during their KIC presentations, noting them as essential in terms of the experiment itself. Owen goes as far as to represent his father, who helped him time trials and measure distances during his basketball experiment. Owen did this by searching for an image of a “dad,” finding a stock photo of a father holding a baby (representing a dad), and labeling it “a dad” on a Power Point slide describing his materials (Figure 6.7). When a student asks Saabira what made her want to study plant growth, she explains

Me and my dad like to plant. We have a garden, and he always buys different flowers, and it’s always in the sun because it’s always on our garden. They don’t grow that fast because we have a tent that covers the sun a little.

Figure 6.7. Owen’s materials slide for his KIC Power Point.
In a similar way, another one of Kelli’s students who I observed presenting his KIC project described his interest in plants because he likes growing, and he does it “with his dad, auntie, and grandma” on a regular basis. Family members factored into being a critical part of students’ community during the KIC projects.

**Division of Labor**

The division of labor defines how members of the community engage in specific actions with which tools (Foot, 2014). This chapter focuses specifically on the students, who are expected to engage in the activities of a) writing a research article; b) designing a visual presentation; c) doing academic research; and d) giving a culminating presentation on their topic, orally and visually. From a vertical orientation, students are responsible for enacting these in relation to their teachers’ instructions spoken through teacher-created documents (i.e., KIC packets, presentation rubric, written article rubric, anchor charts). These teacher-created documents, as discussed in Chapter 5, are guided by curricular objectives and learning standards.

From a horizontal standpoint, students have choice in how they work through these four activities of this activity system. Student agency is at the forefront of this project, and so even though there is an established vertically-oriented framework defined by curriculum, standards, and their teachers’ interpretations of these, students have options in terms their choice of: a) kind of science activity; b) relevant research topic; c) research path and texts used for research; d) visual presentation modality; e) aesthetic design choices; and f) writing modality. While students are shown examples of many (but not all) of these choices by teachers, these options are available to them during the KIC projects.
Mediating Artifacts

Artifacts are objects which purposefully shape different components of the activity system as well as influence the activity system as a whole. Conversely, the artifacts themselves can also be shaped by their use in the activity system. There are multiple kinds of artifacts used by students in order to enacting KIC projects from a learning-doing-designing perspective, which are described below. As described before in Chapter 5, these artifacts, in and of themselves, are not the sole arbiters of mediation but how they are integrated with other components of the activity system and used in interaction. Again, it is also critically important to recognizing the materiality of mediated artifacts, including dialectical shaping of the activity system and the artifact itself, the powers which control access to and availability of specific artifacts, as well as the affordances and constraints as engendered by the materiality of the mediating artifacts.
Figure 6.8. Kinds of artifacts and their inter-relationships learning-doing activity system

Key:
- Thicker black line (no arrow): connecting categories hierarchically
- Thinner grey line with arrow: shows interrelatedness and influence upon mediating artifacts
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below reflects the foregrounded kinds of artifacts and their inter-relationships used in this activity system for student learning-doing-designing.

As in Chapter 5, the vertical and horizontal perspectives in terms of mediating artifacts largely comes down to choice about how artifacts are operationalized or not. If artifacts are operationalized with respect to the curriculum as established, this is a vertical operationalization. An examples of this would be students filling in the teacher-created, curriculum-based KIC packets to guide their writing of their articles, as this was an expectation all children were held to in order to complete their written articles (Appendix J) or that all students must present on the same day (i.e., the KIC calendar). While the calendar may be more flexible throughout the inquiry projects, each child was responsible for presenting on the same day with their classmates. The artifacts are operationalized from a horizontal standpoint when there are options and flexibility for students to choose from in terms of their use. As an example, students were able to choose multiple aspects of how and what the iPads were used for throughout the project. While most students used the iPads for research, some students opted to use it additionally for notetaking, composing their written article through typing or voice dictation, and/or creating a Google Slides presentation. A brief description of each of the foregrounded set of artifacts follow, though literacy-related “skills and strategies for inquiry projects” will be fleshed out later in the chapter (Tables 6.1 – 6.4).

**Digital technologies.** The current fifth-grade students involved in this KIC project activity system were among the first whole grade level in the Legacy District to be assigned personal iPads for daily school use. As such, students generally had access to their iPads throughout all inquiry-related classes (i.e., reading, writing, library) and used them for a
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variety of purposes for the KIC projects. These purposes involve the actions of: a) using databases and search engines to explore topics; b) using databases and search engines to find texts for research purposes; c) taking notes; d) drafting written articles through typing; e) drafting written articles through voice dictation; f) designing digital presentations; g) presenting digital presentations off their device; h) creating data displays; i) taking photographs or video; and j) playing relaxing music while working. The list of databases and apps used on the iPads are located in Figure 6.9.

In addition to the iPads, students also used the Mac desktop computers in the library as well as a set of MacBooks on a cart located in the science lab; both of these class sets of computers were older models of Apple products which are becoming outdated and not useful for student projects. In fact, most students used the Mac desktops in the library for free time after finishing their work. The MacBooks were chiefly used for students in Kelli and Mandy’s classrooms who were opting to do a Power Point presentation, as that application was loaded onto the MacBooks but not the iPads. Some students also used Michelle’s smartboard while doing their projects, which was operated through Michelle’s personal MacBook Pro.
Students would utilize their personal Gmail accounts to send photos and poster elements to the teachers so they could print them on the multiple printers in the school (i.e., fifth-grade black and white LaserJet, Kelli’s color inkjet, and the library printers), as students did not have direct access to the printers from their individual iPads. In terms of peripherals to technology, students usually used headphones when listening to music or videos. Headphones could be borrowed from Michelle in the library or students could have brought in their own pair.

**Non-digital maker materials.** Though the iPads afforded students particular ways of composing and creating, many students opted to use non-digital materials to create parts of their KIC projects. Some students opted to handwrite their first drafts and notes in their notebooks or in their red folders on loose leaf paper. Most students created posters for their visual component of their KIC projects, and as such poster boards were supplied by the teachers, as well as writing, coloring, and affixing supplies, which are described in depth throughout Chapter 4.
**Texts.** Students engaged with texts of multiple modes around their individual KIC project topics during the course of their research, such as finding print articles (i.e., on databases and websites), photographs or diagrams, as well as audio and videos. Students were also encouraged to use physical books and periodicals from the library. However, this was not observed as frequently throughout the KIC projects because, as Michelle discussed with the children, “If [the books] are written too long ago they might not be best source” and as such, the most up-to-date content could be found in the digital databases and online. Students were also offered multiple exemplar texts to use as models during the course of the KIC projects in the form of anchor charts, teacher examples of scientific writing, and previous years’ poster presentations for examples of aesthetic design principles. In the course of the KIC project, students were expected to create numerous texts themselves.

**Student-created documents.** All students were responsible for creating a) drafts and final copies of their written article; b) research path statements on index cards; c) science activity variables written on index cards; d) presentation visual design drafts (i.e., drafted posters and Power Points on a standard white sheet of printer paper); and e) visual presentations (i.e., posters, digital slide-based presentations, videos). Some students chose to create data tables or other data visualizations, such as graphs or photographs of their science activity over time. Some students also synthesized their notes across different articles. Students also would create calendars with their teachers; for example, Owen kept a writing calendar in his red KIC folder, created to keep him “on track” (Figure 6.10).
Literacy-Related Practices as Mediation

The previous section described the different components of the activity system broadly. This section delves into the activities themselves which are a part of the KIC projects. The following is a decomposition of the literacy practices enacted by students in service of students achieving the literacy objectives of the interdisciplinary KIC project. There are four literacy-oriented activities in this activity system: a) writing the article; b) doing the research; c) making the presentation; and d) presenting the presentation. There are numerous practices apparent under each of these four activities undergirded by interactions observed during the course of the KIC projects in multiple spaces. Support for these practices are also triangulated with student interview data, analysis of artifacts (e.g., student presentations and preparatory documents), as well as teacher data (i.e., interviews,
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artifacts). Tables 6.1 through 6.4 shows the decomposition of these activities into practices and events, also pointing to the data sources which identify the evidence supporting the enactment of these practices by the students. Analyses used to identify learning and doing activities, practices, and actions as represented in the four tables below can be found in Chapter 3 under the subheading “Decomposing learning/doing activities.”

Taken as a whole, these tables represent the four main learning/doing literacy-related activities observed during the KIC project, including a) writing a scientific article, b) designing a visual presentation; c) doing research on selected science topic; and d) giving final oral presentation with visual component. Underneath each are smaller practices, which are built up by smaller actions observed as enacted by students. These activities, practices, and actions are related to the pedagogical practices outlined in the similar tables in Chapter 5, but their differences lay in the fact that students were observed to engage in a wide range of actions which may or may not have been directly intended by the teachers.
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### Table 6.1

**Activity: Writing Scientific Article**

Decomposing activity into smaller practices, associated learning-doing-designing actions, and evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Learning/Doing/Designing Actions</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paragraph 1</strong></td>
<td><em>Write why you are doing this experiment</em> Identify and write topic of research</td>
<td>Short 2017.04.03</td>
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<tr>
<td></td>
<td><em>Explain and write reasoning why this is a topic of interest to student</em></td>
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<td></td>
<td><em>Take and use notes (on iPad; in notebook) for future writing</em></td>
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<td></td>
<td><em>Sharing writing with students (peer review)</em></td>
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<tr>
<td><strong>Paragraph 2</strong></td>
<td><em>Write variables of experiment in paragraph form (descriptive writing)</em> Define the kinds of variables conceptually</td>
<td>Short 2017.03.31</td>
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<tr>
<td></td>
<td><em>Identifying variables in various science activities (and their own)</em></td>
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<tr>
<td></td>
<td><em>Write about each of the three variable types in science activity</em></td>
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<tr>
<td></td>
<td><em>Sharing ideas with other students (collaborative “scientific mindset”)</em></td>
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<tr>
<td><strong>Paragraph 3</strong></td>
<td><em>Use the 5W+H questions as framework to ground experiment/demonstration in prior knowledge (“literature review”)</em> Determine which 5W+H questions are answerable for topic</td>
<td>Short 2017.04.06</td>
</tr>
<tr>
<td></td>
<td><em>Identify the 5W+H questions answered within an example P3</em></td>
<td>Short 2017.04.07</td>
</tr>
<tr>
<td></td>
<td><em>Verbalize writing plan for day (or project) to others (or to self)</em></td>
<td>Short 2017.04.18</td>
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<td></td>
<td><em>Synthesize/take notes from multiple sources to answer 5W+H Qs while reading</em></td>
<td>Short 2017.04.18 (SG)</td>
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<td></td>
<td><em>“Trying on writing” (stylistic and voice decisions while writing)</em></td>
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<td></td>
<td><em>Use anchor chart example to guide paragraph writing</em></td>
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<td></td>
<td><em>Defining key scientific terms in writing</em></td>
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<td></td>
<td><em>Writing answers to 5W+H questions in paragraph form using notes as guide</em></td>
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<td></td>
<td><em>Citing sources of information used in paragraph</em></td>
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<td></td>
<td><em>Discussing writing progress of paragraph 3 (answers to 5W+H) with other students</em></td>
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<tr>
<td><strong>Paragraph 4</strong></td>
<td><em>Write steps taken to conduct science activity in paragraph form (procedural writing)</em> Identifying transitions in example P4</td>
<td>Short 2017.04.18 (SG)</td>
</tr>
<tr>
<td></td>
<td><em>Visualize conducting science activity as strategy to write P4</em></td>
<td>Short 2017.04.19</td>
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<td></td>
<td><em>Verbalize steps of science activity as a strategy to write P4 (to others; self-talk)</em></td>
<td>Short 2017.04.19 (SG)</td>
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<td></td>
<td><em>Sharing ideas with other students (collaborative “scientific mindset”)</em></td>
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<td></td>
<td><em>“Trying on writing” (stylistic and voice decisions while writing)</em></td>
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<td><em>Use example P4 as guide for structuring P4</em></td>
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<td></td>
<td><em>Use sketches/visuals to demonstrate procedure</em></td>
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<td></td>
<td><em>Write science activity procedure in paragraph form</em></td>
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<td></td>
<td><em>Sharing writing with students (peer review)</em></td>
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<tr>
<td><strong>Paragraph 5</strong></td>
<td><em>Write results of experiment/demonstration in paragraph form (descriptive writing)</em> Use/highlight transitions and sentence starters in writing to structure P5</td>
<td>Short 2017.04.20</td>
</tr>
<tr>
<td></td>
<td><em>Use bullets and boxes on anchor chart for structuring P5</em></td>
<td>Short 2017.04.20 (SG)</td>
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<tr>
<td></td>
<td><em>Use example P5 as guide for structuring P5 (take photo of it)</em></td>
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<td></td>
<td><em>Verbalize writing plan for day (or project) to other students (or to self)</em></td>
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<td></td>
<td><em>“Trying on writing” (stylistic and voice decisions while writing)</em></td>
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<td><em>Discuss hypothesis support and results (expected and unexpected) with others</em></td>
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<td><em>Discuss what could have been done differently with others</em></td>
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<td></td>
<td><em>Make inference about science activity (to write about)</em></td>
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<tr>
<td></td>
<td><em>Write science activity results in paragraph form</em></td>
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## TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Learning/Doing/Designing Actions</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rereading and revising&lt;br&gt;(changing or adding to)&lt;br&gt;previously written work&lt;br&gt;(esp. paragraphs 3-5)</td>
<td>Rereading written work (to revise; to add; “editing for meaning”)&lt;br&gt;Rereading multiple times to check for mistakes in conventions&lt;br&gt;Revise for word choice and flow&lt;br&gt;Revise for appropriate informational writing conventions&lt;br&gt;Editing for neatness and conventions&lt;br&gt;Peer review and feedback of writing (student writing swap)&lt;br&gt;Seeking out adult assistance to reread writing and give feedback</td>
<td>Short 2017.04.18&lt;br&gt;Short 2017.04.19&lt;br&gt;Short 2017.04.19 (SG)&lt;br&gt;Short 2017.04.20 (SG)&lt;br&gt;Short 2017.04.21&lt;br&gt;Short 2017.04.21 (SG)&lt;br&gt;Short 2017.04.25 (SG)&lt;br&gt;Short 2017.04.24&lt;br&gt;Short 2017.04.24 (SG)</td>
</tr>
<tr>
<td>Paragraph 6&lt;br&gt;Write about inference&lt;br&gt;based on results of experiment/demonstration (i.e., implications)&lt;br&gt;Making in-text citations for research used during this project</td>
<td>Make inferences based on information in example paragraph and prior knowledge&lt;br&gt;Verbalize writing plan for day (or project) to other students (or to self)&lt;br&gt;“Trying on writing” (stylistic and voice decisions while writing)&lt;br&gt;Verbalize struggles of writing P6 with others</td>
<td>Short 2017.04.18&lt;br&gt;Short 2017.04.25&lt;br&gt;Bianchi 2017.04.26&lt;br&gt;Bianchi 2017.04.26 (SG)</td>
</tr>
<tr>
<td>Making references page for research used during this project (MLA style)</td>
<td>Identifying information in paragraph corresponding with a given source&lt;br&gt;Identifying places where more information could be used (to get an additional citation in to meet minimum of three)&lt;br&gt;Determining whether to paraphrase or use a direct quote&lt;br&gt;Citing sources of information used in paragraph&lt;br&gt;Verbalize writing plan for day (or project) to other students (or to self)&lt;br&gt;“Trying on writing” (stylistic and voice decisions while writing)&lt;br&gt;Highlight transitions indicating the use of in-text citation</td>
<td>Short 2017.04.18&lt;br&gt;Short 2017.04.25&lt;br&gt;Bianchi 2017.04.26&lt;br&gt;Bianchi 2017.04.26 (SG)</td>
</tr>
<tr>
<td>Drafting final written articles</td>
<td>Discussing plans for drafting with others&lt;br&gt;Dictating handwritten draft into iPad (speech-to-text)&lt;br&gt;Correcting dictated speech-to-text mistakes (i.e., mishearings, misspellings, capitalizations)&lt;br&gt;Typing handwritten draft into iPad (typed text)&lt;br&gt;Selecting font sizes and color scheme for final draft&lt;br&gt;Drafting final “article” using Google Slides&lt;br&gt;Discussing parameters for final written article (e.g., paragraph labeling)</td>
<td>Short 2017.04.07 (SG)&lt;br&gt;Short 2017.04.20 (SG)&lt;br&gt;Short 2017.04.24&lt;br&gt;Short 2017.04.24 (SG)&lt;br&gt;Short 2017.04.25 (SG)</td>
</tr>
</tbody>
</table>
### Table 6.2

**Activity: Designing Visual Presentation**

Decomposing activity into smaller practices, associated learning-doing-designing actions, and evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Learning/Doing/Designing Actions</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selecting visual representations of data or experiment/demonstration (i.e., creating graphs)</td>
<td>Access web-based tools for creating visual representations (i.e., graphs)</td>
<td>Stasik 2017.04.20</td>
</tr>
<tr>
<td></td>
<td>Navigate web-based tools for creating visual representations (i.e., graphs)</td>
<td>Stasik 2017.04.21</td>
</tr>
<tr>
<td></td>
<td>Browse and “play with” web-based tools for creating visual representations (i.e., graphs)</td>
<td>Stasik 2017.04.21 (SG)</td>
</tr>
<tr>
<td></td>
<td>Identifying kinds of graphs</td>
<td>Stasik 2017.04.27</td>
</tr>
<tr>
<td></td>
<td>Identifying parts of a graph and their functions on an example graph</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Co-constructing visual representation with teacher (i.e., bar graph)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verbalizing relationship between science activity and visual representation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussing decisions/plans about making graphs with others</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Input data into tool to create graph (i.e., bar; line; pie)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Helping other students with their visual representations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify and attend to aesthetics and aspects of visual design for presentations (use of “mentor texts” i.e., older posters)</td>
<td></td>
</tr>
<tr>
<td>Choose presentation medium (i.e., power point, poster, explain everything, Prezi) (multiple acceptable ways of presenting visually)</td>
<td>Determine kinds of presentation media available</td>
<td>Bianchi 2017.04.26</td>
</tr>
<tr>
<td></td>
<td>Select presentation medium for final KIC project</td>
<td></td>
</tr>
<tr>
<td>Sketch out/plan presentation regarding content and physical placement on/within the presentation</td>
<td>Verbally articulate presentation plan</td>
<td>Short 2017.04.20</td>
</tr>
<tr>
<td></td>
<td>Draw presentation plan using shapes, arrows, words, sequence (depending on medium)</td>
<td>Short 2017.04.25</td>
</tr>
<tr>
<td></td>
<td>Discuss and describe rationale for presentation design choices (i.e., aesthetics)</td>
<td>Bianchi 2017.04.26</td>
</tr>
<tr>
<td></td>
<td>Create checklist for necessary slides for Power Point</td>
<td>Bianchi 2017.04.28</td>
</tr>
<tr>
<td></td>
<td>Share presentation medium selection with other students</td>
<td>Bianchi 2017.05.03</td>
</tr>
<tr>
<td>Identify and attend to aesthetics and aspects of visual design for presentations (use of “mentor texts” i.e., older posters)</td>
<td>Identify visually pleasing aspects of poster examples (personally)</td>
<td>Stasik 2017.04.27</td>
</tr>
<tr>
<td></td>
<td>Critique visual elements of poster examples</td>
<td>Bianchi 2017.04.28</td>
</tr>
<tr>
<td></td>
<td>Visualize aspects of own poster/presentation to guide aesthetic design</td>
<td>Short 2017.04.28</td>
</tr>
<tr>
<td></td>
<td>Mounting poster elements on colored paper (i.e., colors; borders)</td>
<td>Short 2017.04.28 (SG)</td>
</tr>
<tr>
<td></td>
<td>Using different types of lettering, fonts, font sizes, and boldness in print</td>
<td>Stasik 2017.04.28</td>
</tr>
<tr>
<td></td>
<td>Making decisions about aesthetic elements of presentations</td>
<td>Short 2017.05.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bianchi 2017.05.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bianchi 2017.05.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bianchi 2017.05.04</td>
</tr>
</tbody>
</table>

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# TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Learning/Doing/Designing Actions</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create presentations</td>
<td>Drawing poster elements in pencil first</td>
<td>Short 2017.04.24 (SG)</td>
</tr>
<tr>
<td></td>
<td>Searching for visual elements for posters online</td>
<td>Short 2017.04.25 (SG)</td>
</tr>
<tr>
<td></td>
<td>Selecting/creating visuals elements for poster, Power Point/Google Slides</td>
<td>Bianchi 2017.04.28</td>
</tr>
<tr>
<td></td>
<td>Printing/cutting/affixing visual elements for poster</td>
<td>Short 2017.04.28</td>
</tr>
<tr>
<td></td>
<td>Placing visual elements in Power Point/Google Slides</td>
<td>Short 2017.04.28 (SG)</td>
</tr>
<tr>
<td></td>
<td>Typing in text elements in Power Point/Google Slides</td>
<td>Short 2017.05.02</td>
</tr>
<tr>
<td></td>
<td>Editing and tweaking elements in Power Point</td>
<td>Bianchi 2017.05.03</td>
</tr>
<tr>
<td></td>
<td>Working with others on presentations (in parallel; collaborating; helping)</td>
<td>Bianchi 2017.05.03 (SG)</td>
</tr>
<tr>
<td></td>
<td>Students guiding each other during presentation prep</td>
<td>Bianchi 2017.05.04</td>
</tr>
<tr>
<td></td>
<td>Students asking other students questions to help guide during presentations</td>
<td>Bianchi 2017.05.05 (SG)</td>
</tr>
<tr>
<td></td>
<td>Ask adults for assistance at various parts of the presentation prep</td>
<td></td>
</tr>
<tr>
<td>Oral presentation preparation</td>
<td>Taking notes for oral presentation on index cards</td>
<td>Short 2017.04.28(SG)</td>
</tr>
<tr>
<td></td>
<td>Walking through parts of oral presentation in front of others</td>
<td>Bianchi 2017.05.04</td>
</tr>
<tr>
<td></td>
<td>Practicing oral presentation and recording it</td>
<td>Bianchi 2017.05.04 (SG)</td>
</tr>
<tr>
<td></td>
<td>Practicing oral presentation in front of others (students; teachers)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timing oral presentation rehearsal</td>
<td></td>
</tr>
</tbody>
</table>
## Table 6.3

**Activity: Researching Science Topic and Science Activity**

Decomposing activity into smaller practices, associated learning-doing-designing actions, and evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Learning/Doing/Designing Actions</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Searching for broader topics of study in multiple kinds of texts, media</td>
<td>Browsing and skimming multiple kinds of texts (i.e., video; photographs)</td>
<td>Stasik 2017.03.22</td>
</tr>
<tr>
<td>Determine research question</td>
<td>Articulate research question to others</td>
<td>Bianchi 2017.04.07 (SG)</td>
</tr>
<tr>
<td>Narrow topics of study guided by research question</td>
<td>Change research question (i.e., wording, phrasing)</td>
<td>Bianchi 2017.04.26 (SG)</td>
</tr>
<tr>
<td></td>
<td>Identifying and using texts/databases (and access credentials)</td>
<td>Stasik 2017.03.22</td>
</tr>
<tr>
<td></td>
<td>Identifying research topics</td>
<td>Bianchi 2017.03.31</td>
</tr>
<tr>
<td></td>
<td>Reading/viewing multiple kinds of texts (i.e., videos) independently and with others</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ask questions about potential topics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELLs - Using translation tools embedded in tech</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify science topic to be researched from research question</td>
<td></td>
</tr>
<tr>
<td>Create a research plan around smaller topic of study</td>
<td>Distinguish between science topic to research and experiment, materials</td>
<td>Bianchi 2017.03.31</td>
</tr>
<tr>
<td></td>
<td>Writing research question</td>
<td>Bianchi 2017.04.06</td>
</tr>
<tr>
<td></td>
<td>Identify science topic to be researched from research question</td>
<td>Short 2017.04.06</td>
</tr>
<tr>
<td></td>
<td>Identify words that require definitions and understanding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify search terms about the science topic</td>
<td></td>
</tr>
<tr>
<td>Design science activity (i.e., experiment, model, demonstration) to be conducted</td>
<td>Discuss/describe underpinning research for science activity</td>
<td>Bianchi 2017.04.07 (SG)</td>
</tr>
<tr>
<td></td>
<td>Listing materials needed for science activity</td>
<td>Bianchi 2017.03.31</td>
</tr>
<tr>
<td></td>
<td>Identify required mathematical tools (measurements; equations)</td>
<td>Bianchi 2017.04.07</td>
</tr>
<tr>
<td></td>
<td>Identify/discuss describe procedure to be used in science activity</td>
<td>Short 2017.04.18</td>
</tr>
<tr>
<td></td>
<td>Discuss/design experiment with others</td>
<td>Short 2017.04.18 (SG)</td>
</tr>
<tr>
<td></td>
<td>Create data displays/tables to collect data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discuss data/results with other students or adults</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying and using different kinds of search engines</td>
<td>Short 2017.04.03</td>
</tr>
<tr>
<td>Selecting and reading informational texts about specific topic</td>
<td>Conducting internet searches (i.e., in browsers; on YouTube) around topic for articles, videos)</td>
<td>Bianchi 2017.04.06</td>
</tr>
<tr>
<td></td>
<td>Conducting internet searches (i.e., in browsers like Google) around topic for images</td>
<td>Short 2017.04.06</td>
</tr>
<tr>
<td></td>
<td>Browsing Internet search results on device</td>
<td>Bianchi 2017.04.07</td>
</tr>
<tr>
<td></td>
<td>Using databases to find texts around topic</td>
<td>Bianchi 2017.04.18</td>
</tr>
<tr>
<td></td>
<td>Synthesizing/taking notes in various ways around topic (i.e., bulleted list; typed in iPad; webs; boxes; sentences)</td>
<td>Bianchi 2017.04.19</td>
</tr>
<tr>
<td></td>
<td>Discussing research topics and ideas with others (i.e., students; teachers)</td>
<td>Bianchi 2017.04.19 (SG)</td>
</tr>
<tr>
<td></td>
<td>Reading (silently; aloud; watching video) from multiple sources and media</td>
<td>Short 2017.04.21</td>
</tr>
<tr>
<td></td>
<td>Defining words using articles, reference materials (independently and with others)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seeking out more sources if minimum of three sources is not reached</td>
<td>Short 2017.04.25</td>
</tr>
<tr>
<td>Smaller Practices</td>
<td>Learning/Doing/Designing Actions</td>
<td>Evidence</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Searching specifically for SW+H questions as framework for understanding the science behind the experiment/demonstration (becomes &quot;literature review&quot;)</td>
<td>Verbalize plan to research SW+H with other students</td>
<td>Bianchi 2017.04.07</td>
</tr>
<tr>
<td>Metacognition check: doing further research if students are not aware of what they are currently reading about their topic (esp. vocabulary)</td>
<td>Discuss writing /research progress on SW+H with other students</td>
<td>Bianchi 2017.04.07</td>
</tr>
<tr>
<td>&quot;Research leads to more research&quot;</td>
<td>Discuss writing /research progress on SW+H with adults</td>
<td>Bianchi 2017.04.07 (SG)</td>
</tr>
<tr>
<td>Synthesizing information across multiple sources</td>
<td>Reading (silently; aloud; watching) from multiple sources and media</td>
<td>Short 2017.04.07</td>
</tr>
<tr>
<td></td>
<td>Skimming articles (i.e., scrolling through iPad)</td>
<td>Bianchi 2017.04.07</td>
</tr>
<tr>
<td></td>
<td>Synthesizing/taking notes in various ways around topic (i.e., bulleted list; typed in iPad; webs; boxes; index cards)</td>
<td>Bianchi 2017.04.18</td>
</tr>
<tr>
<td></td>
<td>Using reference materials to define words</td>
<td>Bianchi 2017.04.19</td>
</tr>
<tr>
<td></td>
<td>Continuously identifying what research happens next (research leads to more research)</td>
<td>Bianchi 2017.04.21</td>
</tr>
<tr>
<td></td>
<td>Identifying when a word is unknown and subsequently seeking its definition</td>
<td>Short 2017.04.06</td>
</tr>
<tr>
<td></td>
<td>Using dictionaries and thesauruses for defining words</td>
<td>Bianchi 2017.04.07</td>
</tr>
<tr>
<td></td>
<td>Distinguishing between prior knowledge (what was already known) and new information (what was found)</td>
<td>Bianchi 2017.04.18 (SG)</td>
</tr>
<tr>
<td></td>
<td>Providing answers to questions in KIC packet about topic</td>
<td>Bianchi 2017.04.18</td>
</tr>
<tr>
<td></td>
<td>Synthesizing/taking notes in various ways around topic (i.e., bulleted list; typed in iPad; webs; boxes; index cards) while reading</td>
<td>Short 2017.04.20</td>
</tr>
<tr>
<td></td>
<td>Make inference about science activity results based on science activity and research</td>
<td>Short 2017.04.24 (SG)</td>
</tr>
</tbody>
</table>
### Table 6.4

**Activity: Giving Final Oral and Visual Presentations**

Decomposing activity into smaller practices, associated learning-doing-designing actions, and evidence

<table>
<thead>
<tr>
<th>Smaller Practices</th>
<th>Learning/Doing/Designing Actions</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children sign up for conference presentations</td>
<td>Hear presentations read by teacher in each session</td>
<td>Bianchi 2017.05.03</td>
</tr>
<tr>
<td>Final oral and visual presentations are given by the students</td>
<td>Choose three of four sessions to attend</td>
<td>KIC Conference Day</td>
</tr>
<tr>
<td></td>
<td>Define variables for science activity (if applicable)</td>
<td>2017.05.05 (SG)</td>
</tr>
<tr>
<td></td>
<td>Describe rationale for doing science activity and research</td>
<td>2017.05.05</td>
</tr>
<tr>
<td></td>
<td>Describe the testable question asked for this research</td>
<td>2017.05.05 (SG)</td>
</tr>
<tr>
<td></td>
<td>Describe background knowledge about research topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Describe what was learned about research topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Describe methods and materials for science activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Describe what was learned (findings) from the science activity and research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Describe any data displays (i.e., graphs, photographs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Describe whether or not the hypothesis was supported or not</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relate the testable question, science activity, and research topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify and discuss problems encountered with the science activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demonstrate the science activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Make inferences about the research topic and results from activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ask questions of the audience about their ideas of the science activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use visual presentation element (e.g., reading from, gesturing to visuals) to help discuss project overall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use note cards to guide oral presentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Answer student and teacher questions posed to presenter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relate KIC project/topic to other students’ KIC projects/topics</td>
<td>KIC Conference Day</td>
</tr>
<tr>
<td>Students expected to ask questions of the presenters and presenters engage in conversation</td>
<td>Seek more information about data displays utilized</td>
<td>2017.05.05 (SG)</td>
</tr>
<tr>
<td></td>
<td>Seek more information about the methods and materials used</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seek more information about variables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seek more information about why student chose the topic (rationale)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seek more information about the conceptual/theoretical ideas around the research topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seek more information about the sources used for research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seek more information about alternative future science activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seek more information about the hypothesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Make connections to other KIC projects</td>
<td></td>
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<tr>
<td></td>
<td>Interrupt students’ presentations to insert their own background knowledge</td>
<td></td>
</tr>
</tbody>
</table>

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Activity in Action: Interrelationships and Tensions between Components

The remainder of the chapter will entail a discussion and illustration of the aforementioned literacy practices in action as they manifested across the four activities in service of achieving the literacy-oriented objectives for the KIC projects, as well as the development of specific literacy skills and strategies for engagement in inquiry. Because I am interested in moments and places where tensions are manifested through the interactions and interrelationships between components of the activity system, I will a) provide a brief vignette of the practices in action; b) identify the interrelationships at work as it pertains to the activity system, and then c) describe the tensions which are at play between these components of the activity system.

Tensions between Student Perceptions of Teachers Roles across KIC Projects

_Owen and I are sitting outside of Kelli’s classroom, doing his second interview for the KIC project. I ask him, “How did your teachers help you specifically with your inquiry project, including your mentor?” He pauses and then says, “Well, they really didn’t. Well... my mentor helped me, but my teachers... just guided us. They didn’t if we asked them, ”What does this mean?” They said, ‘Research. You need to get more and more research.’ So they really didn’t help us, but they guided us to some really amazing stuff.” Interest piqued about his own distinction between “helping” and “guiding,” I pressed Owen for more. “So, what’s the difference between ‘guide’ and ‘help’?” Owen responds, “Help is where they show you how to do it, but guide is... is where they... more like, push you to more research. Pushing you.”_

15 All vignettes are based on elaborated observational field notes and video as well as recorded interviews transcripts and notes; vignettes are presented in italics.
My next question led to further distinctions between Owen’s nuanced conceptions of what it means to guide and what it means to teach. I asked, “What did your teachers teach about during your inquiry projects?” Owen asks for clarification: “What did they teach? What do you mean by teach?” I respond with, “Well... I would ask you the same question. What does it look like when a teacher is teaching?” Owen continues to question precisely what I am asking. I then ask Owen, “Why don’t you paint me a picture? In a regular school day, what does it look like when your teacher is teaching?” He says, “We’re at our desks and... at our desks and... [our teacher] is at the board. And we’re focused on her.” He pauses and adds, laughing softly, “Most of us.”

The tension between and student perceptions of their teachers’ roles involve the subject (fifth-grade students), division of labor (students’ and teachers’ role[s] in KIC project), community (teachers and adults) and object (students completing their KIC projects). Owen’s rather nuanced description of the different ways he was supported pedagogically by teachers during the inquiry projects (and his school learning generally) is an example of how tensions exist about how students perceive teachers’ roles. As described in the Community section above, teachers were differently helpful for students across the inquiry projects in as a) facilitator-guides, b) supporters; c) direct instructors; and d) helper-assistants. While students’ perceptions of teachers differed across different students generally, the way teachers actually took on each of these perceived roles with their students was largely contextualized by the time of the KIC project and the level of independence or need demonstrated by the students themselves.
Teachers perceived as direct instructors. Teachers were often perceived as direct instructors in relation to their whole-group instruction of mini-lessons as well as working one-on-one with students. It was here that teachers provided the concrete expectations of each paragraph during writing or precisely how many sources students needed in order to meet the criteria for the KIC rubrics. For example, Ameena explained that when it came to more rule-based aspects of writing, her teachers taught her exactly what to do:

> When I was typing and I didn't know which paragraph should I indent or something like that, and I asked the teacher, she actually helped me a lot, and she explains it all so I can understand all of it.

Students also used language such as teachers “giving answers” or needing to be “told more” of what to do and what to research in terms of content. For example, Chimin, who outwardly admitted struggling with the KIC project, said “We don’t know what to do even though we do research, we don’t know what to research about. We need teachers to tell us more about it.”

An example Chimin’s sentiments of needing more direct instruction about what to research is embodied in Emma’s actual experience during the KIC projects. For example, Emma struggled to find a third reference for her KIC project. When Emma was simply provided with the rule that all students must use at least three sources for your research, she was visibly stressed out as she spoke with me about it, stating, “Mrs. Short said we needed three sites for paragraph three, and I can’t find a website that has information I haven’t used.” However, the next day, Kelli provided that one-on-one direct instruction in precisely what Emma ought to do after looking over her work:

**Kelli:** So Emma, you have how many?
**Emma:** Two.
Kelli: Do you have information in there that you didn't cite?
Emma: Oh, well I couldn't find, like, a lot of information because I was looking at yesterday at writing I was looking at different sources. I was, like, looking at different articles and websites.
Kelli: So you need| okay, so do you have your| are those your websites?
Emma: Yeah.
Kelli: Okay. So you could say, like, according to sciencing.com or... livestrong.com.
Emma: Is it okay if there's more information?
Kelli: Yeah, that's fine. You only used two sources altogether?
Emma: Yeah.
Kelli: I would suggest getting another source.
Emma: Okay.
Kelli: (pauses, skimming Emma’s writing) Um, do you have enough| how much information do you have?
Emma: Um... (flipping through notebook) this is one article and this...
Kelli: Okay. No, you're probably fine. As long as they're both cited in there and we know where your information came from... Let's just leave it at that, okay? You're fine. Fix that, and then we'll be fine.

However, some students didn't perceive the minilessons as direct instruction but more so as providing structure and giving examples – otherwise, being more of a facilitator rather than what might be seen as a direct instructor. For example, Aiden describes the teachers as “not really teaching” during the KIC projects. Aiden instead felt his teachers were “telling us ways of how to learn. They'd kind of didn’t really stand up there and teach. They wrote different ways, and our paragraphs. The teacher gave us an example of how that would be, so we could write it.” Aiden makes evident that teachers were providing structure and process rather than an instruction in facts and knowledge. That much, according to Aiden, was up to the students: “[Students] can get to do something by themselves and learn it by themselves without teachers, just to get a little break and to try something on their own.”

**Teachers perceived as facilitator-guides.** As with Aiden’s example above and Owen’s in the initial vignette for this section, students also perceived teachers more as facilitators or guides. This sort of guidance was chiefly seen in one-on-one or small group
contexts by ways of teacher “check-ins,” circulating to each student. Generally, teachers being guides and facilitators was characterized by students as “not actually teaching” (Aiden), “leading us to the finish” (Chimin, James), “not telling us the answer” (Owen), “supervising” (James), “helped me walk myself through” (Dimitri), and “helping if [students] are stuck” (Aiden). Some students, like Owen, directly called this “guiding.” The point was students generally expected to work through the projects themselves, with the teachers’ role as one providing a general structure and instruction in process rather than content. This is in line with the overall goals of the KIC project.

While there are multiple examples of one-on-one guidance between students and teachers throughout the KIC projects, an illustrative case of this occurred between Kelli and Aiden during independent research time during their reading block. The following exchange (Figure 6.11) occurred after Aiden raises his hand, indicating his need for help:

Aiden: I was trying to find a picture of air pressure.
Kelli: Like, um, the weather air pressure?
Aiden: Yeah, so like...
Kelli: You know what? Can I give you an example of how to Google that?
Aiden: Yeah.
Kelli: Write "weather air pressure diagram." Cause it’s all about the weather... And - if you really want to get crazy, you could search up the word "barometer." Have you found that in your research yet?
Aiden: Yeah, uh that’s like what they use to measure...
Kelli: Mm hm. If you’d like, I can get you a barometer so you can see what it looks like.
Aiden: ‘kay. Weather air pressure, um, diagram?
Kelli: Yep. Or picture, whatever. You can be fancy with the word "diagram" instead of "picture."
Such guidance was contingent on students’ requests for help. For example, Fatima almost never requested help from teachers, and as a result, teachers almost never worked with her. Instead, teachers would check in briefly with Fatima and move on to other students who needed help. Fatima, who intimated that her least favorite part of the KIC projects was, “when you finish, you have to wait for at least another week until you can go onto the next step,” wished her teachers could have guided her differently. If she could have it her wait, Fatima would “probably just go up to the teacher and then ask for the next step, or if I’m completely finished, I’d just help my friends that aren’t finished.” In lieu of not being able to procure “next steps” from teachers, she did in fact help her friends who were not finished. Kelli confirmed in her interview that Fatima was one of three students in her class in particular who notably did not receive as much teacher guidance throughout the KIC projects, as these students tended to work well independently.

**Teachers perceived as helper-assistants.** Students noted that teachers were helpers toward the end of the KIC projects, particularly Michelle and Kelli, who were the arbiters of all things printing related. This shift in teacher role was clear as students finished writing and research and began presentation preparation. Teachers moved from their role of the circulating facilitator-guide toward being students’ assistants in procuring
the necessary materials and access to specific technologies. In line with this, Ameena described that her teacher

    Actually helped us print out our paragraphs and she helped us print out our pictures, and she would ask us if this was a good size, and she would make sure everything’s right in exactly how you expected it to be and how you wanted it to be.

Similarly, Michelle took up the mantle of printing student pictures and graphs. For example, during a library session, James called over to Michelle, “Mrs. Stasik, what’s your email?” After Michelle gives it, she walks over to her Mac connected to the Smart Board and pulls up her email, showing the queue of students who had sent their graphs to her for printing, including James, and begins sending them off to the large LaserJet printer on her checkout desk. Kelli spent over a half hour hunkered down next to the inkjet color printer – brought in from home and supplied with ink purchased of her own money specifically for this project – helping students from each of the fifth-grade homerooms print high-quality color photos for their posters (Figure 6.12).

**Teachers perceived as supporters.** Students also perceived teachers as being supportive and encouraging during this KIC project, particularly when students were struggling or felt negatively about themselves. Chimin described her teachers as “very nice” and “making sure that we were ready for that and for the kids inquiry project and presentation” especially if they were “really struggling with something.” Dimitri saw his teachers as encouraging students’ perseverance in their KIC projects, emphasizing a can-do attitude towards difficult scientific topics:
[Our teachers] should be encouraging you of what you chose, and if you think it's hard, they should keep on trying and trying, because you chose this one, and they should encourage you to never give up and do what you love to do.

Figure 6.12. Kelli assisting fifth-grade students printing color images from her printer.

The difficulty of the science topics that students were studying was something that teachers, particularly Kelli, addressed frequently during their minilessons and one on one time. Kelli often described the tension of readability of scientific texts and research leading to more research with her students. While guiding Owen, she described his physics topic of acceleration as difficult for adults, noting that “Research is not easy! Even as an adult, I type in ‘for kids’ so I can find something I can understand.” She also made a point to describe during minilessons that science vocabulary and topics as “hard” and requiring more thinking, sometimes having to define words found within the definitions of even more complex words, setting off a chain of research just to understand what a word means.
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Students’ perceptions of the teachers’ role tended to shift across phase of KIC inquiry project, particularly once the research and writing phase gave way to the presentation preparation phase. Their perceptions of teachers’ different roles also fluctuated depending on the pedagogical context, such as whole-group minilessons, one-on-one instruction or guidance, and independent work time. However, student perceptions about what teachers should be doing during the KIC projects are also inextricably linked to their own purposes for engaging with the object of the KIC project itself.

Tensions about Purposes of Doing Inquiry in School

There are tensions between students’ varied purposes for engaging with the KIC project involving the subject (fifth-grade students), the object (students completing their KIC projects), and the rules (expectations, rubrics, grades, orientations towards inquiry and knowledge). As briefly summarized in the Objects section of this chapter, there are multiple purposes articulated by students regarding why they engaged in the KIC projects in the ways that they did. Table 6.5 below further provides evidence of these vertical, ambiguous, and horizontal orientations toward the object of the KIC project, which is for students to complete the written article, visual presentation, and give an oral presentation about their KIC topic and science activity to an audience of their peers and teachers. Some of these purposes are entrenched in students performing within the vertical framework created by school culture and its reified artifacts (i.e., curriculum, standards, standard practices and expectations of students), and these are held in tension as those same students cite purposes that resonate as more authentic to themselves (i.e., curiosity, learning independently, sharing what they know, and preparing for their futures). The following cases illustrate the most salient tensions between student-identified investments
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in these inquiry projects. Instead of a vignette heading this section, there will be multiple smaller cases described in each section below.

An independent learner driven by [school] success: The particular case of Aiden. Aiden's case is especially tension-ridden, as his demeanor throughout most of the KIC project evokes that of a boy striving to succeed in school at all costs, even if it causes him great anxiety when he does not quite meet expectations. And yet, he strives for independence as a learner. Furthermore, Aiden is relieved when he is able to remove himself from spaces and people who would enforce school expectations (i.e., classrooms, teachers). Aiden is a competitive rule-follower who finds solace in a little subversive rule-breaking when no one is looking.

First, Aiden tightly holds himself to the standards teachers and school-associated adults expect of him. Generally, this is positively adaptive, as he tends to do well at doing school, including the inquiry projects. In the KIC projects, where working independently is valued, he does so without hesitation. In fact he values it, perceiving KIC as a chance for students to “get to do something by themselves... learn it by themselves without teachers, just to get a little break and to try something on their own.” In whole-group settings, he does not shy away from showing he knows what to do. For example, during a whole group minilesson in Mandy's writing class about writing Paragraph 3, Aiden offers up the phrase that “research leads to more research.” This is important because the phrase reveals Aiden’s adoption of the teachers’ language around the KIC projects; such an action could be interpreted myriad ways: Aiden could be seeking recognition, validation, and/or showing

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16 Note that this is not an exhaustive list of all of the possible combinations of tensions between the nine factors listed in Table 6.5, but those patterns that manifested across the focal students in this study.
he knows “the right answer” – traditional school practices of children who want to be positioned as successful, showing they are meeting or even exceeding expectations.

However, if and when Aiden did *not* quite meet some expectation, however minor, this adherence to expectation became a source of anxiety. For example, when he forgot to bring in his packet, he appeared anxious, speaking quickly, and providing multiple rationales as to why he didn’t have it, as in the following exchange:

**Katie:** Hey Aiden, do you have your packet?

**Aiden:** Oh, it’s like...I was at, at my house, like my mom| cause I left all, my p| the packet and like, my science test...

**Katie:** Okay.

**Aiden:** ...for my mom to sign it, but I don’t| I checked my backpack in the bottom, and I was| I was like| in my head, I was like, seriously, like I should have brought, I don’t know why like, cause she signed everything else, but maybe she didn’t know what it is, I told her maybe she didn’t know.

It is important to keep in mind here that the packet a) wasn’t necessary for that day’s work and b) was not even necessary for me. I was simply asking about it so that I could take photographs of it for data collection and eventually did so when he brought the packet in later on. Aiden was unduly stressed in this situation as he attempted to remove the onus from himself during a moment where he did not meet an adult’s expectations of him.

Adhering to school rules (but also avoiding ownership of rule-breaking) is clearly important to Aiden.

Aiden is also competitive with other students within teacher and task expectations sedimented in school culture (i.e., the more you write, the smarter you are; if you take your time, your work is better; if it’s aesthetically sloppy, it’s not good work). An example of this is the repeated practice of comparing the number of lines and paragraphs he’s written in a given writing class with his tablemates. He makes these comparisons with multiple groups of children that he works with during the KIC projects at writing time. It also seems that
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this is validated by students and that his lengthy writing is something to be admired, such as when a girl at his table observes the extent of his Paragraph 3 writing and exclaims, “Holy cow!” At another point, he exclaims to his peers while working on his poster, “Bruh, I’m better than you at bubble letters. Don’t believe me? I’ll prove it.” Later on, Aiden turns his competitive letter bubbling into an offer for his letter-bubbling services, enthusiastically saying, “Watch me draw these! You need help? Just ask. I’m really good at them.” Aiden finds an academic confidence through his competitiveness around his peers.

This drive and competitiveness towards academically excelling in school comes into tension with what happens when, “Finally, we’re in a room without a teacher.” At this point, certain rules, particularly those more entrenched in behaving in a school-appropriate way (i.e., quiet voices; no teasing, swearing or inappropriate gestures) are loosened, and Aiden begins joking around with his classmates, talking with a louder voice, playing with his fidget spinner, and even flashing the middle-finger gesture surreptitiously as he walked past the camera. Aiden’s school-rule following is intense when it comes to academic projects like KIC, whether he is around teachers or students. When teachers are removed from the equation, Aiden maintains a focus on being a competitive, high-achiever, but he does so in a way that pushes on school behavioral expectations.

**Independent, curious learners: The cases of Owen, Saabira, James.** Saabira, James, and Owen all stated that their topics chosen from the KIC project were deeply personal interests: Saabira chose plants and photosynthesis because her family are avid gardeners, James chose to simulate black holes because he is fascinated by space, and Owen chose to do a basketball-related experiment to explore physics concepts because of his passion for basketball. All of these students cited curiosity as a reason why people should
do inquiry. James and Owen particularly focused on how the inquiry projects felt less like school compared to other school learning they experienced. As described in the previous section, James noted that the KIC projects felt like “a fun learning. Like I said, it didn’t seem like writing class to me.”
## Table 6.5
Range of Vertical and Horizontal Orientations Towards Objects in KIC Projects

<table>
<thead>
<tr>
<th>Defining factors of engagement with object by students</th>
<th>Example(s)</th>
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<tbody>
<tr>
<td><strong>Owen:</strong> &quot;Searching all those topics I like and getting a chance to know them better. That's one of my favorite parts.&quot;</td>
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<td><strong>Chimin:</strong> &quot;It was really free and it would be nice, since you pick what YOU want to do, it must be more interesting, so you get to enjoy the time of your experiment and explore more about it.</td>
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<td><strong>Dimitri:</strong> &quot;It's like this kind of spark goes off and you're just amazed and you wanna keep on doing more and more and more.&quot;</td>
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<td><strong>James:</strong> &quot;I think, number one, it's more free and you wanna have more stuff that you can learn, so, you can do what's fun for you but you'll still be learning about it, and I think it's like a fun learning. Like I said, it didn't seem like writing class to me, so like, if you're learning something but it's fun, it's good enough.&quot;</td>
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<td><strong>Saabira:</strong> &quot;Personally, I love to plant, but usually I just leave them under the sun, so I just wanted to know if they would also grow in other places instead of just being under the sun. That's what I wrote in my thing.&quot;</td>
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<td><strong>Aiden:</strong> &quot;So [students] can get to do something by themselves and like, learn it by themselves without teachers, just to get a little break and to try something on their own.&quot;</td>
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<td><strong>Ameena:</strong> &quot;I never learned this at school and I’d seen it on TV, so it was kind of interesting, so I thought it would be fun to just teach myself. But it was not just teaching myself, I was also having fun doing it and doing the experiment and testing it out, so it’s actually really fun to do and you can teach yourself something new you have never learned before.&quot;</td>
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<td><strong>Dimitri:</strong> &quot;I would say because it would get [younger students] on what they would want to do when you get to higher grades, you start to get to choose your classes.&quot;</td>
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<td><strong>Fatima:</strong> &quot;I have learned that you really should work together because if you don’t work together, it only hurts yourself because if you don’t learn... to work with others] because your whole life is spent on working with others] if you don’t learn to work with others, then your life is really gonna just be messed up, so teachers should really have kids pair up a lot.”</td>
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<td><strong>Owen:</strong> &quot;I like how you get to tell people when you learn a lot... I just like helping people learn more about something that they might be interested in, like an interesting thing they want to learn about, because sometimes they don’t wanna do it [because] it’s like, ‘Oh this is the second thing I want to learn about!’ Then they learn about it, but then they get more interested, and they could do this next time or some time.”</td>
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<td><strong>Hudson:</strong> &quot;It involves science, so we would learn about it and we would have it somewhere in our minds. Maybe if our friends don’t know about it, we can tell our friends and maybe they will be interested in it.”</td>
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### TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

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<th>Factor</th>
<th>Orientation</th>
<th>Example(s)</th>
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| Researching topics important to students’ futures | Horizontal | **Saabira:** “It’s a part of life. Well, plants have a life cycle. Plants help us survive. It makes our food. Like, the sun goes down to the plants. The plants make sugar and food and then the person gives carbon dioxide to the plant. And that’s how the plant makes food.”

**Dimitri:** “And I believe that the world could use more scientists to figure out more problems and how to solve things.”

**Katie:** “And you think that doing projects like this would encourage kids to be scientists?”

**Dimitri:** “Not encourage but give them background of how things work…”

**Hudson:** “Knowledge, like…”

**Dimitri:** “Cause eventually in life, you would need background knowledge.”

**Owen:** “Getting to show my parents, like… what I can learn and how I’m doing good at school, but then showing my reputation to other people. It happens in all sports and places. You have to represent who you are and act and represent like in sports, you have to represent to a college person or a college basketball coach.”

**Ameena:** “I feel good. I mean, I’m proud of myself that I was able to do what [the experiment] actually told me to do, cause sometimes I have bad luck, but this time, it actually worked for me and it came out really good, and I was happy about it.”

**James:** “I’m thinking my favorite part will be making the poster or will be showing off the poster and the experiment.”

**Emma:** “It’s like, you have to think about what you’re going to write, and you also have to revise and edit, so there’s like… a lot of questions for our paragraphs on our rubric. So we can do our paragraph right.”

**Fatima:** “Like, when I research, the teachers taught me how I could… they taught me how I could research. Like, a specific way to research.”

“Can’t really remember anymore because it’s been, like, awhile since I started researching.”

**Fatima:** “The writing part… [the teachers] showed me the specific steps so then I could actually get a good grade for my writing.”

**Chimin:** “I think having to do something you’re interested in, it makes you want to learn more. To me, since I picked sense of taste, I really only did about sense of taste. If my teacher said, “you have do it about cars” I would just do it and not care about my grade. It is a great opportunity for kids.”

**Aiden:** “Well, over the break, when you had to experiment, I thought I wouldn’t get it done because I forgot about our schedule, and I thought that we had to make a poster during the break… I got nervous cause I didn’t know.”

**Emma:** “If you’re doing an inquiry project due in three days and you get distracted, then you wouldn’t finish in time because distractions can distract your brain and your focus, so it’s not good to have distractions around you. Because you can’t finish in time.”

**Ameena:** [My teacher] actually said “Yes,” and it makes me feel good that she’s not gonna get mad that I don’t have any words on this [first] poster, but I still have it on the other one. . . . It made me feel that [she] wasn’t mad that I don’t have any words like the other kids, but it was still okay with them, so that made me feel better. To make sure that’s alright.”
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Owen also noted a distinct difference in between how his teachers guided him throughout this project rather than directly taught him. Furthermore, Owen often worked independently in the classroom, making choices not only to work without the assistance of teachers (for the most part – he did work with his mentor once weekly), but also without the assistance of students. Owen often isolated himself in a corner of a classroom or on the rug, as described in Chapter 4. Notably absent from these students’ interview conversations was talk around grades and meeting teacher expectations. While these students wanted to do well on their projects, it seemed to stem from a desire to share what they’d learned about topics of deep interest to them. Curiosity and an authentic desire to know more, for these students, held a place of importance in their independent work throughout the inquiry projects.

Rule-followers who strive to authentically collaborate: The cases of Fatima and Emma. Emma and Fatima were both students who described the importance of fitting within teacher expectations and project guidelines while also attending to the collaborative aspects of learning during the KIC projects. Fatima made it clear in her interview that she wanted to “get a good grade on [her] writing.” However, doing well in school goes beyond simply getting good grades for the sake of getting good grades; learning in school is law. She describes school learning as “mandatory” and “part of the law,” and she explains that even in terms of chosen topics, it is important to defer to the teacher, who would “approve” of topic for study during KIC. For example, even though Fatima loves video games, she explains that “It can’t be anything about video games, that’d be stupid,” as she believes it would not be approved by a teacher. Running through Fatima seems to be a sense of what is and is not acceptable for the mandatory study that school entails.
Emma is similarly entrenched in the rules of school in relation to the KIC projects, both from the standpoint of achieving teacher expectations and adhering to deadlines so she can finish on time. Emma states that avoiding distractions is important, because “if they’re doing an inquiry project due in three days and you get distracted, then you wouldn’t finish in time because distractions can distract your brain and your focus.” Like Fatima, Emma similarly paid attention to doing well on the KIC project by answering all “questions for our paragraphs on the rubric.” Both girls adhered to all or nearly all aspects of the KIC presentations, according to the rubric and final presentation scores (Figure 6.13).

The girls both spoke to the importance of collaborating with peers for the purposes of being helpful so that all students could finish their projects. Helping others was not held to a grade or requirement, as each child was responsible for doing individual KIC presentations and articles. Despite this, students did collaborate together after finishing individual projects as a sort of rule of thumb, as discussed in the Rules section. Fatima, for example, spoke to an authentic, real-life importance of why students should learn to collaborate and work with others while they are young:

I have learned that you really should work together because if you don’t work together, it only hurts yourself because if you don’t learn... to work with others| because your whole life is spent on working with others| if you don’t learn to work with others, then your life is really gonna just be messed up, so teachers should really have kids pair up a lot.
Fatima did spend the majority of the final week dedicated to KIC projects helping her friend finish her poster. Only once was this validated by a teacher during the course of these final few days, when Mrs. Bianchi noticed the girls working together and asked Fatima, “You helpin’?” Unlike her previous rationales for engaging with the KIC projects for grades and doing school well, Fatima seemed to be doing this because she wanted to help her friend with her KIC project.

Emma also made a point to discuss the importance of helping others and collaborating, albeit in somewhat different ways. Recall that Emma explained the importance of not only helping others but recognizing others’ feelings in the process. Emma explains that
walking around and asking people for help is a good thing, but it's not always good when you just see people struggling and you just walk up to them. They probably don’t want your help, but it’s good to ask them if they want your help... if they say "Sure," you should. But if you ignore them, that’s not really good. It’s not a good thing for you because someone’s still finishing their project... If they say, "Can you help me?" and you just walk away, that’s a hurtful feeling. Like, you have a bad feeling inside of you.

For Emma, it’s important to reach out to others to see if they need help, but to respect their decision to say “no.” In Emma’s case, she tended to work on her own throughout KIC, but she eventually sought out students and teachers who could watch her rehearse her presentation the day before the KIC conference, looking for feedback.

While it could be argued that the culture of the school environment which influenced students like Fatima and Emma to be helpful and collaborative, such actions were not held to the same sort of rigorous academic scrutiny as the rest of their engagement in the KIC projects were, by comparison. In this way, their engagement with the KIC projects authentically extended beyond simply following rubrics, rules, and teacher expectations in service of a good grade and performing well in school.

**Tensions in Researching Science Topics: “Research Leads to More Research”**

Kelli sits down in the chair next to her whiteboard to begin her minilesson in metacognition, which is recapping processes of what to do if they are researching and come to something that they do not understand. Kelli begins by saying, "Today, we’re gonna do a little more research. We’re gonna talk about this again. I've done this before." She uncaps her marker and writes
on the chart paper: “Research leads to more research.” Some children read aloud along with her as she writes this. Kelli continues, “When you see something on your iPad, you need to read the whole article and take notes on it. Sometimes when I look around, I see people reading only a few lines of articles. You look at an article. You read a few things, and then go to another website.” She asks students if that is what they should be doing. Most of the students answer with a choral, “No,” and one particular student explains, “You need to take notes on it.”

Kelli writes the words she speaks on the chart paper: “What you need to do when you research: Number one: Find an article. Number two: Read the whole article. Number three: Take notes. Three simple steps, really, always.” A student then offers, “And then repeat.” Kelli agrees and then points to steps two and three on the chart paper, “This part right here is where research leads to more research. When you come to word you don’t know, look it up. If you don’t know what ‘density’ means, you need to look it up and find out what density means. Science terms are hard. Am I right?” Students chorally answer, “Yeah.” She continues, “When you are taking notes,” drawing an arrow from the third step ‘Take notes’ underneath it, “and you write down definitions, you should not write them down without knowing what they mean. You can write them down first, but then you will need to find out the things you don’t know. This should be a repeating process.”

Kelli expands this process outward to what scientists do in order to conduct their own research. “There are scientists out there with all of your
topics, still studying them.” She turns to one student and identifies their topic, “Chemical reactions. Somebody is still studying that.” She turns to another boy studying waterspouts: “Waterspouts. Somebody is still studying that. Moss, still studying. Plants, still studying! They’re still out there. Nobody knows everything! Repeat, repeat, repeat – you are never done with your research. Does that make sense?” The students answer chorally once again, “Yes.” Kelli sets down her goal for the day, “I’m going to come around today and ask if you know what your words and definitions mean, and what happens if you don’t know what they mean?” Students chorally answer, “More research.”

The tension inherent in students guiding their own research, particularly when researching complex scientific topics, involved the subjects (fifth-grade students), mediating artifacts (teachers’ instruction; teacher-created artifacts) and object (students completing their KIC projects). Aligning with what was described in terms of readability and text difficulty in Chapter 5 with the teachers, most participating students agreed that the most difficult parts of the KIC projects involved the research element (Figure 6.14). For some students, the frustration parts were finding, reading, and understanding texts as well as key concepts about their science topic. For others, it was about putting into words what they had learned in the articles they had chosen to read their science topics (i.e., writing Paragraph 3).

Some students found researching to be challenging but compelling because of their interest in their topic. Owen was particularly excited about doing research about basketball and physics, even though he had difficulty initially linking his favorite sport to an experiment and subsequently research topic. Owen described of this time, “I like searching
all topics that I like, but then... searching all those topics I like and getting a chance to know them better.” Dimitri expressed similar sentiments about researching and curiosity, explaining about doing research, “It’s like this kind of spark goes off and you’re just amazed and you wanna keep on doing more and more and more.” As students have the open choice of science activity based on their interest, they must then contend with the complexities of the scientific topic behind their science activity, as do their teachers. This especially impacted students doing science activities and research related to the laws of motion (i.e., Owen), the kinetic theory of matter (i.e., Emma), magnetism (i.e., Fatima, Dimitri, Hudson), and barometric pressure (i.e., Aiden), black holes (i.e., James), as well as stalactite and stalagmite formation (i.e., Ameena). Saabira’s and Chimin’s topics were the only ones that were covered in-depth during the course of school science, which included plant life cycles and the five senses, respectively. For most students, making meaning of their science topics through texts was one fraught with challenge, complexity, and engaging with ideas that were not immediately understandable to them.

The tensions here between student topic choice, text readability, and content complexity could only be navigated and mediated by teachers as they unfolded in real-time. As Kelli described in her interview

You do a day, see where it goes, and then you plan from there. You see, the students’ work is gonna guide you to what your next lesson’s gonna be. Like it’s not, “Oh, I’m gonna have to sit at home and I’m gonna think about what I’m gonna do, plan out a whole month.” Unfortunately, in inquiry, I don’t see it that way. I see it the opposite. My students are gonna tell me where I need to go next.
Furthermore, sometimes teachers felt out of their depth with the content studied by students. Michelle explained that students having autonomy in what they are learning during self-directed inquiry “levels the playing field;” teachers have to recognize they might not have the content expertise to guide students. Michelle admits, “I don’t know a whole lot about the electromagnetic field,” but contends that it is more important she can guide students towards finding resources useful and understandable to them about their complex topics. This was demonstrated by Kelli with Owen in his quest to define and understand linear acceleration, as described in Chapter 5.
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Ameena: "Sometimes I couldn’t find what I was actually looking for when I was researching. . . I had to research really closely to see ones that actually made sense and ones with words that I know with some words I didn’t know."

Emma: "I was having trouble because I couldn’t find answers that could help me, and to define the word[s] I didn’t know."

Ameena: "For one question, there [were] multiple answers, but I didn’t know which one was the right one."

Chimin: "Researching and picking topics because there’s so [many] topics to pick, and I really am interested, and when I picked this topic, I don’t know what to research about now."

Aiden: "Sometimes, we got stuck and we didn’t know what to research, and then [teachers] were helping us and telling us different ways so that you can get facts easier."

Dimitri: "During the research, Mrs. Short helped us because I couldn’t find any good reliable websites and I had trouble writing and finding out what to write for our paragraphs."

Emma: "You have to think about what you’re going to write... there’s a lot of questions for our paragraphs on our rubric so we can do our paragraph right... for some people it’s difficult because of their experiment. But for some people it’s not because their experiment was easy to do, and there’s more... answers to their questions on the internet."

Figure 6.14. Students’ identified struggles with research aspect of the KIC project.

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Research leading to more research looked different for each student, depending on their topic of choice – students with more complicated topics that were less familiar required more chains of research and defining terms in ways that were understandable to them. Students that had more background knowledge on their topic, or if their topic had readily available texts aligning with their current strategies and skills spent less time engaging in research. Either way, the most important aspect of the research phase of the project was that students could eventually understand the concepts under study, discuss them in their own words with their peers, and relate it to their science activity. This pushes against school culture practices, such as copying notes that teachers write on the board or passages from a text without actually understanding what they mean or their significance to the topic at hand. This tension - research leading to more research as a site of productive tension between school culture and the KIC projects in general - will be discussed further in Chapter 7.

Tensions in Writing Scientific Articles: Composition Medium Affordances and Constraints

I head over to Owen, who is sitting at his usual corner table in Mandy’s writing classroom, asking him what he is up to today. After noticing Aiden and a few other students in the classroom dictating their drafts into their iPads, I pose to Owen, “I’ve been walking around to other people. And they’re...some...some people are typing, and some people are doing, like...speaking into it. Which one are you doing?” Owen looks up from his iPad and answers, “Typing.” I clarify, ”Typing? So...” Owen continues, explaining, “Because if you use it [voice dictation], when you mess up speaking, you just have to stop. Instead of
typing, you like…” Owen pauses for a moment and picks up his hands, moving them rapidly over his iPad to mimic rapid typing motion, rolling his tongue to make a rapid typing sound. He continues saying, “And if you have a problem you just…” and Owen picks up his hands again over the iPad, making rapid typing noises again as he “taps” the same place repeatedly over and over, as though hitting the backspace key. Owen then leans back on his hands and makes the comparison to voice dictations, saying, “Instead of going, I... want... you know?” He speaks “I want” slowly and deliberately.

I respond in turn, “Yeah. It's really interesting, because I'm noticing different people have different tendencies, like some people really like speaking into it.” Owen elaborates more on his criticism of voice dictation into the iPads, saying, “But’cha have to put like... instead of saying ‘period,’ you have to say "period" instead of just hitting period.”

The tension inherent in offering multiple composition medium choices (i.e., handwritten in notebook, typed on iPad, typed into Power Point, voice dictation into iPad) involve the subject (fifth-grade students), mediating artifacts (digital and nondigital composition technologies; student choice) and object (students completing their KIC projects). The KIC project is designed specifically so students can choose openly how they would like to compose their final written article. Having these loosened expectations about final drafts is not problematic in and of itself, but there are clear affordances and constraints that each of these forms have. Given the choices that students make drafting, some students end up doing substantially more drafting work than others. It is important to note that students’ choice of drafting medium went unaddressed in teachers’
TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

minilessons. It is important to examine why these choices are being made by students if possible, as well as the implications of what happens when such choices are left open and potentially not examined by teachers. Each focal student followed a different compositional path via choice of medium, from the initial first draft through final written article and presentation. Figures 6.15 through 6.18 reveals the compositional practices and phases for each of the four focal students passed through below.

As can be seen, each of the students made different compositional decisions as they wrote through their final drafts and into their presentations. Aiden’s appears the most complex and reveals substantial efforts in editing and revising before turning to the digital medium, writing multiple handwritten drafts, then crafting a final draft on the iPad, and finally summarizing content from his written work and experimentation for the genre of a poster for presentation purposes. Further, Aiden added illustrations and photographs to his poster representative of his topic. Across the four students, Aiden seemed to generate the most original content around his science topic. Owen generated a similar amount of original content compared to Aiden, but Owen saved time by doing much of his editing and revision as he typed his final draft into the iPad. Owen’s Power Point presentation also had some new content that was not contained in his paper. Owen also used photos and graphs as alternative modes within his work.

Fatima’s conversely, shows the least amount of transformative steps between her initial draft through to her presented work – in essence, her first draft became her “final draft” when it was typed into Google Slides, with each slide representing one of her six paragraphs. She did not turn in a written article in paper form, typed into a word processor as other students (did and were expected to do). However, she made an argument as to
why she actively preferred to write through the medium of Google Slides rather than a
word processor, like Microsoft Word or Google Docs:

**Fatima:** With the tablet, there’s like a million apps I could’ve just presented on. And I really like the way I could write, like, with slides, because with Slides, it [was] much easier because you have separate sections. But like if you did it in Docs, which is pretty much like Word, if I did it on there, it kind of wouldn’t look right cause the format... looks like you’re supposed to write| uh, you’re supposed to print [the article] out, which I really don’t like.

**Katie:** You don’t want to print it out?

**Fatima:** No, cause then I would have had to put it on [a poster].

**Katie:** Ah, okay. So, you would prefer to work on slides because it separates the paragraphs out for you automatically?

**Fatima:** Mhm. Yeah. Yeah, and I can slide in little pictures if I wanted to. And the best thing is, if I do it on a mobile device, I can just slide in the pictures by saving the pictures. So I wouldn’t really have to do anything. Maybe just take a picture and slide it right in.

**Katie:** And that’s harder to do on a computer?

**Fatima:** Yeah, because on the computer, you have to save it as, like, its own little file, which is actually kind of annoying.
TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

Figure 6.15. *Aiden's* compositional path from first draft through final presentation

Figure 6.16. *Owen's* compositional path from first draft through final presentation
TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

Figure 6.17. Emma’s compositional path from first draft through final presentation

Figure 6.18. Fatima’s compositional path from first draft through final presentation

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For Fatima, she makes multiple claims why she chose to simply write her article through her presentation. First, she argues that it is simply what she prefers for formatting reasons. She connected the affordance of different slides to the breaking up of the six different paragraphs throughout the writing project. Additionally, Fatima wanted to do a Slides presentation, not a poster. She argued that if she worked in word, she would need to do extra steps by printing her content and putting it on a poster. Finally, she contended that the affordance of being able to input photos into Slides more readily than Docs while on mobile devices was important to her, and less “annoying” than having to save images and then input them into Docs or Microsoft Word on a computer. This is interesting, since Fatima only used a single image in her presentation.

Finally, while Emma was observed making strenuous efforts during writing to edit and revise her drafts, both before and after inputting them into the iPad, she printed her entire paper and pasted it onto her poster without any change in ideas or structure. All six paragraphs ran right together on her poster, though she did add some fun facts, a photo, and her meticulously kept data table for all nine trials involved in her experiment. For Emma, she struggled to transmediate between the genre and medium of the written article and the genre and medium of the presentation poster.

These drafting choices were not addressed by teachers, revealing an implicit assumption that so long as the work is accomplished, it matters little how the students get there. While no students struggled outright in terms of drafting, the tension that remains is that the time spent on work during different compositional phases is vastly different for each student. Fatima spent substantially less time composing, as her article and

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17 See Table 6.6 below for more in-depth analysis of Fatima’s usage of multimodal design elements.
presentation were one in the same. This could have been a ripe opportunity for a student like Fatima to be pushed on her existing ideas about purposes for writing and presenting, their similarities and differences, and how these connect to the affordances and constraints within given media and applications. Emma could have similarly used guidance when designing her poster and its elements. Aiden’s time spent writing an entire second draft after making revisions in his notebook on his first - instead of just moving directly to drafting on the iPads - reveals potential for conversation about when to make the jump to the digital device in terms of drafting. This smaller tension is one which adds to the larger tension that exists between student choices in self-directed research and varying degrees of teacher support for those choices.

**Tensions in Designing Visual Presentations. Design Knowledge and Genre**

Fatima is standing at her desk, working on her iPad and Google Slides presentation. I am circulating the room, placing audio recorders when I noticed that design aspects about her presentation have changed, including a new color scheme, slide design, as well as the bolding of certain words. I set down the recorder near her and exclaim, “You bolded some words!” Fatima explains to me, pointing to the bolded word electromagnetism, “I bolded them because then other people would actually know what my topic is and then they’d just go straight to it. Cause if I left it in italics, it would be harder to notice.” I agree with her, remarking, “That’s true, if something is just in italics, it actually does not jump out, but if it’s in bold, it does. Your eyes go right to it.” Then, as she

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moves to her next slide, I notice that part of an entire sentence is made bold.

After asking her about this, she says

So, I bolded it so they knew my question, so it would be easier, like my question, my topic, I put it in bold so they’d actually go to it. Because if I left it alone, then they would just think that it’s just another part of the presentation, it is not really worth anything.

Curious about anything else Fatima valued as “worth anything” in her presentation, I asked, “When you’re thinking of other things that you could draw your viewers and your readers attention to, is there anything else that you’d bold in here?” Fatima says, “I mean… I could…” and trails off. Then she says, “I’ve got a good idea! Why don’t I just bold some websites?” Figure 6.19 below is Fatima’s final Google Slides presentation.

The tension inherent in offering multiple presentation medium choices (i.e., poster, slides presentations) invoice between and student perceptions of their teachers’ roles involve the subject (fifth-grade students), mediating artifacts (curriculum; lessons taught; digital and nondigital composition technologies; student choice) and object (students completing their KIC projects). The tensions surfaced around the minilessons taught regarding presentation medium, genre, design choices, and aesthetics reveal that students possess a wide range of design knowledge when it comes to their presentations. Doing a cursory multimodal analysis of the focal students’ presentation, taking into account the presentation medium, the genre of presentation, and general principles of visual design
laid out by Kress and van Leeuwen (2001), each student demonstrated areas for growth in their visual presentation (Tables 6.6 – 6.9).

It is important to keep in mind that all students were taught about the expectations of what presentations should entail from a content perspective (i.e., title, research question, research/facts, science activity procedures and materials, results, data displays, photos). Kelli also explicitly taught students about the different options of presentation medium and asked to plan their presentations beforehand. She also modeled what sketches in different presentation media (i.e., poster; Power Point; video) could look like. Additionally and importantly, Michelle spent multiple minilessons explaining multimodal design principles of making posters, discussing the use of poster elements of different sizes and how that relates to relevance, white space, use of color, use of borders, and how to use folds to partition content. However, as described at length in Chapter 5, these design principles were only discussed in relation to posters, and only examples of posters were shown. While it is true that the majority of students created posters, it is a fair question to ask if that could be at least in part because posters were the only medium emphasized by teachers from a design perspective. The following section reveals the analysis of more and less effective elements of multimodal design per content, genre, and aesthetics of each of the four focal students, beginning with Fatima, whose Google Slides are below.
The question I decided to test was which magnet would collect more materials? I found this topic that was related to my research topic and I decided to do it.

In order to answer my question, an experiment was required. I had an AA battery, a nail, wires, a magnet, and paper clips. First, I wrapped the wire around the nail. Then I created an electric current by connecting the wire to the battery. Finally, I put 6 paper clips in front of me, with each magnet on each side of me.

Electromagnets are created when an iron core is wrapped around by a wire carrying an electric current, according to education.jlab.com. The electromagnet these days is used for machines like refrigerators, microwaves, and generators, according to Wikipedia. William Sturgeon invented the electromagnet in 1825, according to thoughtco.com. Electromagnets depend on the coil of the wire because without it, the magnet field will be nonexistent, also from Wikipedia.

After I completed my experiment, I discovered that the magnet was stronger. The magnet collected all 6, when the electromagnet collected only 2. Therefore, the magnet is stronger. This doesn’t support my hypothesis because I thought that the electromagnet would be stronger. I think this happened because the magnet had a stronger force. I could have used something better than an AA battery for my experiment.

Over the next few weeks, I plan to research a way to make magnets weaker. I also wanted to test a weak magnet compared to a strong electromagnet.

Bibliography


Figure 6.19. Fatima’s final draft Google Slides presentation.
**Table 6.6**  
*Fatima’s Multimodal Design for Visual Presentation*  
Fatima’s Google Slides Presentation (designed on iPad)

<table>
<thead>
<tr>
<th>Elements</th>
<th>More Effective</th>
<th>Less Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Google Slides have a title, research question, research (literature reviewed), experiment procedures, materials used, results, future research, and data display, and bibliography.</td>
<td>N/A – all expectations were met</td>
</tr>
<tr>
<td></td>
<td>All content is written clearly and coherently. Multiple slides with printed word use <strong>bold print</strong> to emphasize the science topic, the research question, and the sources where information was found.</td>
<td>Slides tend towards only having printed word. In a visual medium such as Power Point, Fatima could have used photographs or illustrations of kinds of electromagnets or of her materials used in the experiment, as examples.</td>
</tr>
<tr>
<td>Presentation medium and relevant</td>
<td>Fatima used a consistent color, font, and font size that was clearly readable while projected onto a large screen. These design elements were simple but eye-catching, and they tied her presentation together cohesively.</td>
<td>The only non-printed word modality used (aside from color and font) is the photo of her data display. On this slide, Fatima’s color scheme is not present.</td>
</tr>
<tr>
<td>Aesthetic design Principles</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is quite a lot of white space on each slide.</td>
</tr>
</tbody>
</table>
How does basketball relate to acceleration and velocity?

By Owen

What I used for my experiment

A COOL PENCIL

A BASKETBALL HOOP

What is velocity?

Velocity is the rate at which an object changes its position.

The formula for velocity is distance traveled divided by time.

What is acceleration?

Acceleration is the rate at which velocity changes. An object changes only when force acts on that object.

The formula for acceleration is change in velocity divided by change in time.

How does acceleration and velocity relate?

Velocity and acceleration are related because when you apply acceleration like I said, changes in velocity divided by change in time velocity divided by rate of time.

What were my numbers for velocity my experiment?

<table>
<thead>
<tr>
<th>ft</th>
<th>15ft</th>
<th>24ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>sec</td>
<td>.89</td>
<td>13.55</td>
</tr>
</tbody>
</table>

What were my numbers for acceleration in my experiment?

<table>
<thead>
<tr>
<th>ft</th>
<th>15ft</th>
<th>24ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>sec</td>
<td>6.34</td>
<td>7.65</td>
</tr>
</tbody>
</table>

A cool little graph

Thank you

Figure 6.20. Owen's final draft Google Slides presentation.
### Table 6.7
**Owen’s Multimodal Design for Visual Presentation**

Owen’s Power Point Presentation (designed on iPad)

<table>
<thead>
<tr>
<th>Elements</th>
<th>More Effective</th>
<th>Less Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td>Power Point contains a title, research (i.e., velocity and acceleration defined), experiment procedures, materials used, results, and data display.</td>
<td>Owen did not write his research question in his Power Point. He also did not put his bibliography.</td>
</tr>
<tr>
<td></td>
<td>Owen uses images (i.e., photos, graphs) in conjunction with printed word. There is a balance of slides that have printed word and those which have images and words.</td>
<td>There tends to be a substantial amount of white space on slides without much printed word that also do not have images.</td>
</tr>
<tr>
<td><strong>Presentation medium and relevant</strong></td>
<td>Owen used a cohesive font and color scheme throughout. Colors used provided substantial enough contrast to be readable. These design elements helped tie his presentation together.</td>
<td>Some of the content on slides (i.e., calculations for velocity and acceleration) are not aligned. This is particularly important when it comes to making sure calculations line up with their respective distances.</td>
</tr>
<tr>
<td><strong>Aesthetic design Principles</strong></td>
<td>Thin, all-caps font is sometimes visually overbearing when there is a great deal of print at a time.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 6.21. Aiden’s final poster presentation.**
### Table 6.8

*Aiden’s Multimodal Design for Visual Presentation*

**Aiden’s Poster Presentation**

<table>
<thead>
<tr>
<th>Elements</th>
<th>More Effective</th>
<th>Less Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Poster contains a title, research question, research (i.e., facts and defining air pressure), experiment procedures, materials used, results, and data display. Additionally, Aiden put “fun facts” on his board, as well as multiple illustrations of how barometric pressure works.</td>
<td>N/A – all expectations were met</td>
</tr>
<tr>
<td></td>
<td>内容是主要以文字形式。所有手写内容清晰易读。Aiden使用黑色纸张来装裱和创建一个黑色和白色印刷字和图像的边框。每个部分被隔离并易于查看。研究问题被置于中间并以粗体打印（“big, stands out” according to Kelli）</td>
<td>Research question is placed in the middle with bold print, but nothing except bold bring draws the eye to this immediately. Eye gaze and reading tends to travel from left to right, up and down. Aiden’s results are in the top-right corner, the first thing viewers would see, which seems a little confusing. In fact, there does not seem to be a coherent ordering to the content, generally speaking, save for the bibliography being at the end.</td>
</tr>
<tr>
<td>Presentation medium and relevant</td>
<td>White space is limited. Poster elements take up ample space and are relatively easy to read. Color scheme is coherent throughout.</td>
<td></td>
</tr>
<tr>
<td>Aesthetic design Principles</td>
<td>Red handwriting on bottom of poster pops out and provides more information about the science topic.</td>
<td></td>
</tr>
</tbody>
</table>

284
Figure 6.22. Emma’s final poster presentation.

Table 6.9
Emma’s Multimodal Design for Visual Presentation

<table>
<thead>
<tr>
<th>Elements</th>
<th>More Effective</th>
<th>Less Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Poster contains titles, research question, research (i.e., facts and defining air pressure), experiment procedures, materials used, results, and data display. Additionally, Emma put “fun facts” on her board, as well as a photo of the three kinds of balls she used in her experiment.</td>
<td>N/A – all expectations were met</td>
</tr>
<tr>
<td></td>
<td>Content is mostly typed. All handwritten content is legible, clear, and written neatly. Emma’s use of color is both creative and utilitarian, especially in her data display. She uses alternating colors to distinguish between the results (green) and all other text (purple). Emma uses shapes like clouds and squares to set off both her poster title (top center) as well as her name (bottom center). The alternating color motif also happens again here.</td>
<td>Emma printed her entire paper and placed it on one side of the poster. This component carries the bulk of the information on the poster, but the printed word is so small, it is the hardest component to read. It is more difficult to see where each element of the poster begins and ends within the context of the printed word (i.e., the paper).</td>
</tr>
<tr>
<td>Presentation medium and relevant Aesthetic design Principles</td>
<td>Emma uses borders in bright colors as a color scheme, which is eye-catching and aesthetically pleasing.</td>
<td>There is much more white space on the right side of the board when compared to the left. This</td>
</tr>
</tbody>
</table>
Emma does use images to denote her specific materials, which corresponds with the more elaborated list of materials on the right side of the board. Notably, most of the content was foregrounded in the entire paper placed on the left side of the poster, and there was not much left to place on the opposite side.

Notably, students’ presentations met nearly all expectations in terms of content for the KIC project visual presentations. This was available to all students (at least in Kelli’s class) by way of her minilesson and anchor charts containing this information (Figure 6.23). This anchor chart also provided some concrete guidance in terms of aesthetics, including neatness, using as much of the available space as possible, making the research question “stand out,” and the use of pictures, photographs, and data displays (i.e., graphs).

![Anchor Chart](image)

Figure 6.23. Kelli’s anchor chart of expectations.

Generally speaking, the two focal students creating posters (i.e., Aiden, Emma) had a grasp of design elements such as color – Emma in particular. However, both students could have used further guidance with where to place content so that it occurs on the poster in a
coherent order based on how people read from left to right, up and down. This was only briefly touched upon in Michelle’s classroom, and not in reference to eye gaze.

The students who did slides-type presentations had room for improvement in their presentations across the board, even though Fatima verbalized time and time again a deeper-than-expected knowledge of aesthetic design principles, as well as the affordances and constraints of medium. For Fatima, she could have been pushed to use more images to describe her experiment, particularly since electromagnets come in all shapes, sizes, and usages, as she described in her presentation. Owen needed more guidance in terms of alignment, using more legible fonts, and making use of the whole slide rather than leaving so much white space. It bears repeating that the fifth-graders as a whole experienced neither instruction nor examples in terms of slide presentation design. Similar to the tensions inherent to different composition media, attention towards visual presentation modalities and their design contributes to the larger tension between student choices in self-directed research and varying degrees of pedagogical support for those choices.

Summary

This chapter examined the students-as-subjects activity system occurring during the KIC project by a) broadly delineating the components of the activity system, b) defining the four major literacy pedagogical activities of the activity system (i.e., writing a scientific article, designing a visual presentation, doing research on science topic and science activity, and giving final presentations), and b) teasing apart tensions observed between activity system components during these four activities. As in the teacher-focused Chapter 5,
observed tensions with students and the activity system revealed larger tensions between traditional ideas about school culture and how KIC helps to unfold a culture of inquiry.

One notable tension involved the numerous student-perceived roles of their teachers throughout the KIC project. Teachers are considered to be direct instructors, supporters, facilitators, and helpers. Some students, like James and Owen, generally perceived teachers as "not really teaching" and "just guid[ing]" students throughout KIC, which calls to the student self-directed goals of the KIC project; this perception also speaks to what actual teaching "looks like" compared to guidance or facilitation (i.e., Owen’s description of the teacher-at-the-board, quiet-students-attentive, didactic teaching in the initial vignette). Teachers still regularly engaged in direct instruction through minilessons, and multiple students perceived teachers in this light. Ameena and Chimin, though demonstrating the capability to work independently and successfully, verbalized their reliance on teachers for obtaining “right answers” or seeking approval of their independent work. How teachers actually took up these student-perceived roles was deeply rooted in the context of the responding student, KIC project phase, as well as the level of independence or need demonstrated by the students themselves during the project.

Second, this chapter described the tension surfacing between students’ purposes for doing inquiry like the KIC project in school. All participating fifth-grade students identified being driven by curiosity to learn, with multiple others describing a desire to learn from their peers and share what they learned in tandem. Students’ participation in the KIC project in the ways that they did was additionally motivated by the vertically-oriented: desiring to do well by school standards, following the rules, getting good marks, and
pleasing their teachers. Different students exemplified the culture of schooling in different ways. Aiden embodied a competitive, high-achieving student with an intense adherence to school-rule following in front of teachers – sometimes leading to observable discomfort and anxiety. Fatima and Emma were also rather strict rule-followers in their academic practice during the KIC project, particularly in terms of teacher expectations of the project. Other students (Ameena, Owen, James) tended to foreground curiosity as their main purpose for inquiry, though these students were also concerned with “doing well” as per their teachers, grades, and objectives. There are clear tensions between students performing inquiry for purposes structured in the vertical framework created by school culture and those authentic purposes for inquiry from students’ own lives and experiences.

While the above tensions are more general to the KIC project, there were those that pertain specifically to the literacy activities, practices, and actions students engaged in while doing research, writing, and creating their visual presentations. First, students and teachers both found that the research-related aspects of the KIC project to be the most challenging. However, this tension is a productive one, exemplifying a space for both student autonomy as a learner as well as teacher flexibility. At this point, students were in the thick of researching their own topics and as such teachers shifted their practice to support this as fully as possible as students needed it. This pushed against school culture practices (i.e., rote learning, copying notes) and those involved in authentic spaces for inquiry (i.e., making meaning of new ideas as related to one’s own experiences, for oneself).

Finally, the tensions of composition across the written articles as well as the visual presentations were exemplified. Thanks to student choice, students were able to choose
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t heir medium of composition for their written article as well as the medium and modalities used for their visual presentation. These directly paralleled the tensions revealed in Chapter 5 about how certain students’ choices were not as pedagogically supported compared to others. Exploring the major differences in terms of support regarding how students wrote and designed the final artifacts of their KIC projects raise questions about what is considered to be of value in student-directed inquiries, as well as how this relates to both school culture and an unfolding culture of inquiry.

Figure 6.24. A representation of both activity systems under study within the spatial context of Legacy Elementary (to be animated at this dissertation defense).
CHAPTER SEVEN:

TENSIONS IN LITERACY ACTIVITIES, PRACTICES, AND ACTIONS
ACROSS THE KIDS INQUIRY CONFERENCE

This exploratory study of a fifth-grade inquiry project is one taking place in a period of time in which education is entrenched in the joint neoliberal and neoconservative endeavors striving towards privatization of education, centralized content, and mass standardization – one which attempts to run the human endeavor of education as though it were a private company (Apple, 2000; Stedman, 2011). This is not only dehumanizing to teachers, students, and their families involved the project of education, but it also fails to understand what fundamentally makes for authentic learning and teaching. Instead, there remains a push toward back-to-basics understandings of what it means to teach and learn, which largely (and inhumanely) ignore the realities of students, their lives, and their bodies (Dewey, 1938a; Siegel, 2016). If we are to be a functioning democracy, our citizenry need to be able to think critically and purposefully with their interests and those of others in mind, rather than simply regurgitating information. However, despite the push towards privatization, excessive standardization, and the trickle-down that occurs from these (i.e., a hyper-focus on testing and test preparation; a narrow focus on what counts as learning and achievement, as well as the defunding of public education) (Hollar, 2017; Stedman, 2011; Saltman, 2014), there can be spaces created by teachers and students, supported by administrators and families, in which authentic learning through purposeful, student-centered educative experiences can occur. This study reveals how over time, a culture of inquiry can be developed within this larger historical “culture of correct answers” (Lantolf,
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2007, p. 366) in schools through smaller projects like the Kids Inquiry Conference. Such projects are designed in ways which consider students’ stakes in their own learning. This is the sort of learning which is both challenging and empowering; the kind of learning that makes students feel as though they are doing something important for themselves, and thus brings some greater degree of investment to the project.

Learning and meaning-making are human endeavors that work best when they are authentic and purposeful to the learner (Dewey, 1938a). In school contexts, the enactment of processes of learning and understanding are necessarily shaped and constrained by powerful institutional forces. As such, learning and meaning-making are conceptualized here from theoretical standpoints which consider its historical, cultural, and physical situatedness. This study is rooted conceptually in cultural-historical activity theory; Deweyan perspectives about experience, authenticity in learning, and inquiry; as well as assumptions about literacy (i.e., meaning-making) that assert the multimodal, embodied, spatial, and material nature of interaction and meaning-making. The goal was to determine and understand the interactions and literacy practices of fifth-grade teachers, their students, and their learning environments during the weeks-long KIC project. Using such theoretical stances helped to situate and analyze how these interactions and practices involved in an open-ended inquiry project could both fit into and challenge typified school culture from the standpoint of activity and literacy practices. The three research questions in this study which I have answered in the previous three chapters are:
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1. What are the literacy practices enacted across interactions between people (i.e., students, teachers) and materials (i.e., tools, technologies physical materials, curriculum) during the fifth-grade inquiry unit?

2. How does the built environment (i.e., design and use of classroom spaces) support these literacy practices during the fifth-grade inquiry unit?

3. What are the relationships between enacted inquiry as carried out through the literacy practices, built environment, and broader institutional contexts?

This final chapter serves as a place to speak to broader findings and tensions across the previous three chapters, connecting these back to the literature around authentic learning and experience, literacy studies, as well as inquiry in elementary schools. This includes tensions of a) supporting agency of students' bodies during inquiry learning; b) balancing students' access to resources; c) open student choice, widened access to resources, and text readability; d) honoring and pedagogically supporting student choices in inquiry; e) student purposes for inquiry learning in schools; f) teacher purposes for inquiry learning in schools; and g) the socioemotional supports of inquiry learning. Major implications from this study are then discussed, and ideas for future research stemming from this current data set are offered.

Student Choice, Openness, and Pedagogy

Intentionally-designed key features of the KIC project included openness and flexibility for students to make choices about multiple aspects of their learning. From a project standpoint, students were able to make choices about their science activity and associated science topic; research path and kind of texts used for research; visual
presentation modality and ensuing design choices; as well as writing modality for their final written article. These choices are facets of open or full inquiry (Colburn, 2008; Martin-Hansen, 2001), which involve students selecting their own research questions and ways of showing what they have learned largely independently. Also, enabling students with such choice serves to validate students’ curiosity, from which Dewey (1938a) contends that authentic purpose for learning stems from. As in other studies of inquiry spaces, students are highly invested when they make the decision to be “investigating something that matters to [them]” (Gray, 2006, p. 227).

Tension: Supporting agency of students’ bodies while learning. Students also had agency regarding decisions about their learning on a day-to-day basis, including where and with whom students chose to work and which modes of reading and writing they wanted to use. Students were able to elect to use different spaces when researching as well as while constructing their visual presentations – they were not simply confined to their classroom desks and could use different parts of the library, the science lab, as well as other parts of their own classroom. Owen consistently enacted this facet of his agency during the KIC projects by selecting places in classrooms where he could “do his best work,” usually away from other students. Aiden also chose to work in multiple places in classrooms surrounded by different classmates. For Michelle, Kelli, and Mandy, it was important that students had a choice in how they regulated their bodies during learning, and this is no small matter.

18 There were occasions where students did not have this choice in terms of their iPad use. As an example, recall the two-day stretch where students were not allowed to use their iPads because they were taken away from the grade-level due to poor and truant behavior in chorus class.
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The three teacher participants explained that over time, they have each become more comfortable with this kind of student-directedness, “letting go” of this kind of control during the inquiry projects. Teachers in this research enabled choice-oriented practices around students’ bodies in conjunction with their learning, putting agency back in the hands of the students, adding to the authenticity of students directing their own learning. This “letting go” speaks to Siegel’s (2016) assertion that much of school (literacy learning in particular) is very much wrapped up in the social practice of regulating students’ bodies by forcing students to sit at desks to read, walk in straight lines from place to place, and sit in specific ways and orders while attending to teachers.

Further, students not only enjoyed but seemed to thrive in less adult-monitored environments when they had authentic purposes for working on their inquiry projects. Students sought help and provided help to each other frequently and without hesitation, as was demonstrated in places such as the science lab. They balanced out the work of their inquiry projects alongside their chatting, joking, and messing around, with a student like Fatima acting as a monitor when things seemed to get out of control (and when privileges to work in such a space could be lost). There was an excitement around working on these projects alongside or directly with classmates and friends. During this research, students assisted each other, sharing ideas and resources with one another. This facet of inquiry also demonstrated in other large-scale, classroom-wide inquiry projects, where “community is developed through communication” (Dunlop et al., 2015, p. 464) and working together collaboratively. Students being able to direct themselves in their KIC projects also exemplify Dewey’s contention that shared classroom activity (as opposed to entirely
teacher-directed activity) authentically maintain and promote organization and control instead of the assumption that chaos would ensue. The authentic nature of the project helped maintain students’ focus and investment rather than constant teacher supervision.

**Tension: Balancing students’ access to resources.** Students also enjoyed ease of access to the materials that they desired to work with, and the teachers in this study were well-attuned with this. All three teachers spoke about desiring to make students access to books, non-digital maker materials, and digital technologies easier, and these would require both structural and material changes to their classroom spaces. If students know where to go to find what they need, they will do so. Previous research has demonstrated that intentionality in designing the spatial environment is integral to creating the optimal context for inquiry (Dunlop et al., 2015; So & Kong, 2007), including the strategic placement of objects, materials, and texts in places where children are more likely to discover and use them (Moses et al., 2016). It is clear that teachers saw student self-directed learning during inquiry projects and easy access to needed materials as going hand-in-hand.

In addition to textual, physical, and digital resources, students also positioned teachers as resources. The tension arising here was that students very much want ease of access to their teachers, but teachers cannot help all of their students at once. The individualized instruction required to support students’ individual inquiries was directly mediated in this project by teachers in multiple ways. Teachers directly taught strategies for students to employ if a teacher could not help (e.g., Michelle teaching students to check with a friend first) or if a student did not understand something (e.g., Kelli teaching how
Michelle, in particular, also frequently described to her students the socioemotional components of what it might feel like in those moments of not knowing, including feeling frustrated or, in the students’ words, “stupid.” She described these feelings as a part of the learning process – a sign that students were engaged in real learning. Teachers used their pedagogical expertise to give students the tools to both understand and guide themselves out of challenging learning circumstances while waiting for teacher interaction as a resource. This is an example of what Dewey (1938a) described when he wrote, "The ideal aim of education is the creation of power of self-control." (p. 64).

**Tension: The overwhelm of openness and student choice.** Orienting the inquiry projects towards openness of resources and student choice necessitated a shift in how teachers guided their students. While scholarship for student-centered education has been in place since Dewey’s time, didactic instruction in schools aiming for standardized test performance has been the historical trend, leaving students working on the same content and assignment simultaneously (Lagemann, 2000). While balanced literacy programs (e.g., Fountas & Pinnell, 2016) aim to include a range of student groupings (whole, small, partnerships, individuals), times for both student- and teacher-directedness, and varied opportunities to learn and practice literacy strategies using pedagogical models like the gradual release of responsibility (Pearson & Gallagher, 1983), the emphasis on benchmark assessments and other narrow, standardized measures of language and literacy is still an enormous force (Gee, 2003). In the neoliberal age of accountability and back-to-basics education, there has persisted a model of teacher-centered, whole-group instruction.
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around standards-based modules, textbooks, and workbooks as normal and sometimes even mandatory. Such teacher-centered education and one-size-fits-all curricula are embedded in the very fabric of American education (Lagemann, 2000). Teachers like Michelle, Mandy, and Kelli clearly are striving for student-centeredness, but it is impossible to neglect the institutional and historical power that shapes how teachers teach and conceptualize what learning looks like, feels like, and manifests as with their students. When learning is no longer entirely under the purview of the teacher and is instead in the hands of the students, tensions and explicitly-stated discomfort between the cultural activity of schooling and the role of the teacher in that of inquiry becomes clear.

Supporting student choice in content and readability. All three teachers noted that opening student access to texts outside of those found in the school library through the use of iPads was precisely what made these KIC projects not only possible but more authentic toward students’ interests. However, Kelli, Mandy, and Michelle were also acutely aware of a major constraint resulting from such openness: increased choice in terms of science topic (and subsequently, texts) meant increased time spent navigating the murky world of text readability with their students. Students required more time and guidance simply to find texts that fit not only their topics but their developing strategic literacy and language knowledge, let alone read and interpret them. As such, most of the time spent in Kelli’s reading class, Michelle’s library class, as well as some time spent in Mandy’s writing class geared towards doing research on their topics.

This also meant that students who chose topics that were not covered in the elementary science curriculum ultimately had more conceptual difficulty and required
increased assistance in finding and comprehending the texts necessary to support their scientific understanding. For example, students with questions about plant growth (i.e., Saabira) had immediate and easy access to texts written specifically for fifth-graders (and younger) about photosynthesis and the plant life cycle. It is a topic commonly studied in elementary school at various points. However, students like Owen, who studied acceleration and velocity, had to search widely and with a great deal of adult guidance for texts that helped him conceptually understand Newton’s Laws of Motion. The same could be said for Aiden and Fatima, who studied barometric pressure and electromagnetism, respectively. While the baseline concepts of these ideas (i.e., weather; magnetism) may be studied in elementary school, they required more in-depth work with the content in order to speak and write knowledgeably about their topics, based on the framework given by the KIC project curricula, KIC project rubrics, and their teachers’ expectations. Many of the texts these students found initially were geared towards secondary school or college students, making them frustrating to understand. The reality of student-centered research is that if students are truly able to choose their topics, the search for understandable texts across their topics will not be evenly distributed across all students. Teachers spent more time with students who struggled to find texts which support their conceptual understanding of their inquiry research topic. Students who tended not to struggle did not get as much face-time with their teachers. This was the pattern observed over the KIC project and identified by the teachers.

However, teachers found ways of mediating this issue of readability by working within the tension. Most saliently, Kelli saw this as a matter of how she conceptualized the
KIC projects in general. The “messiness” of readability was not a problem to be resolved in the inquiry projects but an inherent feature of them. For Kelli, if students were to maintain authenticity in their inquiry projects, then she needed to both maintain regular, individualized contact with her students regarding their topics and teach her students metacognitive strategies about “what to do with the struggle” when they came to something they did not understand. Furthermore, she recognized that for most students, this took substantial amounts of time. Kelli has openly identified and actively worked within the uncomfortable grey area that came with relinquishing a great deal of control in these inquiry projects to her students. However, she also saw “richness” in these projects, as well as felt sense of “success and confidence” in her students after KIC and other inquiries are finished, even if it was difficult for her. She explained frankly about her own experience of the KIC project,

Who cares about the struggles that the teachers have to go through? Let’s look at if it’s good for the kid, and I think it’s good for the kid. And I think that’s something where people need to step back and say, "I’m going to do my job, and let’s not worry about me being upset about this. If it’s good for the kid, I should try it." I think we don’t put the kid first enough.

This perspective is one that exemplifies Dewey’s principle of continuity in educative experiences. From his view, it is incumbent on the teacher to create the social context in which children can learn guided by their own developed purposes while also preparing students for future experiences they will encounter as they continue to become critical thinkers, readers, and writers. Dewey (1938a) writes that such “planning” is not about
determining how to teach every iota of content a child is supposed to learn but instead, “The planning must be flexible enough to permit free play for individuality of experience and yet firm enough to give direction towards continuous development of power,” (p. 58).

**Tension: Honoring student choices and supporting student choices.** The first step towards a more democratic, student-centered, and inquiry-based pedagogical orientation requires teachers to “let go” and permit students’ decisions throughout the project, as described above. In this way, teachers are honoring student choices and voices. However, close examination of these projects reveal teacher biases towards specific kinds of choices that students could make. Another salient tension surfaced by analysis of the activity systems of the KIC project involve how some student choices (i.e., in science activity and the ensuing writing around it, presentation medium, and data representations) were better supported than others. While this privileging of certain kinds of student choices over others was tacit and likely unintended by the participating teachers in this study, it raises very real questions and consequences of opening up student choices in their learning. The tension involves Dewey’s (1938) ideas about continuity in learning. The question again becomes, how do teachers maintain a flexible enough environment to enable students to root their learning in their own purposes, interests, and choices while also supporting them pedagogically and enabling growth?

**Supporting writing about different science activities.** First, most direct instruction (and their associated anchor charts) in writing during the KIC projects was geared towards students who performed experiments rather than demonstrations or models. Students were given a clear choice between doing an experiment, a demonstration,
or modeling some scientific phenomenon. From a scientific writing standpoint, writing
about an experiment is substantially different from writing about a demonstration or a
model. For example, the notion of variables does not necessarily enter into a
demonstration, but would be absolutely essential to discuss in an experiment. In this way,
students who did demonstrations and models were not provided the same kind of
mediation for their writing as those students doing experiments, given that their mediating
artifacts (i.e., the teacher’s direct instruction; the anchor charts) were mostly directed
towards students doing the traditional science fair experiment.

**Supporting design of different presentation mediums.** Second, even though
students had a plethora of options for designing their visual presentation, students were
explicitly taught multimodal conventions for designing *posters* by Michelle as well as Kelli.
Students were offered myriad choices in terms of their visual presentation design,
including digital slides, videos, as well as posters. While Kelli briefly discussed how
students might plan for digital slide or video presentations, the conventions for designing
such visual texts were not discussed at all by any teacher. This becomes problematic for
students like Aiden, who discussed in his interview that while students had the option to
“do [a] Power Point,” he didn’t know how and so he did a poster instead. It raises the
question that *if* design conventions about digital slides presentations or video were directly
taught by teachers, would more students like Aiden have done them? What is the nature of
a choice in presentation medium if students do not feel as though they could use most of
media without some further guidance? For students already adept at working in these
other design media, it is a choice. For students who do not have this skill set, then they are relegated to what the teachers directly teach – poster design.

**Supporting different kinds of data representations.** Third, students were encouraged to create graphs as data displays by Michelle, who demonstrated three graphing tools found on the internet that students could use. However, the tension became immediately clear in lessons, as there were multiple students who did not collect numerical data or would not be served by having graphs as a data display. These students, including Fatima and Saabira, spoke out about this clear discrepancy during library time, questioning whether or not a graph would be useful to them. Furthermore, Michelle’s instruction of the use of data was entrenched in the discourse of quantitative, numerical research as the best kind of “proof” of how to communicate findings. Many students, like Saabira and Ameena, used observational and descriptive data to show how changes in their experiment occurred over time, and as such, a graph would not serve them. To Michelle’s credit, she did address some of these issues one-on-one with students, including Fatima and Saabira, who either did not have numerical data or did not choose to make a graph as a data display.

**Supporting different methods and mediums of writing articles.** Finally, students drafted and composed their final writing in myriad ways and processes, as described in Chapter 6. Some students spent a great deal of time writing and rewriting their drafts (i.e., Aiden) where other students merely wrote their “paper” in the form of a digital slides presentation (i.e., Fatima). While I wholeheartedly appreciate the flexibility and choice in what counts as writing in Mandy’s classroom, I am left wondering about how students like Aiden and Fatima could have been guided to use their time differently in service of drafting
and publishing their writing projects. Both students were consistently positioned as high-achieving students by teachers, including Mandy, and as such did not engage in much face time with her over the course of writing during KIC. Understanding that my subjectivity as a teacher is influencing my analysis of the situation at hand, I wonder if Fatima could have been guided to write more deeply about her topic, as she had finished her entire KIC project a week early. As for Aiden, he wrote multiple, full-length drafts of his scientific article before publishing his final draft on the iPad. Knowing that Aiden demonstrates writing competitively in terms of length with his peers, I wonder if Aiden could have been guided towards the purposes of drafting in conjunction with editing and revising. As these students appeared to work productively while drafting, they were not the focus of Mandy’s attention. However, both students arguably required different kinds of guidance during drafting to be pushed as writers.

The tension between teacher-directed curricula in inquiry projects and spaces for student choices has been demonstrated time and time again. As such, defining learning as “inquiry” becomes questionable in terms of authenticity and purpose when the students in question are unable to purposefully make choices about any aspect of the process, whether it is the content to be explored or the processes of inquiry in which to engage (Hong et al., 2014; Lofgren et al. 2013; So & Kong, 2007; Woods-McConney et al., 2016). In these cases, student choice is not a factor. In other inquiry-related research, students may have some agency in specific facets of an inquiry project, like deciding how they intend to conduct their experiments (Wu & Hsieh, 2006), construct their final artifacts (Chen et al., 2008; Shih et al., 2010), and how they would like to present their findings (Shih et al., 2010).
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What is notable about the KIC project under study here are the number of decisions which appear to actually be in students’ hands. Students are proposing their inquiries from the ground up, from identifying topics of interest, choosing a topic and associated science activity, selecting a research path and the kind of texts used for their research, creating their choice of visual presentation, designing that presentation their way, and determining a writing modality for their final written article. However, while coming to a sort of resolution concerning how much student self-directedness there should be in the KIC project, new tensions have emerged for teachers. Now, within all of these decisions students need to make, some of those decisions are less supported (or not supported at all) when compared to others. This again connects deeply to Deweyan ideas about continuity and authenticity (1938a), calling to question what counts as student agency in their learning. While yes, these choices are now available for students, are they supported for all students pedagogically? This would appear to be the next step in the evolution of these KIC projects – coming to a sort of resolution for addressing how student choices are supported pedagogically, encouraging not only authenticity but continuity in students’ growth as critical thinkers, readers, and writers.

Purpose: What Drives Doing Inquiry in School?

Establishing a personally motivated purpose for learning is one of the drivers of authentic inquiry. Dewey (1938a) wrote of this “importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process” (p. 67), and that learning should be personally meaningful to students. Further, prescriptive education reliant on externally-oriented motivators (i.e., pleasing the teacher,
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going good grades) neglect authenticity of purpose, as these do not consider students’ curiosities as intrinsic, deeply desires to learn. Finding ways to make learning personally meaningful or interesting to students is not a new idea (Barab et al., 2000), as interest is a well-studied construct that is often tied to goal-setting, motivation, and attention (Hidi & Renninger, 2006). However, teachers who enable students to set personal, interest-based purposes for learning also must contend with other extremely powerful and historically entrenched student purposes for learning related to school culture, like getting good grades, fitting in with the discourses and practices of schoolgoing (i.e., “doing school” well, following directions without question), and working for the purposes of pleasing the teacher. Furthermore, the hierarchical concept of a vertically-oriented grading system creates an environment favoring competition. This competitiveness for achieving the highest grade when compared to peers can also be leveraged by students as a purpose for engaging in the work of learning.

Additionally, teachers’ overarching purposes for engaging their students in self-directed inquiry becomes problematic, as do teachers’ roles within such inquiry projects. Given that the KIC project is interdisciplinary in nature – combining literacies, design, and science – different teachers oriented themselves to the project in different ways. Teachers who provided direct instruction throughout the KIC projects (i.e., the fifth-grade teachers like Mandy and Kelli; Michelle as the library teacher), collaborated and worked together regularly. There seemed to be a shared vision of the KIC project objectives, which were rooted in developing literacy practices and identities of a thinker, researcher, writer, as well as a scientist. When two of the district’s science teachers came in on the final day of
projects to help assess student presentations, it became clear that their orientations toward the project were more rooted in the science content. This, too, is a tension of purpose for engaging in the work of inquiry at school.

**Tension: Student purposes for inquiry.** Students in this study identified a number of reasons why engaging in an inquiry project such as KIC was important to them, as shown in Table 6.5 in Chapter 6. Some of these reasons were more entrenched in school culture, such as adhering to project and teacher expectations, getting good grades, finishing assignments on time, and seeking validation from the teacher. Owen, Ameena, James, and Aiden directly demonstrated or identified the desire to succeed and “show off” what they know as something which excited them during the course of the inquiry projects; here, there is that air of competition and pride surfacing for these students.

Competitiveness was particularly salient for Aiden, particularly in terms of teacher and task expectations common to school culture. He seemed consistently concerned with his performance, and indeed, Aiden provided a thorough, knowledgeable presentation and demonstration about barometric pressure to his peers, his language and mannerisms steeped in academic – specifically scientific – discourse. He adhered to every guideline and followed every rule set before him from an academic standpoint. Aiden never stopped holding himself to high academic standards, no matter if he was in a classroom with his teacher or in the science lab with his friends and peers. However, when he was removed from teachers, Aiden’s anxiety notably lessened. Instead of seeming tightly wound about adhering to expectations, he talked competitively with his classmates, relishing in his talents regarding specific aspects about his KIC project (i.e., “Bruh, I’m better than you at
bubble letters.”). When Mandy was not circulating around his table in writing class, Aiden would compete with his groupmates to see who wrote the longest paragraphs; he was lauded multiple times by classmates for writing extensively.

Whether teachers are around or not, much of what drives Aiden is performance-oriented, wrapped up in the neoliberal discourse of what it means to not only succeed in school but also in a competitive, market-based economy. As Stedman (2014) writes, students indoctrinated into a neoliberal system of values are socialized to “compete for external rewards and pledge allegiance to the State and corporate system” (p. 14). Aiden’s academic performance can be attributed, to some degree, to both his allegiance to school culture and the competitive nature institutionally fostered within schools by way of external rewards such as getting good grades and awards for academic performance. Most concerning is the consistently observable anxiety that such a performance induces in Aiden, particularly when he is around teachers and other school adults who could be perceived to reinforce these values.

However, it is notable that all students who participated in this study – including Aiden – referenced curiosity or genuinely wanting to know more as a reason to be doing inquiry work. Others saw value in learning how to work independently and “teaching yourself something new,” as Ameena described. Particular students, such as Fatima and Hudson, found it an opportunity to share knowledge as well as the work of inquiry with their peers. Still others saw the importance of learning scientific topics that they felt were directly important to their lives, like Saabira and Dimitri. Saabira studied planting because she “love[s] to plant,” and Dimitri saw value in studying science in general because it’s
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important to know “the background of how things work... cause eventually in like, you
would need background knowledge.” Students like Ameena, Chimin, and James discussed
the “fun” felt in learning about topics you want to learn about rather than what you have to
learn about, and how this transformed the feel of inquiry projects for them. There was a
piece of them within these projects, thanks to their choices and decision-making. There was
a felt sense of enjoyment felt by these students engaging in the KIC projects, even if parts
were difficult at times. Feelings like excitement, fun, and enjoyment are reported when
students’ investment in their inquiry projects are emotionally- and identity-laden (Moses et
al., 2016; Kim et al., 2012; Zhai et al. 2014).

What is compelling to note here is that when considering individual students (like
Aiden above), their purposes for engaging in KIC was often held in tension – they were both
driven by curiosity but also used language that revealed that school culture (and deeper
still, neoliberal values) were deeply embedded within them as fifth-graders. Fatima
exemplified this tension most saliently and with complexity. Fatima often discussed the
need to get good grades on schoolwork. She was also the rules-enforcer in the student-
directed space of the science lab when she works in there with her friend. While she
worked with her friend, Fatima sharply demarcated the kind of help that she could provide
her friend (i.e., smaller tasks like printing, cutting, pasting, and so on). No original work
must come from Fatima, or else it would be considered “cheating.” All of these practices
revealed Fatima to be deeply entrenched in the rules and practices encompassing school as
a culture of correct answers as well as neoliberal markers of individualism, external
rewards, and compliance.
However, based on her interviews, Fatima also clearly saw school for what it is – a gatekeeping mechanism for accessing higher education and the job market. She used words like “mandatory” to describe this particular portion of her schoolgoing life, and thus this is the reason that she feels the need to get good grades. Fatima demonstrated a metacognitive stance about what it means to “do school,” and as such, she “does school” it while consciously wrapping as many of her own interests into it as possible through these inquiry projects. Fatima showed a love for technologies, and as such, she expertly learned how to leverage the power of mobile devices so she was able to work on her inquiry projects whether she was at home or school. Fatima also saw the inquiry projects as opportunities to work with others – a skill she believes necessary for life (i.e., “your whole life is spent working with others”). She earnestly enjoyed helping others on their projects, seeking that social connection with her peers and friends. Fatima’s authenticity for engaging in the inquiry projects was entwined with her own interests as well as what she saw as her necessary participation in school culture.

For students, purposes for doing work in school can be both entrenched in school culture, and it can also be ultimately real, purposeful, as well as based on their interests and curiosities. Students in the KIC projects have the opportunity to authentically choose the science topic they would like to study, and other factors of school culture influence their participation, including competing with other students. This is, in part, enabled by the purposeful design of spaces for this kind of inquiry within the school day in which students can use their interests to empower their learning.
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**Tension: Teacher purposes for inquiry.** Participating teachers in this study saw the teaching of inquiry as not only important but necessary for students to become critical thinkers. It was a space for them to try on the discipline-specific identities and practices of being a reader, writer, and scientist (Moje, 2008) and how these practices worked together during the course of inquiry. KIC was designed in such a way that students would be encouraged to direct their own learning, empowered by much of the project being put into their hands. Pedagogically, teachers needed to be flexible and shift their roles across a spectrum of providing just-in-time individual guidance; teach whole-group mini-lessons based on students’ needs; serve as encouragement and support; as well as act as a resource or assistant to students as needed. It seemed as though While participating classroom teachers Mandy and Kelli as well as library media specialist Michelle collaborated regularly around the objective of the project, stated by the KIC project scope and sequence document as, “Students will be working through the reading and writing processes in tandem with science, thus blurring the lines of each discipline.” These teachers also foregrounded student voices in this project, which were oftentimes recognized and validated during the course of this project. These were the teachers who worked with students, day in and day out, having built relationships with them over not only the course of this project but also the year through daily contact. These teachers knew students’ project topics and had been responsible for guiding them in some way during the course of the entire KIC project.

For the KIC conference day, the district’s science teachers came to help assess student presentations, and this created a tension with the purpose of the project. While one of the science teachers did teach exclusively at Legacy Elementary, the other taught at
another elementary school in the district. Neither of these teachers had been involved in
the KIC project up until this point, and as such, they were not aware of the students’ trials,
tribulations, and triumphs throughout the inquiry project. The collaborative nature
observed between Mandy, Kelli, and Michelle was not apparent and truly could not occur in
the same way, particularly from the standpoint of physical presence. These teachers did
have a hand in organizing the presentations, but they were not actually present nor did
they do any sort of direct instruction on a regular basis during the KIC projects.

The teacher who taught at the different elementary school particularly oriented
herself toward this project as an expert scientist rather than a facilitator of student
presentations and conversations about scientific ideas; she tended to foreground the
science content as well as find opportunities for teachable moments based on the students’
content. While this might seem like a teacher enacting good teaching practice, seizing on
authentic opportunities to help students understand content, it also meant backgrounding
the students as experts at their own research in favor of her voice being heard. When she
took the floor, a more didactic feel took over the space with Initiation-Response-Evaluation
(Mehan, 1985) becoming the typical conversational pattern between the teacher and
students. The tension revealed here is one reflecting an implicit misalignment about the
vision and purpose of these inquiry projects within the interdisciplinary scope of literacies
and science learning.

These inquiry projects involved more than the standard science fair, where students
made a poster at home and demonstrated an experiment in a large gym or auditorium to
their teacher. In the KIC project, students were provided ample time and guidance to
investigate a topic related to a science activity of interest to them and then wrote about it. Then, they were expected to present to a collection of their peers and teachers through both oral and visual media. Students then asked questions of the ideas and practices discussed in the presentation. Academic and scientific discourses were at play and supported for weeks within the school day. In order to execute this pedagogically – to address all students as authentically as possible – multiple teachers were required.

Furthermore, these teachers needed to be conversing regularly. Mandy and Kelli regularly referenced each other’s instruction in their lessons, addressing what research was done in Mrs. Bianchi’s room earlier that morning, or what was taught by Mrs. Short the day before during writing, as examples. On top of that, Michelle regularly pushed into Kelli’s classroom and worked with her students during reading block. These three teachers worked together closely to address the needs of their students during KIC. Simply put, the two district science teachers could not have been as deeply involved with the KIC projects because they were not present and active in instruction compared with Mandy, Kelli, and Michelle. Given that these district science teachers were substantially less involved in the planning and direct instructional contact with students regularly, their presence and actions also tacitly speak to another facet of neoliberalism in schools: the assessment-driven practice of audit culture, with outside “experts” coming into a space for top-down assessment purposes (i.e., the rubric) without being involved in the actual teaching-learning work alongside students (Stedman, 2011).

This is not to say that the science teachers’ involvement was, on one hand, purely authoritarian, or on the other, perfunctory and not useful. One of these science teachers
organized the student presentations into the four different presentation locations and helped create individual student programs and schedules based on their choices and preferences. However, it is evident by the actions of the other science teacher in comparison to Kelli and Mandy during final presentations that she had a different purpose of the project at least partially in mind. Alignment amongst teachers in regards to such interdisciplinary inquiry projects is important, as a shared vision about project objectives ought not to be assumed but instead negotiated and supported by all involved.

**Teachers Considering the Socioemotional: Supporting Emotions of Inquiry Learning**

There is a wide range of students’ feelings and emotions which can manifest during the course of an inquiry project, particularly one in which so much of the decision-making about their learning is in their hands, including those of frustration, excitement, fun, enjoyment, and surprise (refer to Table 2.2 in Chapter 2 for specific references). During the KIC projects, students’ emotions and orientations towards self-directed learning were not only cultivated but validated during the course of the inquiry projects. Though Kelli and Mandy both addressed students’ emotions at different points during the course of the KIC projects, this was especially salient in Michelle’s library space. She thought of her library as a dynamic space for purpose-setting, ownership of learning, and subsequent engagement in processes of inquiry.

In setting purposes and developing that sense of ownership towards their inquiry learning, students needed what Michelle called “opportunities for access.” Whether that entailed access to information, technology, engagement with others (peers, teachers, experts in the field), materials, quiet spaces to spread out and work, or louder spaces for
collaboration, this sort of access helped students feel “the best they can be” and “as literate as possible” in their learning. Through refining their capacities to think, question, develop purpose and feel ownership of their learning, students took on the identities and discourses related to inquiry learning (Zhai et al., 2014) and felt empowered.

For the teachers in this project, though Michelle in particular, the intuitive, felt experiences underpinning teaching and learning were a part of the pedagogy compared to prescribed definitions of what it means to be a library media specialist or a classroom teacher of literacy. When students were asked to think and act for themselves, making choices about their learning, a new kind of vulnerability surfaced. Michelle discussed this as potentially “threatening” for students to be asked to think for themselves when that it not typical practice. She explained that “there’s that threat of, ‘What if what I say is stupid? Or what if nobody likes what I have to say?’” Michelle further elaborated that students experienced less risk during more teacher-directed work, describing that “it’s so much easier when people tell us what to do and take that first step for us.”

However, Michelle contended that in her experiences that alongside vulnerability, there was also power in student-directed learning and the choices they must make along the way during their inquiry projects. This recursive relationship between the feelings of vulnerability and those of empowerment was one that Michelle described as essential to inquiry learning through practices like questioning and developing one’s own inquiry project. Furthermore, movement between such emotions was facilitated by students’ feelings of safety, acceptance, and support in their environment, that feeling of being
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capable of their own learning (Gray, 2006). Michelle theorized from her experiences facilitating student-driven inquiry that,

When you question, you empower somebody to learn. When you empower someone to question and you empower someone to learn, you empower someone to be insecure. So, to be insecure, you have to feel secure with the person you’re with.

Students in this study at times described feelings of frustration and “feeling stupid.” These feelings are not uncommon in inquiry learning (Dunlop et al., 2015). However, for teachers like Michelle, Mandy, and Kelli, student feelings were not written off. Instead, they were recognized as a valid and an integral part of the work of student-directed inquiry. This is in line with the idea that emotions neurologically (Immordino-Yang & Damasio, 2007) and experientially (Dewey, 1938b) underpin inquiry learning.

As school cultural norms continue to favor teacher-centered pedagogy, the discomfort involved with self-directed thinking, questioning, and making choices is not something students experience often. This requires explicit instruction in language to reframe and externalize such emotions, and as Michelle describes, “They have to learn that language. I feel frustrated. I feel stuck.” Once students cultivate the practices and feelings involved with self-directed thinking, there can develop purpose-driven confidence, excitement, and a sense of freedom that engrosses them in the inquiry projects. Teachers like Michelle modeled this curiosity, challenge, and excitement for her students. As she described, it is critical that in student-directed inquiry work, “pedagogy is not always academic.” It is instead also rooted into the social and emotional, integrating these deeply felt underpinnings of authentic learning into the practices of inquiry.
Implications and Future Research

The Literacy Activities, Practices, and Actions of Student-Directed Inquiry

This study provides an in-depth analysis of the activity systems and spaces in which teachers and students engage in a six-week, student-directed, interdisciplinary inquiry project involving practices intersecting with literacies, visual design, and science. This addresses the call for further research put forth by Woods-McConney, Woznitza, and Sturrock (2016), who stated that “There are too few examples of what inquiry teaching looks like in the classroom” (p. 857). This research not only provides examples of what student-directed inquiry teaching and learning looks like; it also emphasizes literacy and design practices rather than the more common stance foregrounding scientific principles and processes (e.g., Amaral, Garrison, & Klentsch, 2002; Dunlop, Compton, Clarke, McKelvey-Martin, 2015; Hampton & Rodriguez, 2001). In the decomposition of activity systems encompassing the KIC project from activities to practices to teaching and learning actions, this study uncovers the building blocks of an interdisciplinary inquiry project from the ground up.

Tensions revealed in actual practice through activity systems analysis.

Furthermore, this research uses a theoretical-analytical approach of cultural-historical activity theory and activity systems (Engeström, 2005, 2015; Foot, 2014; Greeno & Engeström, 2014; Jonassen & Rohrer-Murphy, 1999) in conjunction with pragmatic principles of educative experiences (Dewey, 1938). This theoretical-analytical approach served to surface tensions between a developing culture of inquiry within an elementary school historically steeped in larger institutional discourses of schooling and neoliberalism...
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(Apple, 2006; Stedman, 2011). Surfacing these tensions made visible the different forces which come to influence how purposes are formed, decisions are made, and difficulties are handled in regards to teaching and learning inquiry as they unfold over time in an actual public school classroom. It shows real-life practice, not isolated from the everyday challenges of school, but instead, revealing and analyzing what teachers and students with a developing orientation towards inquiry are already doing. Revealing such tensions through the use of activity systems also show the contradictory-laden nature of teaching and learning in school settings (Engeström, 2015). This study particularly exemplifies that when one tension is seemingly resolved (e.g., the iPads and online databases opening up the kinds of topics to be authentically chosen and studied by students), more tensions arise due to that very resolution (e.g., the text readability component of research becomes more difficult for teachers and students to manage).

In this case, teachers attempting to engage with and develop a culture of inquiry (in this case, via the KIC project) were also encountering tensions inherent to education, such as: decisions about teacher- and student-centered pedagogies; prescriptive and authentic orientations towards learning; and the question of how to engage students more deeply with content and practices they require as critical thinkers in society. Teachers spoke toward the importance of students developing a sense of ownership, wanting to bolster their engagement by leveraging the power of interest in a given science topic. A number of choices were offered in terms of science activity and science topic studied; research path and texts for research; visual presentation modality and subsequent design choices; as well as writing modality for their final article. These choices afforded resolutions about some
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questions of authenticity and student engagement through interest, but it brought about a whole new set of tensions.

**Pedagogically Supporting Student Choices in Inquiry**

Most saliently, if teachers are to offer student choices in their learning, these need to not only be honored but pedagogically supported. Where there is student choice, there also needs to be teacher reflection about how each of these choices are supported and nurtured pedagogically. Dewey (1938a) describes reflection as part of the teacher’s responsibility in designing learning environments that bring about educative experiences for her students which are not only authentic but also continuous. If students are going to be able to choose between doing an experiment, demonstration, or model for their science activity, and instructional time is dedicated to teaching students how to write about conducting an experiment, then there should also be instructional time and/or space of some kind dedicated to writing about demonstrations and models.

The necessity for pedagogical supports for the kinds of choices that can be made during inquiry projects is particularly important for students who may not otherwise have the declarative, conditional, and procedural knowledge about the choices at hand. For example, students already adept at using Power Point, Prezi, and Explain Everything as well as making posters and videos have the knowledge and practices to make an informed decision about what platform will work best to support their presentation. Students who do not yet have this knowledge or practice will not be able to make such choices in the same way experientially and might just default to whatever the teacher foregrounds in her instruction. In this case, most students did posters, and most students did experiments.
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These were foregrounded by teachers from the start. The students who did alternative presentations or demonstrations were students who knew from the get-go this was what they wanted to do, already having the background knowledge in place in regards to constructing those kinds of presentations and writing those sorts of articles. These are qualitatively not the same kind of choices as they are for the more knowledgeable student in design or science than it is for those students with less experience.

**Students with limited or modified choice in inquiry.** In terms of choice, there were other moments during the KIC project where some students were not in the position to make choices about their learning as freely when compared to others. Though I did not study students learning English as a new language (ENL students) specifically in this study, it was clear that these students did not have the same opportunity to make choices in terms of what they studied or visual presentation medium. While Kelli did explain that this was a carefully calculated choice because in a previous project, the ENL students were able to make these choices; however, Kelli did not feel as though she could support her students as well as she would have liked when they all had different topics. To Kelli’s credit, she also did offer choice to the students as a group about which experiment they wanted to do after giving multiple demonstrations of topics, which brings about a modicum of authenticity to the ENL students. However, Kelli’s admission that she could not support her students in the way that this sort of open inquiry required, even with the help of an ENL teacher and the ENL teacher’s aide, reveals more tensions, both about the nature of student-driven inquiry in schools and how ENL students are supported in school generally.
Striking a balance between freedom and frameworks. The pedagogical decisions enacted by teachers were supported by a concept that Kelli, Mandy, and Michelle called “freedom within the framework;” students were able to have freedom in their learning through their choices while also adhering to certain, vertically-oriented procedures and rules (i.e., rubrics, anchor charts, curricular and standards-driven expectations communicated via teachers through instruction). However, what became clear was that while there was “freedom in the framework” for students and their inquiries, teachers needed to work within the emerging framework of students’ choices of topic, research, writing, and design as much as students needed to work within the framework of the project guidelines. This seemed to be the most challenging balance to strike.

For teachers, it meant making constant contact with certain students and very little contact with others, making decisions about which students required more teacher guidance on a given day with very limited time resources. It meant deciding whether or not students needed yet another day for engaging in research on their topics, or changing instruction mid-lesson to address a common problem among students’ understanding about data displays. It meant equipping students with the strategies necessary for mediating difficult texts and what to do if they cannot rely on their teacher for help in a given moment of struggle. It meant helping students mediate and work with emotions that came as a part of thinking and learning for themselves on a daily basis. As explained by Kelli, the affordance of doing open inquiry with students is the lessened degree of pre-planning that happens before students actually do the research; the constraint is that once students begin researching and writing, instruction becomes so deeply individualized (and
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to different degrees, around upwards of 20 different science topics and activities) that instruction is necessarily fluid from student to student. It is as though the teacher’s movement around the classroom never stops. A framework of understanding begins to emerge for each student individually, and as such, the teachers must find ways to support and scaffold that framework on a daily basis toward the main objective: for students to be able to report knowledgeably about their learning to each other in academic and scientific discourses through the modes of written word, visual representations, and speech.

Ongoing Research Pertaining to this Data Set

This dissertation project has amassed a data set which can be approached from a number of angles and perspectives. The research questions here specifically address interactions, literacy practices, and the learning environment from the perspectives of cultural-historical activity theory and pragmatic perspectives toward educative experiences, informed by the multimodal, embodied, spatial, and material turns of literacy studies. However, during the course of data collection, analysis, and the writing of this study, there arose specific situations and themes which warrant further study through other theoretical stances and lenses.

Positioning theory. Positioning theory (Davies & Harré, 1990; Harré & van Langenhove, 1999) would be a useful tool through which to study the discourses and identities are produced and taken up during the course of these inquiry projects. Operationalizing positioning theory affords moment-by-moment analysis of interactions and practices between individuals, but it also situates these within institutionally, societally, and historically established subject positions as pertaining to rights, duties, and
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use of particular discourse (Davies and Harré, 1990, p. 46). How these rights, duties, and uses of discourses are taken up or resisted within the scope of student-directed inquiry projects could speak to how specific aspects of such projects promote agency (or not) for students.

As an example, I noticed a pattern about how boys of color were positioned, positioned themselves, and positioned each other during the course of the KIC projects across different learning spaces. This became particularly salient when observing a particular group of boys of color who tended to sit and work together when that choice was available to them. As the boys appeared to move as a group from Kelli or Mandy’s classroom into the more student-directed science lab or even to the library (which was generally less teacher-directed), I observed that particular students in this group tended to be positioned in certain ways. Students who teachers tended to work with in teacher-directed classroom spaces also tended to be positioned by their peers (also boys of color) as disruptive and disengaged. This makes me wonder about the assumptions made by teachers in teacher-directed spaces about these boys of color, and how this comes to bear on the ways these boys come to position themselves and each other across the KIC projects.

Operationalizing spatial and material perspectives. As a part of my analysis, I created hand-drawn maps of each classroom space, scanned them into my computer, digitized them so they were easy to label and manipulate, and then transcribed student’s narrating space videos onto these. While these helped me triangulate findings about the spaces students came to value during the course of the KIC projects, I found that it could be useful to aggregate this data and layer them onto one another. iMap Builder is map creation
software that enabled me to do this. Through the software, I could upload these digitized maps and then begin adding interactive components and content to these, even animating them. I could add the static data for each student on each of these maps, which taken together would reveal the “hot spots” within the school that students found themselves working within during the inquiry projects and for what purposes. Further, interview data can be used to support each of these, which could then reveal to the teachers how and where students are leveraging spatial and material resources during the inquiry projects that might not be immediately visible during the hustle and bustle of the projects. Given the proactive and reflective stances taken up by all three of these teachers in terms of how they would want to improve their space and materials in the future, these interactive maps could provide them information that could guide subsequent iterations of KIC and other inquiry projects.

**The relationship between space and students’ bodies during inquiry.** Another way to think about space during these studies would be to zoom in on particular students’ use of space over the course of the study juxtaposed with their literacy practices specifically. For example, Owen would be very interesting to study from this perspective, because he seemed to intentionally move himself across different spaces during the KIC project. He seemed to truly take ownership of his surroundings in classrooms, even going so far as to calling the corner desk of Mandy’s classroom “home.” Owen also frequently took advantage of the opportunity to work anywhere but a standard student desk or table. Additionally, he actively chose to work alone for the most part, which was in contrast to most other students participating in this study. This could theoretically be done with any
Conclusion

"The only freedom that is of enduring importance is freedom of intelligence, that is to say, freedom of observation and of judgment exercised in behalf of purposes that are intrinsically worthwhile." (Dewey, 1938a, p. 61)

Here, Dewey alludes to an all-important “freedom of intelligence,” rooted in authentic purpose and supported by educative experiences which build upon each other over time. It is true that the staying power of an educative experience is clearest when it is co-constructed from the “intrinsically worthwhile” curiosities of learners, the pedagogical expertise of teachers, and a built environment which supports students’ inquiries materially and spatially. However, beyond the interests of the students, guidance of the teachers, and a supportive learning environment, there are tensions that arise as such these sorts of educative experiences are made available to children in a culture of correct answers mired by a narrow view of what counts as learning and standardized testing in seeming perpetuity. A school culture which – if it is working as currently designed – aims to prepare students not to be curious, questioning, critical thinkers contributing to a democratic society, but instead to be individually-minded, competitive consumers as instruments serving the economy.

However, the tensions surfaced between teachers and students working together to build a culture of inquiry embedded in the institution of education as we know it are
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instructive. First, the KIC project itself as it currently stands is an example of a way to open a space for student-directed inquiry within the current framework of standards, curricular expectations, and grading. It helps bring the language, feelings, critical thinking, and practices of inquiry to students, empowered from the authentic place of their own curiosities. It also reportedly requires a great deal of adjustment in practice and orientations to learning on behalf of the teachers and the students. Given that this is the fourth iteration of the KIC projects, these adjustments have been taken place over a number of years.

Second, as these inquiry projects are refined over time, new problems take the place of older ones. New contradictions are surfaced as older ones become less important or even obsolete. An activity theory orientation helps to draw attention to these new issues in inquiry learning, such as making sure to support student choices if they are made available throughout student-directed inquiries, or addressing ongoing and ever-more complex issues of text readability as digital and mobile technologies open the world of texts and topics to students. The ability to identify and reflect on specific tensions in teaching as well as learning, particularly from a cultural-historical activity perspective, enables teachers to forge productive paths forward. Tensions can lead to the formulation of questions relating to purpose, objective, and pedagogical support, which could subsequently lead to changes made in the effort to provide increasing support to students in their learning endeavors.

A learning experience ideally is one which builds upon a student's life experience, taking what they are already curious about providing subsequent experiences which cultivate that initial spark into a burning desire to know even more. This was demonstrated
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in numerous ways throughout the fifth-grade Kids Inquiry Conference conducted at Legacy Elementary. The KIC project provided numerous opportunities for students to authentically bring their lives and interests into the classroom. Their presentations were spaces for their voices to be heard and experiences validated while also enabling them to try on academic and scientific discourses as well as their associated practices. I will close with the words of Ameena, who encapsulated the authenticity and student-driven purposefulness of these inquiry projects in her own words:

   We can teach ourselves. We can do whatever we want on our posters and search up any questions we would like, and we don't have to do the same thing . . . So, that's why I like these projects, 'cause you can pick your own topic and you can have fun doing it.


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Appendix A

ADMINISTRATOR INTERVIEW Question Set

1. What is the purpose of a child’s education?

2. How would you define the term “inquiry?”
   a. What are some practices (i.e., things you do inherent to engaging in inquiry) that you associate with inquiry and inquiry learning?

3. How would you define the term “literacy?”
   a. Some in the literacy studies field have made literacy plural (i.e., literacies). What do you think of this?

4. Where do you see inquiry and literacy/literacies intersecting in your school, if at all?

5. What do you believe teachers would require in order to engage their students successfully in inquiry projects?
   a. In terms of space?
   b. In terms of materials?
   c. In terms of time?
   d. In terms of professional opportunities for growth?

6. What might a classroom with students engaging in inquiry projects look like? Sound like?
   a. Prompt if necessary: Feel free to use examples from your experience.
   b. How is this different from what might be considered to be the “traditional classroom?”

7. If you had an unlimited budget, how would you structure your space, materials, and other opportunities to further support your teachers’ instruction for their students in inquiry learning?
   a. If it helps your thinking, feel free to draw a picture of what this space would look like.
8. What are/might be some struggles, if any, to encouraging inquiry teaching and learning in your school?
   a. How do you mediate these struggles, if at all?

9. What do you think are benefits for students who learn inquiry models of thinking and learning?

10. What kinds of pedagogical models do you think would best support inquiry teaching and learning?

11. In the future, what do you see happening in your school in terms of inquiry teaching, inquiry learning and/or student inquiry projects?

**NOTE:** Questions listed here are semi-structured; this means they could change over time as participants’ responses to initial interview questions should inform subsequent questions (Seidman, 2013)
Appendix B
TEACHER INTERVIEW Questions Sets

INTERVIEW 1 Question Set: Life History
(through the lens of inquiry-based learning)
1. Tell me about your educational background and the story of how you came to be a teacher. What was school and learning like for you?

2. Describe the kinds of teaching and learning that you felt were valued as you were going through school.

3. Recall the time you first exposed to any sort of inquiry learning or thinking processes. Describe that time. How did it compare to other kinds of learning that you’d experienced?

4. Describe a situation that occurred outside of school in which you remember feeling as though you learned a great deal of knowledge.
   a. What qualities would you ascribe that learning situation?

5. When did you first start engaging in inquiry teaching in your teaching career? What initiated this inquiry teaching?
   a. How has this progressed since that time?

6. Where is inquiry useful outside of scholarly settings? (i.e., not school, college)

7. In your experience, where do you see inquiry learning and literacy intersecting?

INTERVIEW 2 Question Set: Details of Experience in Teaching Inquiry
8. How would you define the term “literacy?”
   a. Some in the literacy studies field have made literacy plural (i.e., literacies). What do you think of this?

9. What role do you play in your students’ literacy/literacies development?

10. How would you define the term “inquiry?”
   a. What are some practices (i.e., things you do inherent to engaging in inquiry) that you associate with inquiry?

11. From a pedagogical standpoint, detail how you would prepare to teach a unit on inquiry with your students.
12. Describe what a student inquiry project could look like in your classroom from start to finish.

13. What is important for your students to understand when engaging in inquiry projects?

14. What materials and resources are important to your students’ engagement in inquiry learning?

15. What spaces are available to students as they engage in their inquiry learning and projects?
   a. How do you see students using these spaces?

16. In your view, how does inquiry learning benefit your students?

17. How important is it, if at all, for students to have choice in inquiry learning?
   a. What are some choices that your students can make regarding their inquiry projects, if any?

18. What does a classroom with students engaging in inquiry projects look like? Sound like?
   a. Prompt if necessary: Feel free to use examples from your experience.
   b. How is this different from what might be considered to be the “traditional classroom?”

19. What school supports are in place in order for you to support your students inquiry learning and projects?

INTERVIEW 3 Question Set: Reflection on the Meaning
1. Describe what you think is meant by “inquiry skills.”
   a. What other capacities do you think students need in order to be successful in their inquiry?

2. If you had an unlimited budget, how would you structure your space to further support your students’ inquiry learning?
   a. If it helps your thinking, feel free to draw a picture of what this space would look like.
3. Follow-up: Also with an unlimited budget, what materials and resources would you procure to further support your students’ inquiry learning and projects?

4. How do technologies support your student’s inquiry learning, if at all?

5. Provide a detailed example of what you would deem to be a student highly engaged in their inquiry project, drawing from your recent experience, if possible.

6. What are some struggles, if any, of teaching inquiry to fifth-grade students?
   a. How do you mediate these struggles, if at all?

7. How comfortable are you teaching inquiry to your students?
   a. Describe if and how this has changed over time.

8. How often do you teach inquiry to your students?
   a. What other kinds of pedagogical models do you use in your instructional practice? (prompt with examples if necessary, e.g., whole-group teacher led instruction)

9. Describe how you feel you are situated in terms of inquiry teaching and student inquiry projects in relation to the following communities (i.e., what is your role and how do you feel you are perceived?):
   a. grade level
   b. building level
   c. district level

10. In the future, what do you see happening in your classroom in terms of inquiry learning and student inquiry projects?

**NOTE:** Questions listed here are semi-structured; this means they could change over time as participants’ responses to initial interview questions should inform subsequent interviews and their questions (Seidman, 2013)
Appendix C

Teacher Educational Background and Demographic Form

Your background in teaching and demographic information will provide a richer to this study of inquiry teaching and learning. The answers provided on this form. All names of people and institutions will be changed to pseudonyms during the writing of the study to protect your identity. Please note that you may elect not to answer a question at any time during this form.

Name:
What is your race/ethnicity?:
What is your gender?:

Current Teaching Experience
How many years total teaching experience do you have?:
What grade level/subject do you currently teach?:
How many years have you been teaching in this current position?:

Previous and Other Teaching Experience
List other grade levels/subject areas that you have been responsible for teaching. This includes the K-12 school context as well as other educational spaces (i.e., collegiate level, professional development):

What other areas do you currently work (or have worked) in a teaching or advisory capacity? This can include coaching, religious education, recreation departments, project or lab management, mentoring, tutoring, etc.:

Educational Background and Certifications
What was your undergraduate institution?:
What was your undergraduate major(s) and minor/concentration?:
What year did you graduate from undergrad?:
What was your graduate institution (if applicable)?:
What was your graduate major(s) and minor/concentration?:
What year did you graduate from graduate school?:
What are your NYS teaching certifications?:

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Appendix D

Procedures and Topics for Student Interviews

Procedures for Student Interviewing:

*Note: This procedure applies only to students providing assent and parental consent.*

1) During a time when students are not engaged in direct instruction from their teacher, I will ask a student to sit down for a brief interview.

2) The student can choose the space in the room where we will do the interview.

3) I will remind the student that I will be recording this interview and turn on the recorder. I will state the name, date, and time of the student interview into the recorder and set it down between us. I will begin notetaking.

4) I will ask the students questions around the topic areas below as it pertains to their inquiry projects. Note that these questions may be different from student to student based on the events of the classroom that day and their project, which cannot be predicted before the study.

5) At the end of the interview, I will turn off the recorder.

6) That evening, I will offload the audio data and scan the notes into the computer and place on the hard drive. Written notes will be de-identified.

Topics and sample questions for student interview questions:

*Note: Not every question here will be asked; these are sample questions which can be adapted based on the students’ individual projects and experiences up to this point.*

1) General questions about student inquiry projects

   a. Tell me about your inquiry project. What are you learning about?

   b. What made you interested in this topic?

   c. How have your ideas about this topic changed since you first started this project?

   d. What are the requirements of the inquiry project assignment?

   e. Describe what you do in an inquiry project, from start to finish?

   f. What is your favorite part about the inquiry projects?

   g. What is your least favorite part about the inquiry projects?

   h. What are some feelings that you have had during the inquiry projects? You can name and describe more than one.

   i. Have you done other inquiry projects in the past? What were they like?
j. Why, if at all, do you think inquiry learning/inquiry projects are important for students to do?

2) Teacher questions
   a. How do your teachers help you with your inquiry projects?
   b. What do your teachers teach about for you inquiry projects?
   c. What do you think is the most important thing your teacher has taught you/helped you with so far?
   d. Describe what you think a teacher's job should be during inquiry projects.

3) Working with others
   a. Tell me about times you might work with your classmates on inquiry projects.
   b. What do you think about working with others during inquiry projects?
   c. What have you learned from your classmates during this inquiry project, if anything?

4) Inquiry learning spaces and materials
   a. Describe the space where you do your inquiry projects.
   b. What do you think is important to have in a place where you are doing inquiry projects? What materials are helpful and/or necessary for inquiry learning?

5) Other kinds of school learning
   a. How do the inquiry projects compare with other things you do during the school day?
   b. How is inquiry learning similar to the other kinds of learning you do in other subject areas?
   c. How is inquiry learning different than the other kinds of learning you do in other subject areas?
   d. Are there things that you can do during your inquiry projects that you can’t do during other times in school? If so, what are these things and describe them.
   e. Are there things you wish you could do during inquiry learning that you are not allowed to do right now? If so, what are these things and describe them.
6) Outside of school inquiry
   a. List five things that you are very interested in learning more about right now; you don’t have to be limited to school subjects.
   b. What does doing research or inquiry look like when you are at home/outside of school?
   c. What do you think about other people engaging in inquiry outside of school? What do you think that looks like?
   d. What careers or jobs do you think use inquiry learning?
Appendix E

Legacy Elementary Map with Labels
TENSIONS IN LITERACY ACTIVITIES, PRACTICES, ACTIONS

Appendix F

Excerpts of Analytic Memos and Elaborated Field Notes

Screenshot of analytic memos (all were typed):

- Fatima’s NARRATING SPACE video: "And in the science lab, that’s where I helped [friend’s name] a lot, and she got a lot of work done in there ... It was very quiet, so we were able to get a lot of work done, and all our materials were right in here, so we didn’t have to get out."

- Aiden’s NARRATING SPACE video: "The second place I worked was... The SCIENCE LAB. The SCIENCE LAB is down the hall... by the FIFTH-GRADE CLASSROOMS... Right over there, in the FIFTH-GRADE CLUSTER. I worked at a table. I worked at a table next to another person while writing on my poster and typing things out on my iPad."

- Owen’s NARRATING SPACE video: "[The] SCIENCE LAB... is where... This is the SCIENCE LAB... This is where I did all the | my presentation. It was mostly like right here..." (gestures a circle with his outstretched finger directly in front of the WHITEBOARD) Like around here. This is where I did it."

- Emma’s NARRATIVE SPACE video: "So this is where...I showed my presentation At the SCIENCE LAB in the FRONT.

- FATIMA INTERVIEWS: Access to space and materials are important to Fatima during collaborating. The ability to spread out, not have interruptions (“wasn’t that loud” even with some people in there), less distractions, less people, and have basically unfettered access to materials is attractive. Love how she frames with that transition:

  o “But here’s the thing: like, when we were working in the lab, when science wasn’t in session, it was really much easier because you had all the materials in there, so we really didn’t need to do anything. The only thing we didn’t have there was a printer, which really| um, which really is okay because we got the printer over there (points into Kelli’s classroom). Very simple. I really like it.”
This one is designed differently than expected, and this piques multiple students' interests. It is sort of proving Michelle's point about things being designed in interesting ways as capturing the readers' eye.

James “wow”

Ss “Tall and skinny”

Dimitri “Is that from this school?”

Michelle “No this is from MM, all four schools do it”

The KIC conference happens across all four elementary schools in the district. It would be interesting to interview other teachers and see how they do it in comparison to this school.

Michelle “This one says the bread mold test – here’s the question: how does mold happen and how does it affect us? What are the different types of mold? Hypothesis, results, different types of mold, different

KEY:
Typed text: identifying speakers, direct observations
Bold, italics text: researcher inferences, usually provided during field note elaboration after the observation
“Ss”: Students answering chorally
Appendix G

Screenshot of Studiocode Coding Window (from 2018.04.28 in the Science Lab)

**KEY:**
Purple code lines: Spatial Use (multiple needed for overlapping spatial use)
Dark green code line: Student(s) Talk
Light green code line: Teacher Talk
Appendix H

Initial Codes

These codes are representative of initial coding using Spradley's (1980) domain and taxonomic analysis. The taxonomies are the **bold headers** and the domains are beneath each.

**Inquiry**
- inquiry and evaluation
- inquiry and planning instruction
- inquiry as empowering
- inquiry as engaging
- inquiry as familiar
- inquiry as felt
- inquiry as flexible
- inquiry as generative
- inquiry as habitual habits
- inquiry as hands-on
- inquiry as interaction with others
- inquiry as interpersonal
- inquiry as longitudinal
- inquiry as ownership of learning
- inquiry as pedagogy
- inquiry as powerful
- inquiry as questioning
- inquiry as self-selected
- inquiry as skill-building
- inquiry as student-directed
- inquiry as ubiquitous
- inquiry as vulnerable
- inquiry defined
- inquiry practices

**Learning**
- learning and emotions
- learning and engagement
- learning and familial connections
- learning and flexibility
- learning and groupings
- learning and learning experience
- learning and learning spaces
- learning and learning standards
- learning and literacy
- learning and making mistakes
- learning and multimodality
- learning and objectives
- learning and opportunities to learn
- learning and power
- learning and structure
- learning and technologies

**Kids**
- kids as risk-takers
- kids as scared
- kids as self-directed

**School**
- school and emotions
- school and school culture
- school and students' cultures
- school and struggle
- school and success
- school and traditional education
- school as a space

**Space**
- space and access to materials
- space and authenticity
- space and ambient factors
- space and bodies
- space and choice
- space and control
- space and inquiry pedagogy
- space and furniture
- space and messiness
- space and movement
- space and students working
- space and teacher PD
- space and technologies
- space and "traditional classroom"
- space as shared ownership
- space as kid-directed
- space as limited (or not)
- space as resource
- space as teacher-directed

**Teaching**
- teaching and assessments (teach to the test)
- teachers and accommodations
- teaching and becoming a teaching teaching and doing inquiry
- teaching and district support
- teaching and emotions
- teaching and flexibility
- teaching and identity
- teaching and interpersonal/relationships
- teaching and role
- teaching and literacy
- teaching and multimodality
- teaching and objectives
- teaching and opportunities to learn

**Technologies**
- NOT using tech/removing tech
- tech and access
- tech and assessment
- tech and creating balance
- tech and monitoring
- tech and reading ability
- tech and stalling out students and or research
- tech and strategies for use
- tech and teacher as tech leaders
- tech and tech support
- tech and trusting students
- tech and trustworthiness
- tech as 1-to-1
- tech as accommodation
- tech as authentic use
- tech as creating deficits
- tech as distraction
- tech as enacting purpose
- tech as expensive
- tech as frustrating
- tech as fun
- tech as leveraged by kids
- tech as NECESSARY for inquiry
- tech as needing improvement
- tech as needing organization
- tech as needing training
- tech as part of space
- tech as providing curricula pedagogy
- tech as space to try on new
- tech as time saver
- tech as time-consuming
- tech as underestimated
- tech enabling changing practice
- tech enabling creating learning environments
- tech enabling choice
- tech enabling creativity
- tech enabling idea exploration
- tech enabling inquiry
- tech enabling new teaching and learning
- tech enabling problem solving


**Technologies continued...**

- tech enabling research
- tech enabling sharing
- tech leads to failure
- tech leads to ownership of learning
- tech leads to limitations
- tech leads to multimodal
- tech leads to onus on teacher

**Time**

- length of time - careerspan
- length of time - dayspan
- length of time - inquiry
- projectspan
- length of time - lifespan

- length of time - literacy
- developmentspan
- length of time - minutespan
- length of time - momentspan
- length of time - schoolspan
- length of time - school-yearsspan
- length of time - weekspan
- time and boredom
- time and energy
- time and engagement
- time and flexibility
- time and identifying learning time
- time and immediacy
- time and materials/technologies
- time and pedagogical decisions
- time and repetition

- time and schedules
- time and simulteneity
- time and student focus
- time and teacher focus
- time as balanced
- time as felt
- time as limited
- time as providing direction
- time as related to space
- time as rigid
- time as stressful
- time orientation - future
- projecting
- time orientation - past reflecting
- time orientation - present doing
Fifth graders are approaching the end of their elementary career and this unit presents the perfect opportunity for them to take on a self-directed interdisciplinary unit of study. This unit is designed to integrate learning across reading, writing, listening, speaking and science so students are making connections and focusing on applying all they learned to their big idea: a question of inquiry. Students will embark on a journey through a learning process that will push them to ask and answer a testable scientific inquiry, plan and conduct an experiment, gather and interpret data and communicate their findings to a larger audience. Students will be working through the reading and writing processes in tandem with science, thus blurring the lines of each discipline. The culminating KIC conference will showcase weeks of effort, trial and error, synthesis of study, and questions for future scientists in an engaging presentation. Students will also go public with their scientific findings by penning a scientific article that will be published in a scientific journal to showcase the accumulated learning of the group. While this unit may seem daunting, students' motivation will come from their self-selection of topics, and will be fueled by the shared scientific language and trials and tribulations as students work through unintended results. This unit is intended to show the never-ending cyclical process that scientists embark on and provide a venue for students to celebrate setbacks along the way. After all, failure is simply the discovery of what did not work; they eventually lead to success and questions for further learning.

Indicators of Understanding

<table>
<thead>
<tr>
<th>Standards Addressed</th>
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<tbody>
<tr>
<td>RI.5.4 Determine the meaning of general academic and domain specific words and phrases in a text relevant to a grade 5 topic or subject area.</td>
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<tr>
<td>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</td>
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<tr>
<td>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (aligns with SEP 8)</td>
</tr>
<tr>
<td>RI.5.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4-5 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td>W.5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</td>
</tr>
<tr>
<td>* Refer to sub-standards a-e.</td>
</tr>
<tr>
<td>W.5.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grade 5 on page 28.)</td>
</tr>
<tr>
<td>W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (aligns with SEP 8)</td>
</tr>
<tr>
<td>* Apply grade 5 Reading standards to informational texts (e.g., &quot;Explain how an author uses reasons and evidence to support particular points in a text, identifying...</td>
</tr>
<tr>
<td>W.5.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline specific tasks, purposes, and audiences.</td>
</tr>
<tr>
<td>SEP 1 Asking questions and defining problems</td>
</tr>
<tr>
<td>Asking questions and defining problems in 3-5 builds upon K-2 experiences and progresses to specifying qualitative relationships.</td>
</tr>
<tr>
<td>* Ask questions about what would happen if a variable is changed.</td>
</tr>
<tr>
<td>* Identify scientific (testable) and non-scientific (non-testable) questions.</td>
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</tbody>
</table>
Let’s Plan Our Experiment Using A Scientific Method!

Testable question: What are we trying to find out?

Based on my knowledge of science, I can predict what might happen in the experiment.

If you can change the strength of an electromagnet, it will overpower the magnet.

Independent Variable: the one that is changed by the scientist. Good experiments have ONE.

The type of magnet I’m using.

Controlled Variables: All the things we are keeping the same:

The amount of magnetic things in the cube.

Dependent Variable: the thing we watch to see how it is affected by the Independent variable.

How fast the magnets collect the materials.
During the experiment you will make observations and collect data.

- Plan how you will organize your data. What types of things will you be watching?
- Will you use: a table, a chart, a graph, bulleted notes, photographs, drawings?

Set up and begin your experiment, collect and record observations as your experiment progresses. Analyze your data as you collect it. What are you noticing? What does it tell you along the way?

The magnet attracted the paperclips faster than I thought. The electromagnet is weaker than expected.

I learned that...

When your experiment is done:
- Analyze all of your data.
- What does it tell you?
- Does your data support your hypothesis or refute it?
- What did you learn from your experiment?

I learned that you should never underestimate the power of a magnet. My hypothesis was wrong.

and that is also very interesting.

Share your results with others.