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Exploring the Role of Off-Task Activity on Students' Collaborative Dynamics

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Off-task activity is ubiquitous in classrooms, yet little understood. Building on recent work that illustrates the utility of off-task activity to disrupt relations of power among students, this article explores the potential functions of off-task participation during collaborative mathematics problem-solving. We examined 56 instances of off-task participation across 12 collaborative problem-solving sessions in a fourth grade classroom during a collaborative inquiry unit on place value. Results show that the majority of instances functioned to support the collaborative problem-solving process. Further, off-task participation often succeeded in shifting collaborative dynamics after on-task bids to shift dynamics failed. Off-task activity seemed to introduce new storylines that served as discursive tools to navigate local social hierarchies. We close by situating an understanding of the resources that students bring into collaborative learning through off-task activity within conversations on inclusive pedagogies.

Educational Impact and Implications Statement

This study found that off-task activity can often help students manage collaborative dynamics during mathematics small-group work. Off-task activity helped students warm up to collaboration, gain the attention of others, recruit others into participation, gain access to collaboration, extend the task, and resist concentrated authority. Moment-to-moment analysis of four vignettes from the study show that the storylines introduced by off-task activity offered students new ways of being and relating that helped shift dynamics. These results suggest that off-task activity offers resources for students to manage their participation and may be an important characteristic of inclusive, student-centered, collaborative classrooms.

Keywords: collaborative learning, mathematics, elementary school, off-task participation

Collaborative learning tasks engage students in agentic social activity. Students make various choices together—about what to work on and who participates in what ways. At times, students choose to go off-task, using task materials in imaginative play, sharing stories, or singing songs. While going off-task may seem counterproductive, studies have found that off-task behavior may be beneficial to collaboration by extending the task in new directions (Dyson, 1987), alleviating boredom (Baker, D'Mello, Rodrigo, & Graesser, 2010), supporting emotional regulation (Sabourin, Rowe, Mott, & Lester, 2011), and negotiating status (Sullivan & Wilson, 2015) or disrupting dominance (Esmonde & Langer-Osuna, 2013) within the group.

The possibility that off-task activity can support collaborative efforts is worth exploring. Consider, for instance, findings that off-task activity can serve to disrupt dominance or negotiate status within small groups (e.g., Esmonde & Langer-Osuna, 2013; Sullivan & Wilson, 2015). Collaborative learning activity can often fall prey to issues of status and marginalization, wherein particular students dominate the work, while the contributions of others, even those that could be useful to the task, are ignored or consistently rejected (Cohen & Lotan, 1997; Kotsopoulos, 2014; Langer-Osuna, 2016). These dynamics constrain possibilities for joint thinking (Clark & Brennan, 1991) and the development of shared

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meaning (Langer-Osuna & Avalos, 2015), key components in collaborative learning (Akkerman et al., 2007; Beers, Boshuizen, Kirschner, & Gijselaers, 2006). Dynamics marked by marginalization also create inequitable learning opportunities (Wood, 2013). That off-task activity might, at times, serve to disrupt problematic participation dynamics and negotiate more inclusive ones points to the possibility that going off-task may, at times, a useful thing for students to do.

Indeed, research on group work has long documented that the main impediments to collaborative learning are related to student participation dynamics (Barron, 2003; Kumpulainen & Kaartinen, 2004). For example, Barron (2003) found that peers often did not attend to group members' contributions, even when those contributions could have been helpful. Instead, students tended to advocate for and repeat their own ideas, ignoring or rejecting others' ideas without justification, and to interrupt and talk over their peers. Group dynamics often have too much conflict or too little (Bearison, Magzamen, & Filardo, 1986). Students in small groups either argued without resolution or, conversely, suppressed disagreement such that incorrect ideas were not challenged.

Extant work on off-task talk during collaborative learning activities suggests that these forms of participation may well support coordination among students, especially resisting marginalization and sharing participation. Esmonde and Langer-Osuna (2013) found that students used off-task conversations about romance and friendship to resist a peer with high academic status who had been dominating the group's mathematical discussions. Off-task conversations functioned to silence the dominating peer, who his groupmates then recruited back into on-task activity on more shared terms. Sullivan and Wilson (2015) similarly found that students used playful talk to negotiate status during collaboration through their use of imaginative storylines. They draw on Vygotsky (1978) who

> argued that play arises in young children as a response to desires that cannot be immediately gratified. To cope, children invent imaginary situations . . . in an effort to fulfill their unrealizable wishes. This behavior is what Vygotsky considered the foundation of play. (Sullivan & Wilson, 2015, pp. 7–8)

In playful talk, students use imaginary situations unavailable in the official collaborative learning activity to position themselves or others as either more or less capable. For instance, a student with low status engaged in playful talk to position herself with competence, while a high status student engaged in playful talk to position others as less competent and, in doing so, maintain his status (Sullivan & Wilson, 2015).

Both studies framed off-task or playful activity in terms of imagined storylines that students used to disrupt or alter existing positional relations. For example, in Esmonde and Langer-Osuna (2013), the dominating student, Riley, positioned himself with mathematical authority—as someone who had the right to intellectually lead his group mates. This positional identity drew from reform-oriented discourses about school mathematics that expect students to make sense of and lead the mathematical work with one another. His peers interpreted Riley's leadership from a more traditional discourse about school mathematics that expects only the teacher to hold such authority, positioning Riley as inappropriate and disrespectful. They then brought in new social discourses—specifically about interracial dating and romance—wherein Riley's group mates, Dawn and Shayenne, were positioned as central and which served to marginalize Riley. These new dynamics allowed Dawn in particular to regulate when and how Riley was able to take the conversational floor, shifting his role from mathematical leader to a mathematical resource, and enabling Dawn and Shayenne to contribute to the mathematical discussion in more even terms. The varied storylines at play through the mathematical and social discourses that organized both on- and off-task talk among these students offered a range of positions that they drew on to negotiate social hierarchies within their small group.

As in those studies, in this article we frame both on-task and off-task activity in relation to available discourses. Theoretically, we frame on-task activity in relation to mathematics classroom discourse and off-task activity in relation to other social discourses. We focus on off-task activity, attending in particular to how students become positioned through talk and actions in relation to these discourses and its consequences to the collaborative dynamics. A growing body of research has focused on how students position themselves and one another within small group mathematics activity. These studies have illuminated the importance of positioning in mediating possibilities for participation and orienting students toward or away from particular learning opportunities (Anderson, 2009; Wood, 2013). For example, Wood (2013) traces how being positioned with mathematical authority within a small group, such as being positioned as a "mathematical explainer" oriented a student toward very different, and more robust, learning opportunities than her peer who was positioned as a "menial worker." These positional identities become available through discourse and draw on the particular storylines at play in conversation.

This body of work has typically focused on the consequences of particular kinds of positioning on individual students; less attention has been given to its effects on the collaborative dynamics. Rather, studies on strategies to support collaborative dynamics have typically focused on the teacher. In a review of research on the role of the teacher in promoting effective small group learning, Webb (2009) found that teachers prepare students for collaboration by providing instruction in how to take turns, explain, actively listen, ask for or offer help, and other kinds of communicative discursive acts. Teachers also choose and structure tasks that promote collaboration, as well as influence student interactions through both small group interventions and whole class discourse. For example, teachers choose tasks that utilize multiple kinds of competencies and student roles, and then additionally intervene on small-group status issues by intentionally positioning a low-status students' work as worthy of taking into consideration by the group (Cohen & Lotan, 1997; Staples, 2008).

The focal teacher in this study prepared her students for collaborative work, chose tasks that facilitated collaboration, and regularly attended to issues of status. In this sense, the classroom study context was designed to promote successful collaboration among students. The teacher also supported student agency in a number of ways, which we describe further below in the next section. The teacher's emphasis on both student agency and collaboration made this classroom particularly suited for a study on how students use off-task activity to negotiate collaborative dynamics.

With these ideas in mind, this article explores the following research questions:

- How does off-task activity affect students' collaborative dynamics?
- When does off-task activity occur during collaborative mathematics problem-solving and to what end?
- How does off-task activity function in relation to contiguous on-task activity?
- What storylines are at play in off-task activity and how do these storylines affect the collaborative dynamics, especially during subsequent on-task activity?

Study Context

This study is part of a larger research-practice partnership with teachers at an elementary school in Northern California, which, in the year of data collection, served a predominantly Latinx (67.9%) and Pacific Islander (17.2%) population. English-language learners made up 58.4% of the student population, and 91.0% received free or reduced-price lunch. The larger partnership included teachers in Grades K–4 and focused on supporting teachers' capacity to implement collaborative mathematics activity. Teachers used Fosnot's (2007) Contexts for Learning Mathematics (CLM) as focal curricular units. CLM units are story-based mathematics inquiry units organized around core mathematical ideas, such as place value. Collaborative small-group mathematical activity is a key component to the daily structure of the focal unit lessons.

This study focuses on data from the fourth grade classroom, in which the teacher used the CLM unit called "The T-Shirt Factory." The T-Shirt Factory tells the story of a boy who accidentally pours paint over plain t-shirts and his grandmother offers to open a t-shirt factory with him to sell the colorful shirts. The boy must decide on how to organize the t-shirts to fill orders; he ultimately decides to organize the shirts in bundles of tens and loose ones. Mathematically, tasks were organized around open-ended conceptual problems that required students to compose, decompose, and combine numbers as units of tens and ones. Students had a number of manipulatives available each day, including plastic hangers and rubber bands, linking cubes, and base 10 blocks.

The teacher framed collaboration as "productive partnerships" wherein students were expected to reflect on and make choices about whom to work with, where to work, and which manipulatives or strategies to use in order to make progress on mathematical tasks. During the 3-week period of data collection, the class reflected on the productivity of their partnerships regularly, identified useful language for collaboration (i.e., responding to one another's ideas, revoicing), and discussed the physical postures that created shared space for working together (i.e., eye contact, sitting facing or side-by-side). Thus, students developed repertoires for managing collaborative dynamics, but were largely able to decide when and how to go about deploying them.

The data for this study was captured during September, beginning in the third week of school and was the first CLM unit the class worked on. The unit included about half an hour of student-led small-group collaborative work on most but not all days of instruction (collaborative sessions ranged from 16 and 38 min). The research team collected video of the entire classroom, as well as two additional cameras focused tight on representative small groups. This study draws on the 12 videos of small-group collaborative work that were collected, representing eight instructional days. Three additional small group videos were removed from the data set due to problems with audio. For each group, we used a video camera mounted onto a tripod raised over the group and pointed in a downward angle in order to capture all students at the table and their collaborative work artifacts. We used a table microphone connected to the camera to capture small group talk. The two tables videotaped were selected because their location in the room best allowed for video camera mounting and capture while minimizing distraction or disruption due to the cameras' presence.

Because students in this classroom were afforded the agency to choose whom to work with, where, and in what ways, videotaped collaborative sessions at times included groups of two, three, or four students. Across our corpus, three sessions were dyads, six sessions were trios, and three sessions were groups of four. Further, though the camera was always mounted over the same two representative tables, students varied in where they chose to work. Some students tended to return to the same table each day, while others moved from day-to-day. In terms of our data, this means that some students appear in videotaped sessions across multiple days, while others appear in only one. Across our corpus, there were a total of 16 unique students captured across all videos. Of these, nine students appeared in more than one video, ranging from appearing in two to six total videos. Appendix B offers greater detail. We discuss the analytic limitations due to these variations in the Discussion section toward the end of the article.

Analytic Approach

In order to determine the functions of off-task interactions during collaborative problem-solving, our analysis proceeded through several iterative phases. First, we uploaded the 12 videos of small group collaboration to video analysis software. We then identified all instances where off-task participation was present ($n = 56$ instances, mean duration of 59.9 s, ranging from 6.7 s to 6 min, 1.4 s, $SD = 76.0$ s). We defined off-task participation as any interaction, verbal or nonverbal, where there was evidence of off-task talk or actions between two or more students. This included off-task activity that coexisted at times with on-task activity. For example, students could be building 10 sticks with linking cubes while discussing a video game. Because they were also discussing video games, we included these instances in our data corpus. Empirically, the goal was to capture any instance of activity that was not exclusively on-task participation in order to explore its functions.

Instances were temporally bound by the start and end of off-task activity, which defined the unit of the analysis. By definition, each off-task instance began when there was evidence of off-task activity that was not previously present and ended when students ceased participating in the off-task activity. Students ceased this activity either by getting back on-task or because the classroom group work activity ended while they were off-task. Even when off-task and on-task activity were copresent, instances were still bound by the start and ending of off-task activity; that is, these instances ended when students either moved into exclusively on-task activity or the collaborative session ended. In the majority of instances, off-task activity was both preceded and followed by on-task activity. Across the data corpus, only five instances (8.9%) of off-task activity occurred at the end of the collaborative session and thus were not followed by subsequent on-task activity. These five instances represent the last interactions of five out of the 12

total collaborative sessions; that is, for seven out of the 12 sessions, class time ended while students were on-task. The other 51 instances (91.1%) of off-task activity occurred at other times in the collaborative sessions and were, by definition, followed by on-task activity. Similarly, across the data corpus, only seven instances (12.5%) of off-task activity occurred at the very start of the collaborative session and thus was not preceded by on-task activity. The other 49 instances (87.5%) of off-task activity occurred at other times and were, by definition, preceded by on-task activity. Taken together, 44 out of 56 instances (78.6%) were bound (that is, both preceded and followed by) on-task activity.

Analyzing the Functions of Off-Task Interactions

In order to code the 56 instances of off-task activity, we created analytic memos describing the content of words or actions, including students' eye gaze and bodily positions in relation to one another and physical access to the artifacts of the collaborative work (e.g., manipulatives, worksheet) before, during, and after each off-task interaction. We drew our attention to shifts in access to the conversational floor and interactional space, as well as relations of authority. We coded the function of each off-task interaction in relation to evidenced shifts in the collaborative dynamics across contiguous on-task activity (that is, on-task activity that occurred just before and just after off-task activity). Codes for off-task functions were discussed and refined across the four authors for all instances until consensus was established. In eight cases an instance was coded with more than one function.

Analyzing Off-Task Interactions Within Problem-Solving Session Contexts

We then examined the coded data in relation to each of the 12 collaborative sessions, noting when off-task instances occurred and how they functioned relative to the day's lesson and other contextual features. To do so, we developed analytic summaries of the off-task functions as they were enacted within an entire problem-solving session, noting the day's task, instructions, and participation structures, as well as how the functions of off-task participation were organized temporally, from the start to end of the problem-solving session.

Analyzing Off-Task Interactions in Relation to Contiguous On-Task Interactions

In order to dig more deeply on what was happening just-prior to the start of off-task activity, we returned to the analytic memos focused on the students' words and actions during each off-task instance and added notes on what was taking place for one minute of interaction previous to the off-task instance, describing any interactional bids that occurred and their outcomes. In social activity, individuals bid for particular interactions; for example, they might bid for the floor by raising their hand or through a cautious interruption; they might bid for authority by issuing a directive. Others then respond to those bids, handing or denying the floor to the person bidding for it or accepting or rejecting a directive. For the minute preceding each off-task interaction, we tabulated whether and how often students made such interactional bids, whether those on-task bids were taken up by peers or ignored or rejected. We then compared students' bids and their peers responses with the nature of the bids and responses during subsequent off-task activity.

Analyzing Moment-to-Moment Off-Task Interactions

Lastly, we conducted moment-to-moment analysis of students' talk and interactions on a few focal instances of off-task activity in order to illuminate the interactional mechanics at play. We drew on techniques for interaction analysis utilized by Erickson (2006), including the transcription of all verbal and nonverbal activity from the selected video segments, parsed into turns by speaker. With respect to nonverbal activity, we focused on the orientations of bodies and eye gaze of students in relation to one another and the location of task resources in relation to students. These details mark particular elements of the collaborative dynamics (e.g., access to resources and peers' attention). We noted any shifts in these elements by turn. We also transcribed all talk by speakers, with attention to whom talk was directed. We noted whether talk was task related or off-task, with attention to shifts into and out of on-task talk. This approach to transcription enabled analysis of how elements of collaborative dynamics such as access to resources, attention, and participation shifted in relation to on-task or off-talk, allowing us to consider these forms of talk as discursive resources.

We parsed turns in relation to interactional bids and peers' responses. We examined how students bid for the floor, for interactional space (as in gaining attention or access to resources), for authority, and so on. We also examined peers' responses to those bids; that is, whether peers ignored, rejected, modified, or accepted the bid. For example, a student might bid for attention by saying "Hey guys." The student's peers might take up this bid by shifting their gaze or leaning their bodies toward the speaker. They might also respond in ways that hand the student the conversational floor, such as "Yeah, what?" They might instead ignore the bid, leaving the student unattended. The student might bid again or give up. We noted the nature of these bid-response dynamics in relation to both on-task and off-task discourse, noting how they shifted over time, especially in relation to the storylines introduced through off-task activity. Describing the storylines introduced, and thus their role in students' collaborative dynamics, is interpretive work. We carefully attended to what Erickson (2006) has elsewhere described as local, in-the-moment meaning-making; in our case, we attended to students' meaning-making of peers' actions. Such analytic work requires carefully constructed inferences taking into account all available data sources.

Results

We found that off-task interactions served a variety of functions that both supported and derailed the collaborative dynamics, though the majority of functions supported the collaborative dynamics. Additionally, we found that off-task interactions often were successful where similar on-task bids failed, suggesting that off-task interactions provided additional discursive resources for managing collaborative dynamics.

In the sections below, we describe each of the nine functions of off-task interactions found in the data corpus across all sessions, first across all sessions and then contextualized within the partic-

ular problem-solving sessions. We next explore the functions of off-task interactions in relation to the group's interactional dynamics just prior to shifting into off-task activity. Finally, we dive into a moment-to-moment analysis of four instances of off-task activity to illustrate the nature of the interactions and how they served to function as they did.

Understanding the Functions of Off-Task Interactions

Results show that off-task interactions served both productive and unproductive functions in relation to the collaborative problem-solving process. The functions of off-task interactions in our data set ($n = 56$ instances), in order of prevalence, were to: (a) fill time ($n = 17$); (b) warm up to collaboration ($n = 9$); (c) gain the attention of others ($n = 7$); (d) avoid work ($n = 7$); (e) recruit others into participation ($n = 6$); (f) gain access to collaboration for self ($n = 6$); (g) destabilize collaboration ($n = 4$); (h) extend the task ($n = 3$); and (i) resist concentrated authority ($n = 2$). An additional seven instances were coded as flops (see Table 1). Table 1 defines each function operationally and offers examples of the kinds of interactions that were coded as such.

We grouped these functions into three broader categories: (a) growing and sustaining the collaboration ($n = 28$); (b) tensions and challenges to the collaboration ($n = 6$); and (c) dealing with time and task ($n = 27$). Functions deemed productive to the collaboration included all four of the functions under growing and sustaining the collaboration and one each under the other two categories: resisting concentrated authority, a form of dealing with tensions in the collaboration, and extending the task, a form of dealing with time and task. The majority of off-task instances (58.9%) served one of these six productive functions. That is, over half of the time that students engaged in off-task interactions with one another, those interactions enhanced the collaborative process.

The four functions we identified that served to grow or sustain the collaboration were: warming up to collaboration (16.1%), gaining the attention of others (12.5%), recruiting others into the collaboration (10.7%), and gaining access to the collaboration for self (10.7%). The two other forms in which off-task interaction functioned in ways that were productive to student collaboration were the two least frequent. However, their presence is meaningful. On two occasions, only 3.6% of instances, off-task interaction functioned to resist concentrated authority in the group. On both occasions these were conversations about a student's intelligence being labeled, which was then rejected. On three occasions, 5.4% of instances, students participated in off-task interaction that extended the mathematical task in creative ways. Rather than abandoning the task or the collaboration, in these instances students made use of off-task talk to support continued work on task-related activity in collaboration with each other.

The most prevalent function of off-task participation, 30.4% of all instances, was to fill time when students perceived their task to be completed. Perhaps unsurprisingly, off-task participation occurred often when students seemed to believe that they had nothing else to do (e.g., when students stated explicitly "We're done"). However, only 12.5% of the time did off-task participation serve to avoid the task when students' talk and actions revealed that they were aware there was work to be done. Off-task interactions that functioned to destabilize the collaboration, another problematic function, only accounted for another 7.1% of the instances. Altogether, outside of times when students were either done or seemed to think they were, off-task interactions derailed collaboration less than a fifth of the time.

Appendix A offers simple descriptive statistics of the nature of each kind of off-task interaction, including the number of instances, the range and mean duration of instances, as well as its percentage of total time. The purpose of these descriptive statistics is to offer a broad sense of the patterns of interactions and their functions across all problem-solving sessions. In sum, Appendix A shows that off-task interactions that were unproductive to the collaboration, such as destabilizing the collaboration and avoiding work generally tended to last longer than the more productive functions which tended to be more fleeting. However, overall, the range of duration was generally wide; more research is needed to see if there are real differences in this trend.

Understanding Off-Task Interactions Within Problem-Solving Session Contexts

Off-task participation occurred within and arose out of specific group work sessions, among particular individuals working on a given task. The results reported so far have considered how off-task participation functioned generally across all the contexts within which they occurred. Here, we situate those findings in relation to their problem-solving contexts. We focus on: (a) where kinds of off-task interactions were located temporally within collaborative problem-solving sessions and (b) how the specific functions of off-task participation related to the unfolding of the day's specific task, participation structure(s), and the day's math lesson.

Figure 1 shows the distribution of off-task interactions within the 12 problem-solving sessions, highlighting what types of off-task interactions occurred and when in the session's unfolding.

Across all 12 sessions, the functions of off-task participation were, in part, shaped by *when* it occurred in the collaborative session. For example, off-task interactions that functioned to warm up to the collaboration, a subcode within the "growing the collaboration" code, tended to occur as the very first interactions of the collaborative sessions in nearly all of the sessions. Similarly, off-task interactions that functioned to deal with time and task tended to occur toward the end, when students at least perceived to be done with the task or were unclear of what to do next. In between the start and end of the collaborative sessions, off-task participation tended to function to grow the collaboration by gaining peers' attention, gaining access to the collaboration, or sustaining the collaboration, as well as challenging the collaboration by resisting authority or dissolving the collaboration.

Furthermore, the functions of off-task participation were also shaped, in part, by the tasks that students were expected to work on during a particular day. The 12 sessions represent video of one or two small groups across eight different days of instruction during the same unit in the same classroom. The nature of the tasks in part shaped possibilities for interaction, and thereby the ways in which students attempted to navigate and shift collaborative dynamics.

For much of the unit, students were asked to represent numbers (representing t-shirt orders written on cards) as bundles of 10 and single units. At times, students had enough cards at their table such that each person worked on their own number, affording more cooperative than collaborative activity. Other times, students were working on the same number, which afforded shared thinking. The

Table 1
Definitions and Examples of Off-Task Interaction Functions

Function	Definition	Example
	Growing and Sustaining collaboration	
Recruit others into the collaboration	Off-task interactions that (a) bring a student or students previously not participating into the collaboration, and (b) are followed by on-task interactions between now-collaborating peers.	Prior to off-task instance, a student makes several bids to recruit his two table mates into the collaborative task, which they repeatedly reject. He then begins to play with the connecting cubes, loudly declaring that he is building a tower. His two table mates shift their bodies toward him and one another, enabling cooperation, smile and join him in creating towers of their own and comparing them to each other. Immediately subsequent, the student repeats his original contribution, which is now taken up by his peers who shift into on-task interactions.
Gain access to collaboration for self	Off-task interactions that (a) enable a student that was previously not participating in the collaboration to enter, and (b) are followed by on-task interactions between now-collaborating peers.	A student's on-task bids for participation are rejected. He and his peer begin to play fight with connecting cubes. In doing so, their bodies and talk become oriented toward one another. Student's subsequent bid for participation in the collaborative task is successfully taken up.
Warm up to the collaboration	Off-task interactions that mark the beginning of the collaborative activity and functions to support initial connection/interactions with peers.	Students walk over to their table for the first time as a group. A student asks her peer whether the purple pen is his and then starts to take all of her pens out of a bag to demonstrate their varied colors. As the rest of the table mates join the table, they acknowledge the display of pens and one another. Immediately after, a student offers the first on-task directive to the group.
Gain attention of others	Off-task interactions that serve to shift the gaze of others toward a peer; the gaze is sufficiently sustained to support verbal interaction.	Prior to the off-task instance, a student bids for the attention of this table mates, who ignore him. He begins to tell a story about playing the game Minecraft. His peers' gaze shift toward him, gaining their attention.
	Tensions/Challenges to the collaboration	
Resist domination or concentrated authority	Off-task interactions that serve to ignore or deflect a directive or other move that positions one peer with concentrated social or intellectual authority.	One student is copying the work of another. A third student asks why they are copying to which the student replies "she's smart." A few moments later the student called smart says not to use that word because when you call someone smart their brain stops growing.
Destabilize the collaboration	Off-task interactions that serve to reject or deflect bids to join or remain in the collaboration.	Two students work on representing the number 34 as 3 tens and 4 ones. One student asks his peer if she has another idea for representing the number 34. His peer responds with teasing him about who he "likes" and continues to tease him until he stops asking for her contribution.
	Dealing with time and task	
Fill time	Off-task interactions that occur after a declaration that the task is complete	A student utters aloud, "we're done!" and high-fives his two peers in the group. Giggling, the students spend the remainder of the session time hitting their 10 stick together, testing which are the "strong" or "weak" sticks.
Extend the task	Off-task interactions that are related to the context of the task, but that depart from the task instructions.	Students are tasked with adding imagined orders for t-shirts, totaling the number of t-shirts in an order. Before starting on the expected task, students spend several minutes discussing who should be in charge of small, medium, or large sizes of t-shirts, elaborating on personal characteristics, such as height or preferred fashion style, that would make particular sizes reasonable for specific students to take on.

(*table continues*)

Table 1 (*continued*)

Function	Definition	Example
Avoid work	Off-task interactions that serve to resist efforts to make progress on task or steer members away from the task.	A student bids for his partner to model the number 38 with connecting cubes. His partner counters by telling him the green connecting cubes are peas and they will make soup. They begin to build with the cubes. As he attempts to make sticks of ten, his partner launches into a story about making soup and insists the blocks are her ingredients.
*Flop	Off-task interactions entail a bid to shift the group dynamics (e.g. gain attention of others or grow the collaboration) but no shift occurs, or is interrupted by teacher intervention.	A student repeatedly attempts to share an idea with his table mates. His two peers ignore his attempts, as they share a story about a classmate who got in trouble that morning and pass the shared worksheet among the two of them.

particular numbers that students were tasked to represent together also shaped possibilities. For example, on the second video-recorded day of the focal unit, one of the groups, a partnership, worked exclusively on the number 13. The task afforded moments of collaboration as they worked to initially represent 13, but, once they exhausted "one 10 and three loose," they quickly ran out of ideas. Thus, much of their interactions were marked by tension, as they struggled to come up with other combinations (i.e., 13 loose) and each insisted that the other come up with new possibilities. Thus, their off-task interactions throughout the session functioned respectively to resist being positioned with intellectual authority, dissolve the collaboration, avoid work, and extend the task. On the

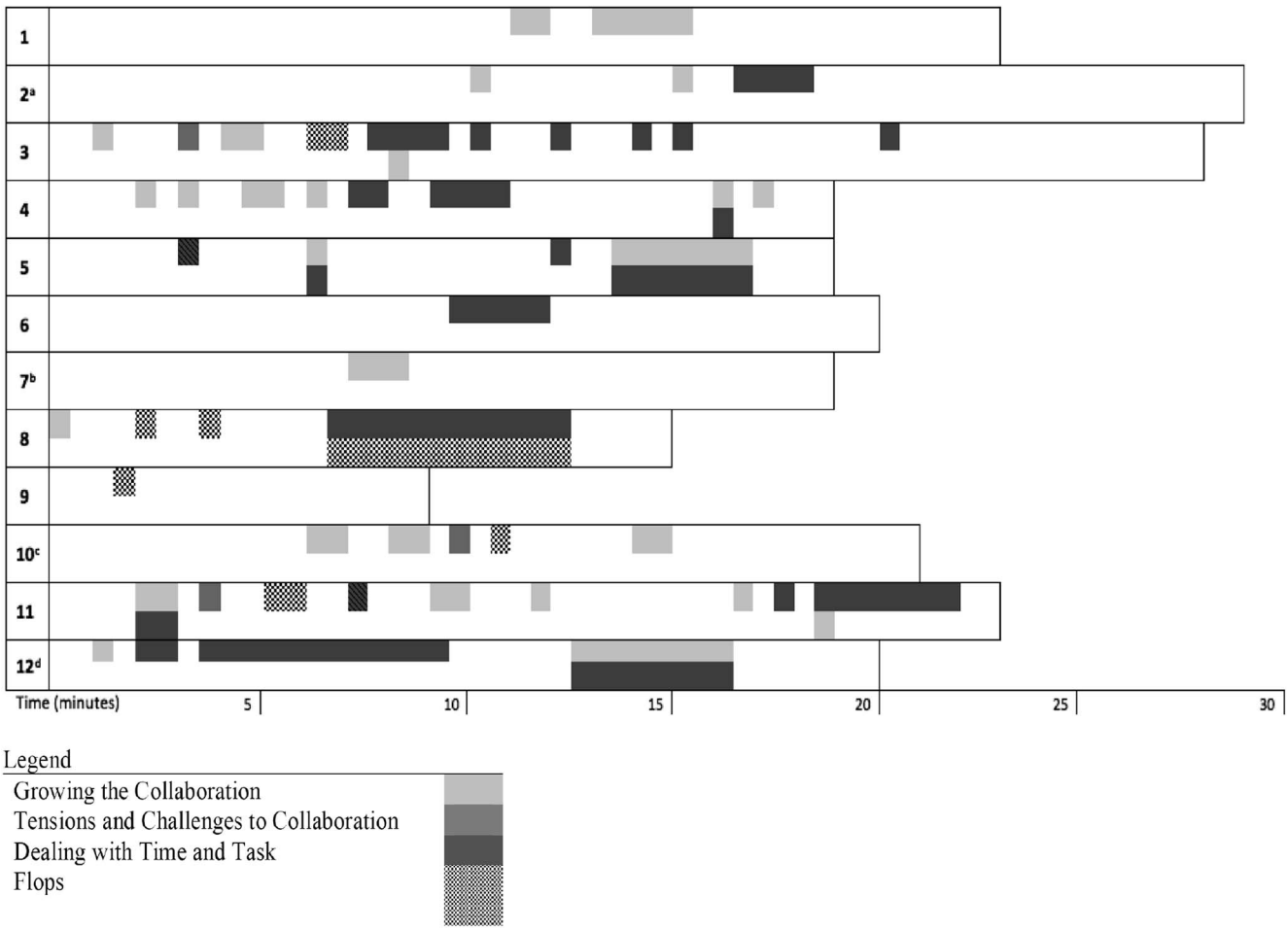


Figure 1. Off-task instances and their coded functions over time for each collaborative problem-solving session. The following symbols indicate which sessions are represented in the vignettes: [a] Vignette 4; [b] Vignette 3; [c] Vignette 1; and [d] Vignette 2.

same day, the other videotaped group, a trio, had several cards at their table and each student worked on representing their own number, resulting in less off-task participation than the partnership just described. Instead, off-task participation functioned to attempt to recruit peers into collaboration in light of the parallel individual work. Such a dynamic—moving from parallel cooperative to collaborative work—was more easily fostered on the fourth videotaped lesson of the unit where students were directed to first work individually to represent the number 64 and were then tasked to represent the number together. Here, the move to collaboration was supported by the fact that students had already generated their own representations, enabling the sharing of ideas more easily, and the explicit directive from the teacher that all students move to a shared representation. On this day, both groups were on-task nearly the entire session. Indeed, each of the two videotaped groups that day had only one instance of off-task participation, which served to grow the collaboration and extend the task, respectively. Overall, these contextual features shaped possibilities for when and how off-task activity operated.

Off-Task Interactions Often Functioned Where On-Task Bids Failed

With these contextual understandings in mind, we sought to explore more deeply how off-task activity operated. That is, we examined whether and how off-task emerged as responsive to local interactional needs. To do so, we focused on interactional bids. For example, we noted whether students bid for the floor by raising their hand or bid for authority by issuing a directive. For the minute preceding each off-task interaction, we noted all interactional bids that occurred. We then tabulated whether and how often students made particular kinds of interactional bids during just-prior on-task activity, and whether those on-task bids were taken up by peers or ignored or rejected. We then compared students' bids and their peers' responses to those during subsequent off-task activity. Table 2 summarizes these findings.

We found that students made interactional bids through just-prior on-task participation three fourths of the time they engaged in off-task participation. Only a quarter of off-task instances ($n = 14$) were not preceded by an on-task bid of a similar type. Of those 14 instances, 11 off-task bids served one of the following functions: warming up to the collaboration, avoiding work, or filling time. Of the remaining three instances, one included only independent work, one had the off-task instance initiated by a student outside the group, and one had another off-task instance in the previous minute along with independent work. The absence of bids makes sense in these cases. Warming up to the collaboration is an initial event, and was not often preceded by any talk at all, but rather students gathering to a table after leaving a whole-class discussion at the carpet in the front of the classroom. Avoiding work and, to a lesser extent filling time, are functions of off-task participation where on-task bids to work together do not make much sense because the task is either being actively resisted or students assume the task is complete. The rest of the off-task instances existed within the collaborative session (as opposed to the very start, as in warming up to the collaboration) and while students were intentionally working on the task (as opposed to avoiding work or filling time because they believed they were done). These instances were all preceded by on-task activity that included bids for attention, access to the collaboration for self, recruiting a peer into the collaboration, resisting authority, and extending the task.

Of these bids, over 95% failed. Similar off-task bids (that is, bids for attention or the conversational floor, etc.) were then successfully taken up in subsequent off-task participation and were sustained once the group got back on task. That is, the student who then bid for the floor again during off-task activity was able to indeed gain access to the conversational floor. This shift was sustained as the group returned to on-task activity.

Off-Task Interactions as Resources for Managing Collaborative Dynamics

In order to illustrate these dynamics at play, we examine four vignettes based on instances of off-task activity. We situate each vignette within its collaborative context and trace the shifts in interactional dynamics before, during, and after the off-task interaction, focusing on gaze, body orientation, and access to material resources within a student group. We provide full transcript from each of these instances accompanied by visual diagrams of student positions as the interactional dynamics shift.

Vignette 1: Gabe recruited Lina to collaborate with him and Katy through stories about Minecraft. Even during a group task, students sometimes pursue components of the task independently and in parallel. Recruitment of group members into collaboration is thereby an important component to collaborative activity. We found that 10.7% of off-task interactions functioned to recruit others into collaboration. Off-task instances were coded as functioning to recruit others into the collaboration when a student who was not participating in the joint work of the task prior to the off-task interaction became integrated into the collaborative dynamics, a shift that was sustained during subsequent on-task activity.

Vignette 1 (see Table 3, also Session 7 in Figure 1) focuses on a table of four students: Gabe, Lina, Katy, and Denise. Gabe and Katy were working together as a partnership, while Lina and Denise were each working independently. As you will see, Gabe twice attempted to recruit Lina and Denise into collaboration with him and Katy. These bids for recruitment failed; Lina and Denise

Table 2
Frequency of Preceding On-Task Bids to Shift Dynamics and Their Successes of Failures

Off-task instances	Count	Percent	Peer uptake of on-task bid	Count	Percent
With preceding on-task bids	42	75.00%	Failed/incomplete uptake	40	95.23%
			Successful	2	4.76%
With NO preceding on-task bids	14	25.00%	N/A		

Table 3
Vignette 1: Recruiting Others Into the Collaboration

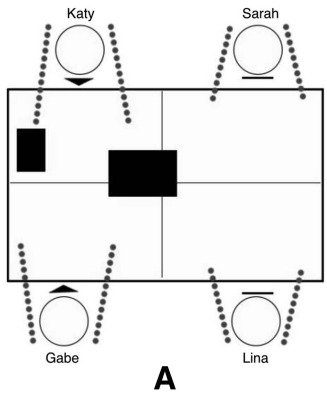
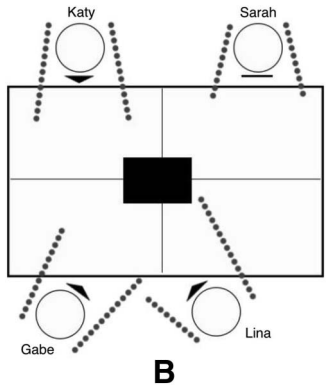
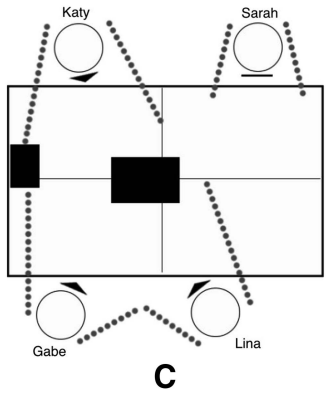
Line	Talk	Action
0		 A
1	Gabe: I thought we were working with you guys, too.	Gaze toward Lina and Denise, who are working independently.
2	Katy: They're working together	Gaze toward Gabe
3	Gabe: Are you guys working together?	Gaze still toward Lina and Denise
4	Lina: Yeah?	Looking down
5	Gabe: Oka::::y. (. . .) I insi::st. (. . .)	
6		Katy pushes loose linking cubes toward Gabe.
7	Gabe: Stop Katy.	Shifts gaze to Katy.
8	Katy: It's a person.	
9	Lina: Here, just make a lot of these so you can stack.	Gaze toward Gabe. Lina pushes an incomplete 10 stick toward Katy, then toward Gabe. Lina reaches for a red cube from the pile in front of Gabe.
10	Gabe: Oh. (. . .) No. Hey. You know how you secure your horse? You know how to secure your horse?	Gaze toward Lina, who nods slightly, as she constructs a 10 stick.
		 B
11	Lina: stables. You know what happen/	Gabe turns head dramatically left then right once.
12	Gabe: you have to feed them sugar to heal, but/	
13	Lina: But not always, like most of the time, I don't really heal them with sugar, because, I always just place like hay bales? and like the next day, like Minecraft next day, they're all, they're all gone	
14	Gabe: what?	
15	Lina: he's all healed. (.) I made it so/	
16	Gabe: You know what a creeper was chasing me and my horse? I was like, WA::::::, I got on my horse, it kept missing me, I was like run, like the battlefield.	Gabe spreads arms out to sides and moves arms back and forth in alternating movement, bounces up and down in his chair
17		Lina reaches for a linking cube under Katy's hand, Katy pulls the linking cubes toward her

Table 3 (*continued*)

Line	Talk	Action
18	Katy: There's some right <u>there</u>	Katy motions toward loose linking cubes on the table near Lina.
19	Lina: I need bla::ck (. . .) oh.	Lina identifies a loose black cube.
20	Gabe: Then my friend, he kept messing me up, he's like, get off my horse so he could destr- so the horse could get, so the horse could destroy it. I was like, <u>heck</u>naw. I want my horse. I just got it. And I burned down the village. So, there.	
21	Lina: Good job	Katy shifts gaze to Gabe.
22	Gabe: <u>Yeah</u>. I was the first one to <u>burn down a village</u>. <u>Woohoo</u>	Katy reaches into the basket near Gabe, takes out the completed 10 stick, pushes it in front of Gabe. Gabe picks up, looks at it, and places it back in the basket. Katy's gaze remains on Gabe.
23	Gabe: Oh <u>guys</u>, put all your tens in here, <u>all your tens in here</u>. then another five then another five then another five.	Gabe shifts gaze from Lina and Katy. He picks up the basket and waves it in the air between all four students, then places it back down.
		 C
24	Katy: o::ne (..) two:: (. . .) three:: (. . .)	Katy places her 10 sticks into the basket.
25	Gabe: You're doing the same thing as me::	Gabe shifts his gaze from Katy to Lina. All three students build 10 sticks using the cubes and placing them in the basket.

Note. Underlined words represent emphasized speech. The use of colons represent elongated speech.

rejected his attempts. Gabe then made use of off-task interaction to recruit Lina into collaboration as a trio.

Gabe insisted he and his group mates should work together, but was ignored. At the start of this vignette, two students, Katy and Gabe, were oriented toward each other (see figure at Line 0 in Table 3): Their gazes were toward one another and the task materials were largely between them. Two other students, Denise and Lina, were each working independently, their gaze down toward their desks. In Line 1, Gabe bid for recruitment of the table group as a whole, "I thought we were working with you guys too." His partner Katy resisted the recruitment by saying that they (Lina and Denise) were working together (Line 2), which Gabe verified with Lina, who agreed with Katy and kept her gaze downward (Lines 3–4). Gabe continued to try to recruit Lina (Line 5). Lina rebuffed him again, offering him materials to work on his own, saying "Here just make a lot of these so you can stack" (Line 9). All in all, his bids for recruitment failed.

Gabe shifted to a story about Minecraft and gained Lina's attention. Gabe then began to tell a story about playing Minecraft, a popular video game (Lines 10–16, 20–22), as they constructed 10 sticks in parallel. As Gabe posed a game-related question about securing one's horse, Lina shifted her gaze toward Gabe, while Katy continued to gaze toward Gabe (see figure at Line 10 in Table 3). In Line 11, Lina picked up on the storyline and answered "stables," then continued the conversation by posing another question. Lina then leaned in toward Katy and reached for a cube from a collection under Katy's hand, which Katy pulled away, pointing to where Lina could get more cubes (Lines 17–20). Gabe continued talking about his adventures in Minecraft, building the storyline (Lines 22–26). In the story, a creeper (an enemy in the game) was chasing him and he escaped, despite his friend who "kept messing me up" (Line 20). Finally, Gabe concluded the story by claiming he "burned down a village. So there." (Line 20), positioning himself as powerful within the game's imagined social hierarchy. Lina affirmed him, saying "Good job" (Line 21). Gabe followed by further affirming "Yeah, I was the first to burn down a village. Woohoo!" (Line 22). Both Lina and Katy remained spatially oriented toward him.

Gabe offered an on-task idea and it was taken up by both Katy and Lina who began to work together as a trio. With both Lina and Katy's attention toward Gabe, he lifted up the basket of cubes and suggested that they place all their 10 sticks in the basket (Line 23). The figure at Line 23 in Table 3 shows Gabe waving the basket between Lina and Katy, which they both are oriented toward. All three students are oriented dialogically, the materials between them. Katy took up Gabe's suggestion (Line 24), which Gabe affirmed by enthusiastically stating "You're doing the same thing as me!" (Line 25). The dyad turned into a trio and they

continued to build 10 sticks together and place them in the basket (Line 25).

Gabe's discussion of his role in Minecraft, described in Vignette 1, functioned to recruit Lina into his collaboration with Katy. In the next vignette, off-task participation functioned to enable a student marginalized from the collaboration to gain access and successfully join the discussion about the mathematical task.

Vignette 2: Jose gained access to the collaboration with Mutya and Felix through imaginary sword play. Students not only work to recruit peers for collaboration, they, at times, also struggle to enter an existing collaboration. We found that 10.7% of off-task instances functioned to enable a student to gain access to the collaboration, most often after several failed bids to enter. During off-task activity, students were often able to gain peers' attention and even the conversational floor, shifting the dynamics to be more inclusive. The then-larger group then shifted back on-task together. In Vignette 2 (see Table 4), we focus on how Jose gained access to the ongoing collaboration between Mutya and Felix through imaginary sword play involving 10 sticks.

In this vignette (Session 2 in Figure 1), three students, Mutya (bottom left), Felix (top left), and Jose (top right), were tasked to work together to build multiple representations of each of their numbers. They each had a card with a different number on it. The vignette begins just after Jose attempted three times to gain access to the materials and collaborate with Mutya and Felix but was unsuccessful.

Mutya and Felix were oriented to each other and had access to all the materials, while Jose was left out. At the start of the vignette, Felix and Mutya were spatially oriented toward each other and had all of the task materials between them. Felix's arm blocked Jose's access as he held onto the two 10 sticks closest to Jose (see figure at Line 1 in Table 4). Mutya then reached out and collected all of the loose linking cubes on the table, pulling them toward her. She stated "These are all mine" and told Jose "Don't touch" (Lines 1, 3) with affirmation from Felix (Lines 2, 4). As she spoke, Jose tentatively reached toward the materials and took two 10 sticks, pushing one back slowly (Line 1).

Jose gained access to materials, the interactional space, and Felix's attention through imaginary sword play with Felix. Holding one 10 stick upright, Jose leaned in toward Felix, called his name, then hesitated, adding "Never mind" (Line 5). Felix responded to Jose anyway, picking up a 10 stick built of red and green linking cubes, holding it like a sword. He leaned in toward Jose and asked "Want to fight m:e:: ra::r::" (Line 6). Jose responded by calling Felix a Christmas tree in reference to the red and green color of his 10 stick (Line 7). Felix picked up a different 10 stick built of black and red linking cubes and asked again if Jose wanted to fight (Lines 8–12). Jose again called Felix "a Christmas tree" (Line 10). Felix continued to bid to Jose to play, claiming that Jose declined his offer to fight because Felix was stronger (Line 10). Jose then took up the bid for swordplay, leaned in toward Felix and used his 10 stick to break Felix's (Line 10) and then put it back together (Line 11). Through this play (see figure at Line 8 in Table 4), Felix and Jose became spatially oriented toward each other.

Jose, Felix, and Mutya got back on task as a trio and Jose suggested they represent him number next. When Jose broke Felix's 10 stick, Mutya's gaze shifted toward them and she scolded the two for playing around (Lines 12, 14, 16). At this point all three students were oriented to each other and had access to the materials (see figure at Line 13 in Table 4). Following Mutya's directive to stop, Felix suggested they next work to represent Mutya's number (Lines 17). Jose then took the floor to suggest they make *his* number first, because he had the smallest number (Line 18). The trio took up this suggestion and worked to represent Jose's number together.

Vignette 3: Resisting authority. The previous two vignettes focused on ways that off-task activity functioned to grow the collaboration. Here we focus on how off-task activity functioned to resist bids related to mathematical authority. Only two off-task instances functioned to resist interactional bids related to authority. Such resistance enabled a dynamic that had become mathematically unproductive to become productive again.

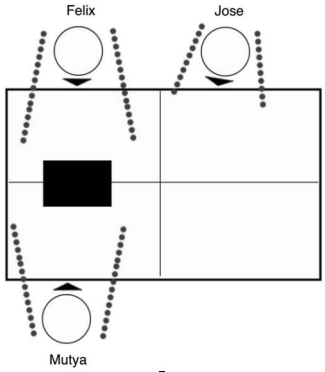
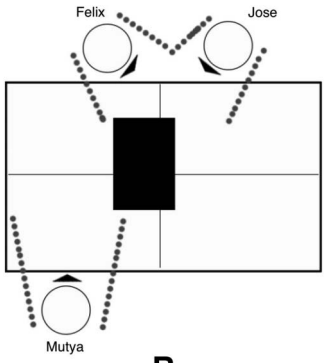
In Vignette 3 (see Table 5, also Session 3 in Figure 1), we see again Katy and Gabe, this time working as a partnership to represent 13 t-shirts as different combinations of bundles of 10 and single shirts (one bundle of 10 and three single t-shirts or as 13 single t-shirts). Katy had originally offered the idea to represent 13 as "one 10 and three ones," and then both partners struggled to come up with a different representation. Gabe repeatedly bid to position Katy with mathematical authority, which she rejected by countering that he should come up with ideas, too. In short, their partnership had become unproductive. In the vignette below, Katy brought in off-task activity repeatedly in ways that disrupted Gabe's continuous bids for Katy's leadership, until he gave up and agreed to get a new number to represent together. While the move foreclosed possibilities for discovering the other representation that worked (13 ones), it nevertheless enabled a partnership that had stagnated to shift back into mathematical activity by opting to reason through a new number.

Katy resisted Gabe's bids for her to take on the intellectual work by recasting her activity as serving imagined noodle soup. Gabe asked Katy for new ideas for representing 13 (Lines 1, 3, 5). Katy resisted, telling Gabe he must come up with ideas himself (Lines 2, 4, 6). When Gabe insisted again (Line 5), Katy repeated that he must make ideas and then recast her activity as play, pretending to serve Gabe noodle soup (Line 6). Katy continued this storyline as she collected all the connecting cubes from Gabe, and, by implication, the mathematics activity (Lines 8, 10). As Gabe tried to hold onto the cubes and 10 sticks, Katy recast them as hot noodles (Line 12).

Gabe bid again. Katy continued to resist Gabe's bids for her authority by gossiping about a teacher. Gabe bid for Katy's authority again, asking her "Ok, what am I doing?" (Line 13). Katy ignored his bid entirely and instead engaged him in whispered gossip about a teacher's recent absence from school (Line 14). Gabe took up this bid, but became increasingly worried about getting in trouble for it (Lines 19, 21, 23), leading him to bid again for task-related ideas as the teacher approached (Line 24).

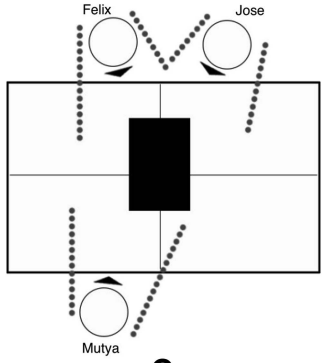
Katy suggested they work on a new number, which Gabe ignored. Katy returned to off-task activity until Gabe went to get a new number card to work on together. Gabe insisted that Katy had more ideas than she let on (Lines 23, 25, 27). On Lines 28 and 30, Katy pivoted her position of authority from mathematical to social and issued a directive: "Go get a new one [number card]." Gabe resisted (Lines, 29, 31), stating instead that they can keep working on 13 on the back of their worksheet while still not offering mathematical ideas of his own. Katy then returned to the

Table 4
Vignette 2: Gaining Access to Collaboration for Self

Line	Talk	Action
1	Mutya: Ok I'll make (. . .) I'll make another ones. But all these are mine.	Mutya is building with green cubes Felix has 10 sticks in his hands. Jose tentatively reaches for two 10 sticks closest to him, hesitates, and puts one back. Mutya pulls all loose cubes in front of her.  **A**
2	Felix: /got it	Felix holds 10 stick.
3	Mutya: Don't touch.	
4	Felix: Got it	
5	Jose: Felix (. . .) oh never mind.	Jose leans into Felix, 10 stick in hand.
6	Felix: Want to fight m:e:: ra::r::	Felix grabs a 10 stick made of red and green linking cubes and holds up like a sword and leans towards Jose. Gaze toward Felix.
7	Jose: No you Christmas tree.	Jose pulls back 10 stick.
8	Felix: Want to fight me no::ow.	Felix places down red and green 10 stick and picks up another 10 stick made of red and black cubes, holding it up to Jose's. He deepens his lean towards Jose.  **B**
9	Jose: No you Christmas tree.	Jose pulls 10 stick further away.
10	Felix: Yeah, 'Cause I'm <u>stronger</u> than you.	Felix leans in waving 10 stick towards Jose's 10 stick. Jose leans towards Felix and uses his 10 stick to break Felix's.
11	Felix: HE::Y:: that's not fa:air (. . .) that's not (. . .) what that is (. . .)	Felix puts 10 stick back together. Felix leans towards Jose and grabs Jose's 10 stick and break it. Jose puts it back together.
12	Mutya: STOP PLAYING AROUND WITH IT (. . .) it's meant to (. . .) it's (. . .) <u>this is meant to um</u> (. . .)	Mutya looks up toward Felix and Jose.

(*table continues*)

Table 4 (*continued*)

Line	Talk	Action
13	Felix: /Now let's make	Shifts gaze to Mutya
		 C
14	Mutya: work with	
15	Felix: /now let's make	
16	Mutya: not play with	
17	Felix: Now let's make Mutya's number.	Jose grabs two 10 sticks from the pile in front of Felix.
18	Jose: Why don't we make mine first cause it's like the shortest?	Jose shifts gaze toward Felix and then Mutya.

Note. Underlined words represent emphasized speech. The use of colons represent elongated speech.

noodle soup storyline and explicitly positioned Gabe within it, telling others around them that he had made the soup (Lines 32, 34). Gabe persisted, asking Katy for ideas for several more turns (Lines 39, 41), which Katy repeatedly deflected (Lines 38, 40, 42). She then repeated her directive that Gabe should get a new number for them to work on (Line 44). As she issued that directive, she continued to introduce more off-task activity, simultaneously constructing a sword out of connecting cubes (Line 44). When Gabe admonished her for making a sword (Line 45), Katy brought in multiple imagined storylines (Line 46). Finally, Gabe took up Katy's directive ("Ok, I'm going to grab a new number") and stood up to get a new card to work on together (Line 47).

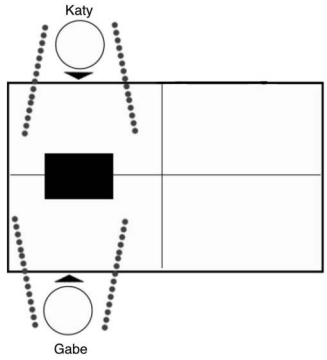
Vignette 4: Warming up to the collaboration through talk about Avengers and notebook colors. At times, students began to engage in off-task activity as soon as they came together as a table, before beginning the task at all. We found that such activity offered a way for students to attend to one another and begin to orient as a group. In this sense, off-task activity functioned for students to warm up to the collaboration before launching the mathematical task with one another. We found that 16.1% of off-task interactions functioned for students to warm up to launching the collaborative task. While the collaboration often began with an on-task question, such as "So what are we doing?" or a directive (e.g., "You get the hangers and I'll get the base-10 blocks"), students also initiated connection and began coordinating activity through some socializing before the work began in earnest.

Vignette 4 (Table 6, also see Session 10 in Figure 1) follows a table of four students: Jessica, Kiara, Felix, and Jose. The students have just gathered at their table one-by-one after collecting materials for the day's task, including brand new math notebooks given to them by the teacher. Students were tasked with working together to fill t-shirt orders for their imagined t-shirt factory. For the task, each student had received a manila envelope with three index cards inside, each of which had a number on it representing the t-shirt order. The number cards were being reused from the prior day's lesson, such that many of the cards had a different student's name written on them. The names written on the cards were unrelated to the day's task, and students received cards with the names of classmates that weren't necessarily in their small group.

In this vignette, the group moved through three stages of interaction, which ultimately launched the collaborative mathematical work. At the start, the four group mates were oriented away from one another, instead facing off-camera students whose names were on their number cards. Then, off-task conversation about superheroes and notebook colors oriented the group toward each other at the table. Finally, oriented to each other, all four students in the group launched the collaborative task together.

Group mates focused on student names on their number cards, which oriented their attention toward peers outside the small group. Students arrived at their table with materials (notebook, cards, task sheet) for the day's talk. First, Jessica and Kiara arrived (Line 1), then Felix (Line 8). Jose arrived later (Line 17). As they arrived and opened their manila folders which contained number cards, they focused on the names on the number cards and called out to those students, orienting them away from their group mates. In particular, Jessica called over a student from outside the group, Student A, and told her she had Student A's former number cards (Lines 2–4). Kiara joined the conversation and also oriented toward Student A (Line 6). Felix joined next, also telling Student A that he had her card (Line 7). Student B, also from outside the group, then walked over to Jessica. Kiara's gaze shifted to Student B, still away from the small group. Student B asked Jessica for a

Table 5
Vignette 3: Resisting Authority

Line	Talk	Action
1	Gabe: Do you have any more ideas?	Gabe and Katy are oriented toward each other face-to-face and remain so throughout. There are connecting cubes and base-10 sticks on the table between them as well as a basket. Gabe has worksheet in front of him and is recording. 
2	Katy: NO Gabe. You:: make ideas.	Katy collects 10 sticks from table and puts into basket.
3	Gabe: Please?	
4	Katy: Make ideas.	
5	Gabe: Plea:::se?	
6	Katy: Make ide:::as. Here's your soup. Gabe, I'm not gonna give you idea. Make your own idea.	Pushes basket toward Gabe.
7	Gabe: I get all this.	Gabe grabs blue and black linking cubes.
8	Katy: STOP Gabe, I'm gonna use some of them.	Katy grabs linking cubes from Gabe and pulls them towards her work space
9	Gabe: I need all these.	Protects a small subset of cubes in front of him
10	Katy: /I'm gonna use all of them,	
11	Gabe: /and I need some tens	Pulls from 10 sticks from the basket
12	Katy: its hot (..) this is hot noodles, it's hot noodles e::at it	Grabs a ten stick and points it at Gabe, then takes all but one 10 stick from him.
13	Gabe: ok this is nine, ten, eleven. You can have the rest of them. Ok, what am I doing?	Keeps one 10 stick and three cubes; pushes the rest towards Katy's pile.
14	Katy: Do you know why, do you know why Mr. (inaudible) didn't want to come cause yesterday? [continues whispering]	Leans in toward Gabe, lowers voice.
15	Gabe: For real?	Leans in toward Katy.
16	Katy: yeah	
17	Gabe: You're not lying?	
18	Katy: I'm not lying.	
19	Gabe: You know, there's a voice right there? oh my go::d it heard what you said. Say I didn't mean it.	Points toward table microphone.
20	Katy: I didn't mean it.	Katy laughs and looks away
21	Gabe: without laughing	
22	Katy: Gabe, for real. Gabe, I went like this.	Katy laughs and turns toward students at nearby table
23	Gabe: Ok let's get to work. I said do you have any ide::as?	Gabe turns back toward Katy.
24	Katy: I already gave you two ideas.	Shifts gaze back to Gabe, then points at worksheet in front of him.
25	Gabe: I know you have more.	
26	Katy: No I don't.	
27	Gabe: Why you laughing, huh? Dude, I know you have ideas.	
28	Katy: No I do::n't. Go get a NEW one.	
29	Gabe: Huh?	
30	Katy: Go get a new one.	
31	Gabe: We can put it on the BACK	Indicates back of the worksheet.
32	Katy: Do you want some soup, Gabe made it. GABE MADE THE SOUP	Turns to student in nearby table, offering basket, then returns it to their table, laughing.
33	Gabe: I'm not kidding we need to get to work.	
34	Katy: Gabe made the soup.	Turns gaze toward other student table
35	Gabe: I wrote this.	Turns gaze toward other student table, points to worksheet.
36	Katy: /YOU LI:::A::R:: I WROTE TH::IS. Fine you write it and I'll give you ideas. You can make one t-shirt and three left over::s	Laughing throughout.
37	Gabe: I already did it.	Holds up and points to paper

(*table continues*)

Table 5 (*continued*)

Line	Talk	Action
38	Katy: Oh. I'm out of ide:::as	
39	Gabe: Ok, ten t-shirts and three loose ones. Do you have any more?	Reads their earlier recorded work from worksheet.
40	Katy: No, do YOU?	
41	Gabe: No. Do you have any more?	
42	Katy: No, do you?	
43	Gabe: thirteen, thirteen, thirteen	Looks at number card.
44	Katy: You should go get a new number. Look, Gabe.	Holds up long stick of connecting cubes.
45	Gabe: Stop, you can't make swords.	
46	Katy: It's not a sword it's just the Eiffel tower. Are you going to eat your soup?	Shakes basket toward Gabe.
47	Gabe: Ok I'm going to grab a new number.	Gets up from table to pick up a new number card.

Note. Underlined words represent emphasized speech. The use of colons represent elongated speech.

pencil, which she at first rejected and then agreed to (Lines 8–11), leading to a tense moment where Student B admitted to having opened Jessica's pencil case, saying "I opened your purse thing all the way" (Line 12). Kiara watched the exchange between Jessica and Student B, remarking to Student B "She's gonna kill you" (Line 13). Jessica affirmed the offense, asking Student B "You seriously did that . . . ?" (Line 14). Kiara then exclaimed "It's revenge time for the Avengers!" (Line 16), suggesting that she and Jessica were Avengers seeking revenge for Student B's act. In doing so, she positioned Jessica in relation to a superhero storyline, and herself as allied to her.

Conversations about Avengers and notebook colors shifted groupmates' attention toward each other, especially Jessica. Jose arrived at the table with his new math notebook, remarking on its color (Line 17), which Kiara took up (Line 18). Jessica affirmed her position, stating "I just caused the Avengers" (Line 19), which Felix took up, shifting his gaze toward Jessica and asking "You caused ummm . . . ?" Jessica restated "The Avengers" (Line 21). Felix further affirmed the Avenger storyline, claiming that they are "more better than Fantastic Four," which Jessica took up (Lines 22–23). Felix's, Kiara's, and Jose's gaze were then all toward Jessica, who shifted her gaze from Felix to Kiara and Jose (see figure at Line 22 in Table 6). Together, the group continued to talk about notebook colors while oriented toward one another dialogically (Lines 24–27).

Jessica suggested they begin the task and all four students launched the collaboration. Jessica then bid to launch the day's math task saying "Okay so . . ." and opening her notebook, indicating it was time to begin work (Line 28), while all students were sharing attention (see figure at Line 28 in Table 6). Kiara, like a sidekick, repeated "Okay so" (Line 34), and began to read the task instructions. Felix took up the bid to start the work, asking for clarification about the task, which Kiara provided (Lines 34–36). Kiara then stated "So now we have to write" (Line 38). The collaborative mathematical work began.

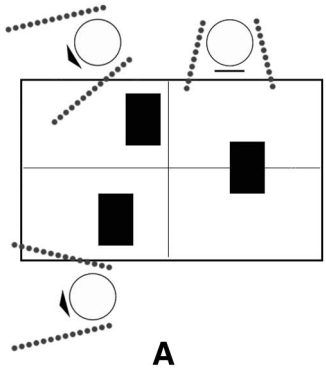
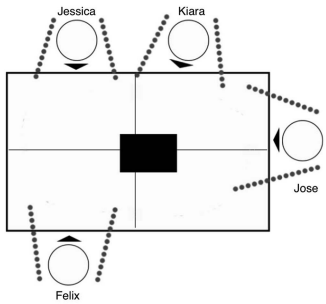
Discussion

Off-task activity is often productive for collaboration. As in other studies, we found that off-task activity can serve to extend the task (Dyson, 1987), manage relations of authority (Esmonde & Langer-Osuna, 2013; Sullivan & Wilson, 2015), and fill time (similar to alleviating boredom; Baker et al., 2010). We further found that off-task interactions can serve to grow and sustain the collaboration, contributing to our knowledge of strategies students use to manage attention and engagement with others. Along with strategies such as metacognitive talk (Artz & Armour-Thomas, 1992; Efklides, 2008), nonverbal actions such as tapping a peer's shoulder (Barron, 2003), and managing emotions (Baker et al., 2010; Sabourin et al., 2011), students also manage attention and engagement through off-task activity.

Off-task activity can be usefully understood as discursive resources that help students shift dynamics in ways that grow the collaboration and share participation. In this sense, off-task activity and the many storylines it makes available for interpreting and interacting with peers can be understood as resources that students bring into the classroom. Indeed, students bring much of themselves into social activity; students bring prior knowledge (Henningsen & Stein, 1997), cultural and linguistic repertoires (Gutiérrez, Baquedano-López, & Tejeda, 1999), identities (Esmonde & Langer-Osuna, 2013), and experiences (Rosebery, Ogonowski, DiSchino, & Warren, 2010). Gutiérrez, Baquedano-López, and Tejeda (1999) emphasize students' agentic moves to bring these aspects of themselves into classroom activity. They frame the classroom as the official space and the experiences, identities, and repertoires students bring as the unofficial space. Gutiérrez et al. (1999) focus on how teachers can support a classroom third space, a hybrid space that utilizes students' lived experiences as resources for subject area learning. In this article, we illuminate ways that students themselves bring the unofficial space to bear on their official learning activities. The implication here is that, whereas, in the third space, the role of the teacher is to intentionally pick up on opportunities to create official links to learning, here, the implication is that teachers may productively make space for off-task activity.

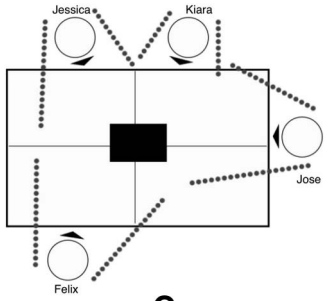
There are several implications for teaching. Rather than reprimanding students or pathologizing such behavior as defiant, teachers can frame off-task activity as a possible resource for collaboration that may continue to, at times, serve as a useful tool even in supportive collaborative classroom contexts. Teachers may expect that some amount of socialization is part of what it means for students to go about the work of solving problems together. Overall, off-task activity offered students resources for managing collaborative dynamics, mediating shared attention, access to the collaboration, and relations of authority, as well as support warming up to the collaboration and extending the task. In particular, off-task discourse may have enabled subject positions that draw on

Table 6
Vignette 4: Warming Up to the Collaboration

Line	Talk	Action
1	Kiara: [hums to tune of "This Old Man" nursery rhyme]	Jessica is at table, Kiara arrives
2	Jessica: As a group you will need to xxx (. . .) Hey [Student A]. I got the cards from you and [Student B].	Jessica reads from instructions, then looks up toward Student A (not a group-member), as she arrives at table.
3	Student A: Huh, I know.	
4	Jessica: Are you . . . [*indecipherable, discussing card names]*	Jessica opens her pencil case.
5	Student A: Except that one, we put it in/	Points to a number card on the table.
6	Kiara: Every, almost everyone at this table got them, except for, Jose and/ Felix. I have one of yours, I'm just gonna xxxx in here	Felix arrives to table.
		 **A**
7	Felix: I have [Student A's]. Student A. I have yours, I have yours.	Felix turns gaze away from table toward Student A who walks off camera.
8	Student B [to Jessica]: Can I borrow a pen?	Student B comes to table, standing next to Jessica.
9	Jessica: No.	Gaze toward Student B.
10	Student B: Please?	
11	Jessica: Fine.	
12	Student B: I opened your purse thing all the way	Student B and Jessica look at pencil case. Kiara's body and gaze are oriented to the interaction between Student B and Jessica.
13	Kiara: She's gonna kill:: you::	Jessica and Kiara's gazes follow Student B as he circles the table.
14	Jessica: You seriously did that?	Gaze toward Student B. Jessica leans back and slouches in her chair.
15	Student B: Uh-huh	Student B maintains body toward Jessica as he walks away backwards.
16	Kiara: It's revenge ti:::::me, for the Ave::nger:::::s.	Kiara's gaze moves visibly back and forth between Jessica's pencil case and Jessica's face twice. Jessica turns gaze to open pencil case.
17	Jose: Kay I'm back. How come I got a purple notebook?	Jose arrives to table, sits, places notebook on table.
18	Kiara: Why can't I get a blue?	Kiara flips her notebook to reveal purple cover as well.
19	Jessica: Hey, I just caused the Avengers	Jessica orients body away from table, toward student who is passing by table
20	Felix: You caused u:::m	Felix shifts gaze to Jessica.
21	Jessica: The Avengers	Gaze shifts to Felix.
22	Felix: It's more better than Fantastic Four	
		 **B**
23	Jessica: Okay	
24	Jose: She got the blue [notebook]	Jose extends arm toward Jessica. Kiara shifts gaze toward Jessica. Jessica orients body and gaze toward Kiara and Jose.

(*table continues*)

Table 6 (*continued*)

Line	Talk	Action
25	Kiara: And I got a purple	
26	Jessica: Oh hey hey hey. Got purple	(Mock laughter.) Jessica waves hand toward Kiara.
27	Jose: I got purple too	All group members are oriented toward each other.
28	Jessica: Okay so::::	Jessica opens notebook.
		 C
29	Kiara: Okay. So. (. . .) You're a t-shirt factory. Now you are a t-shirt factory	
30	Felix: Teacher fac-, did you say teacher factory?	
31	Kiara: T-shirt	Kiara orients gaze to Felix, points to the word "t-shirt" on the task instruction sheet
32	Felix: Oh I thought it was a teacher factory	
33	Jessica: Okay.	
34	Kiara: So now we have to write.	

Note. Underlined words represent emphasized speech. The use of colons represent elongated speech.

storylines of friendship or popular culture, among others, that are sufficiently potent to disrupt existing dynamics in ways seemingly unavailable through on-task discourse. Such disruptions increased access to peers' attention, task resources, or other aspects of the collaboration.

A more productive question, then, might be, when or under what conditions should teachers intervene on off-task activity? Our findings suggest that teachers might benefit from noticing *when* off-task participation occurs, as well as its duration and other features, in order to better diagnose the moment as one worth intervening in or leaving alone. For instance, we found that, early on, off-task participation served to warm students into collaborative dynamics and tended to be relatively fleeting. Off-task participation that served unproductive functions, such as avoiding work or dealing with time and task, tended to occur toward the end of the collaborative session and tended to be longer-lasting. Off-task functions in the middle of the sessions, which often served to grow and sustain the collaboration or negotiate authority, also tended to be rather fleeting. Generally, off-task interactions that lasted more than a minute and that tended to be later in the collaborative sessions may signal unproductive functions that merit teacher intervention. More research on noticeable differences between productive and unproductive off-task participation would be useful for guiding professional development and instructional practice.

Limitations in the Study

While the study reported here utilizes appropriate interaction analytic techniques to understand naturalistic classroom activity, the nature of the data presents multiple limitations. The findings presented here are based on data derived from videotaped collaborative problem solving sessions across a mathematics curricular unit in a naturalistic classroom setting. The 12 videotaped collaborative sessions varied in a number of ways related to the classroom study context that created limitations in the data. For one, students in this classroom were afforded the agency to choose whom to work with, where, and in what ways. Thus, videotaped collaborative sessions included groups of two, three, or four students. Across our corpus, three recorded sessions include dyads, six sessions include trios, and three sessions include groups of four. The number of students in a collaboration could affect the complexity of navigating dynamics and thus affect the ways in which off-task activity arose. We did not have sufficient numbers of sessions of each small group configuration to make claims about the group size in its relation to off-task activity; further, given the naturalistic setting, we did not have control over these configurations. In our corpus, trios are overrepresented relative to dyads or groups of four students.

Additionally, because students were able to choose whom to work with and where, some students appeared in more than one video, working with the same or different peers. Across our corpus, there were a total of 16 unique students represented across all videos. Of these, seven students appeared in only one video. Of the nine students who appeared in more than one videotaped session, two students participated in two sessions, four participated in three videotaped sessions, and one student participated in each of four, five, or six videotaped sessions. Appendix B offers greater detail. A given individual who may have been particularly more or less inclined toward off-task activity and who participated in multiple videotaped sessions may have unduly influenced patterns found in our analysis. In addition, videotaped sessions varied in relation to task and time. The length of the sessions varied, lasting

between 16 and 38 min. Additionally, the corpus of videos represent eight different instructional days and, therefore, different tasks that may have varied in its affordances for collaboration. The length of a session, coupled with a task that more or less afforded productive collaborative dynamics, may have also affected whether, when, and in what ways off-task activity arose.

These variations limit the kinds of claims we could make with our data. Rather than control for these variations as they played out in our focal classroom context, we delved into the collective set of collaborative problem-solving dynamics across task, time, and students during one focal unit in one classroom for broad insights to pursue in future work. In this sense, our findings should be taken as exploratory in nature and offering beginning understandings of the nature and function of a range of off-task activity on student collaborative learning.

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(*Appendices follow*)

Appendix A

Descriptive Statistics of All Off-Task Interactions ($n = 56$)

Code	*n*	Mean duration	Min duration	Max duration	*SD*	Total time	% Time	% Instances
Growing and sustaining collaboration	28	50.4			55.5		42.06	50.00
Warm up to collaboration	9	29.8	13.8	77.9	20.3	268	8.00	16.07
Gain attention of others	7	81.8	9.5	234.9	85.5	573	17.08	12.5
Gain access to collaboration for self	6	44.0	11.8	151.2	48.9	264	7.88	10.71
Recruit others into collaboration	6	50.8	6.7	83.8	31.5	305	9.10	10.71
Tensions/challenging the collaboration	6	76.0			123.1		13.60	10.71
Destabilize collaboration	4	97.1	9.0	350.2	146.1	389	11.59	7.14
Resist concentrated authority	2	33.8	27.4	40.1	6.4	68	2.01	3.57
Dealing with time and task	27	79.1			84.5		63.71	48.21
Fill time	17	53.5	6.9	193.7	51.9	910	27.14	30.36
Avoid work	7	107.4	18.4	361.4	125.5	752	22.42	12.50
Extend task	3	158	133.1	180.4	19.4	474	14.14	5.36
Other (flop)	7	78.3	12.3	350.2	112.3	548	16.35	12.50

Note. All times reported in seconds.

Appendix B

Frequency of Student Participation Across Sessions and Group Configurations by Session

Student	Sessions												Total appearances
	1	2[b]	3[c]	4	5	6	7[a]	8	9	10[d]	11	12	
Aaron						✓[†]							1
Caryn												✓	1
Denise	✓			✓			✓[†]						3
Erica												✓	1
Felix		✓				✓		✓	✓[*]	✓	✓		6
Gabe			✓		✓		✓						3
Isabel												✓	1
Jessica	✓			✓						✓	✓		4
Jose		✓						✓	✓	✓	✓		5
Katy			✓		✓		✓						3
Kiara										✓	✓		2
Lina							✓						1
Marcos												✓	1
Melissa						✓							1
Mutya		✓						✓	✓				3
Victoria	✓			✓									2
Total number of students (group configuration)	3	3	2	3	2	3	3	3	2	4	4	4	

Note. The following symbols offer further clarification: [†] student worked independently. [*] student began in group but left after 2 min. [a] Vignette 1. [b] Vignette 2. [c] Vignette 3; and [d] Vignette 4.

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