

## Chapter 4

# Organizational Mediation of Urban Science

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On this late morning of a sunny fall day, I arrive with a colleague at the main entrance of City High. The building still strikes me as a prison, although I have become familiar with it over the past several years while doing research in this setting. The sense of visiting a prison intensifies as I open the entrance doors and face a metal detector—as always, I step around it but, invited by a co-researcher to sign in, step toward the table where two individuals are engaged in a lively conversation. We walk up and my colleague shows his ID card while saying that I am a visiting researcher.

We stop at the main office to ascertain that our meeting with the assistant principal is still on for later in the afternoon. At the counter that separates the front part of the room, an African American man with a teenager is talking to an individual on the other side. A few other students sit or stand in this area. In the background, on the other side of the counter, several women at their desks talk to one another, and do not acknowledge us. We wait and then catch the attention of the assistant principal, which allows us to set our meeting for four o'clock.

We walk to the stairwell and up to the third floor where the science, engineering and mathematics (SEM) small learning community (SLC) is located. The assistant principal has told us that Cristobal Carambo, the coordinator of this SLC, is probably in his science classroom, involved in lunch period tutoring sessions. As we approach the designated classroom, we find Carambo speaking

in Spanish with two students. One of the two is, as I find out later, a twelfth-grade student participating in the tutoring program as a mentor to the second student. Carambo points out two other females in their early twenties, one Asian and the other Caucasian, each working with two African American students. He explains that they are engineering students from the nearby university, helping City High students with science and mathematics.

This science classroom becomes our home base for the remainder of the day, since Carambo, whom I interview later this afternoon, has made this place his headquarters. Those needing him apparently know that they can find him there. In the course of the next three hours, many come and go. The new Spanish teacher in the SLC comes to pick up the materials left by the previous Spanish teacher, who had gone on sick leave. Two students, who have been asked by their science teacher to leave their classroom, Bobby for sleeping (we meet him again later in this chapter) and the other for doing homework for another course, also arrive in the room. Carambo, after briefly talking with them about having a meeting with the teacher later, asks the two to sit down until he has time to accompany them to “have a chat with the teacher” and resolve the issues of contention. There are also several twelfth-grade students apparently returning with class sets of completed PSSA personal information forms, and leaving, after having been instructed to go to another classroom, with a fresh set of forms. All afternoon, Carambo is busy attending to the needs of others. In fact, Carambo had asked the twelfth-grade students to assist him in getting the PSSA forms completed, because attending to the needs of others takes considerable time and only allows him to personally complete the task in one tenth-grade classroom taught by Juanita Solento, a chemistry and physics teacher in SEM.

When Carambo visits Solento’s chemistry class, it begins with a considerable, twenty minute delay since the students have been asked to complete the cover sheet for a standardized examination (PSSA) that the school district main office has scheduled for one of the following three days. While they are waiting for the students to complete their task, Carambo talks to Solento repeatedly and at length, both to organize the time for completing the form, and about other issues. While moving back and forth from Solento’s classroom to his room to get the forms, Carambo interacts with a physics teacher and a coordinator from another SLC. Although they evidently want to talk to him, the interactions are icy. I find out that the first teacher had been competing with Carambo for his coordinator position; Carambo had “stepped on the second person’s toes” while attempting to place a student in her SLC so that he (student) could take the courses of his choice.

At the end of the day, my colleague and I return to the main office. When we arrive at the assistant principal's office, she invites us in although she is currently talking with a school police officer. They are talking about an incident, in which he removed an unruly female student by her arm, and after having been expelled, she had returned to school with a parent, to complain that the police officer had roughed her up. The parent was the one we had seen in the office when we entered the school earlier that day.

### **Fields and Interactions**

During this single day at City High, I spent time in different settings within the school. In each of these settings, I witnessed events and patterns of behavior similar to others I had already seen during previous research stays. But events and behaviors differed between settings—I saw non-teaching assistants and police officers at the entrance, parents interacting with school personnel, students waiting around in the foyer of the main office, science teaching, and tutoring during lunch. Other events were not only new to me but also, as different individuals with whom I interacted in the course of the day told me, were infrequent and even singular. The request to have students fill out the title pages of the standardized test had arrived at the school only that same morning, and there appeared to be a frenzy of activity to get everything set for the next three days, including a change of bell schedule, forms, supervision, etc. The settings were not only different, but also what happened there, most of the time, seemed to be independent from what happened somewhere else. For example, the interactions between the father and the school personnel in the main office had no bearing on the tutoring sessions that we saw immediately after; but he was in the main office because of a series of events following his daughter's actions in a setting other than the office.

In each of the settings within City High, I observed a different set of cultural practices, which, though characteristic, were not enacted in a deterministic fashion. Thus, Carambo's presence during the tutoring session did not influence events in a determinist way but rather contributed to the possibilities. His fluency in Spanish, for example, became a resource to the tutor-tutee relationship. But the interactions with students may not have occurred had I arrived ten minutes earlier and taken up Carambo's time.

To analyze cultural practices within and across multiple settings, the construct of field is useful (Bourdieu and Wacquant, 1992). A field is a system of

social and material relations that functions according to its own, characteristic logic (rules), which is partially inscribed in and arises from the sociomaterial resources available to the actors, who themselves bring structure in the form of schema. Classrooms, main offices, teacher staff rooms, and hallways constitute fields, where characteristically enacted practices are related to roles, spatial arrangements, entitlements, and artifacts; all these are resources for actions available to be accessed and appropriated by students, teachers, administrators, and others. Whether they are actually accessed cannot be predicted because of the emergent nature of social action in general.

Any action is therefore doubly structured, by the relevant sociomaterial resources available in the setting and by the schema embodied by the person. However, the structuring processes are non-deterministic, because resources (e.g., an artifact) and schema (the way participants perceive and act toward the artifact) are two, non-identical aspects of the same irreducible unit. For example, the metal detector at the main entrance is both an opportunity and a constraint for action; different actors perceive it in different ways leading to different actions and the production and reproduction of different aspects of society. Since all students entering the school have to pass through it, this has led in the past to two-hour line-ups before students could get in. Of course, this mediated subsequent actions in the sense that the scheduled lessons including science could not take place as planned. Teachers and students viewed these delays in ways ranging from frustration to relief. Some teachers and students appreciate the presence of the metal detector since it creates a sense of security that would otherwise be lacking for many. My stepping around the metal detector, a manifestation of White privilege, is for me an opportunity not only to show that I find the practice demeaning, but also to question the practice of having the detector there. Both points also show different forms of equality and power being enacted. The students, mostly African American, are subjected to the procedure and have to suffer an effect of power, whereas I, a White professor, can without trouble circumvent it.

Organizational effects are created when different fields interact. Although the cultural practices within the different fields of a school often seem to be independent, they are actually connected by artifacts that move between fields and people that traverse them. Artifacts, including human bodies, structure events (in non-deterministic ways) because they are resources for the actions of people in and constitutive of the field. First, when artifacts move into a different field, they contribute to the structure of events that happen there. For example, when administrators of a school district instruct principals in the system to test all stu-

dents and all students take the test, many processes and effects take place. A letter or fax containing instructions arrives in a school; the principal uses it as a resource for action, telling the coordinators of the SLCs that testing will take place; she instructs the assistant principal to create a new bell schedule to structure the temporal organization over the next three days. Her actions therefore both produce and reproduce the school as an organization nested in a larger organization. Objects moving between the different settings linked and therefore produced the different levels of the organization. However, the way in which an object structures the events in a setting is not predetermined, and the same form or instruction can give rise to quite different practices as they move across field boundaries.

Second, organizations come about when members, normally from different fields, interact in the same setting. Organizations are produced and reproduced in interactions, as participants use what they understand about the organization as a resource for their action. A teacher who comes to the SLC coordinator because she has difficulties with a particular student crosses from her classroom into the coordinator's office where they seek a solution that may or may not have been achieved in the original field. However, as I show in this chapter, such interactions not only get things done and therefore produce and reproduce the organization, but also contribute to who the various actors are, including their relative position within the organization.

Organizational phenomena require coordination between fields, which requires work because each field is characterized not only by the participants, artifacts, and practices, but also by a particular timescale, duration, sequence, temporal location, deadline, and cycle of events. Time is inscribed within the artifacts, operating routines, organic matter, habitual norms, and sedimented practices (Kavanagh and Araujo, 1995) and social actors are not just subject to time ("there is no time for labs," "students wasted time") but also use time in productive ways ("make time for meetings," "sync our schedules"). Organizations stand and fall with their members' ability to produce and reproduce coordination despite differences in the structures characteristic of each of their many fields.

This perspective on schools as organizational phenomena cuts across the divide often made between micro level, on the one hand, and meso and macro level, on the other. These levels are treated here as a heuristic for the analysis of a singular but dialectical phenomenon: individual, face-to-face interactions produce the organization, but the organization constitutes a structure that social actors are continuously oriented to. Social actors draw on and use organizational

phenomena in their actions, thereby producing and reproducing these phenomena that frame and enable them. Schools, school districts, and society at large are meso and macro level phenomena that are continuously oriented to, produced, and reproduced in micro level social actions and interactions.

To account for the differences in science teaching and learning across school systems and schools, we need a better understanding of organizational mediation of the events that make a school. In the following two sections, I analyze the two processes that have organizational effects, that is, which produce and reproduce an organization (i.e., make it what it is). First, I focus on the effect of boundary objects, material entities that cross from one field into another, on the social practices in the field where they arrive. The name of the concept derives from the fact that boundaries between fields can be recognized when the same object leads to different practices. Second, I show how micro level interactions produce the school as an organization. Finally, I intimate how boundary objects and micro level interactions mediate science teaching and learning.

### **Boundary Objects and Power**

The school district office, school main office, and SLCs within the school all are organizationally complex, and they constitute fields or sites for the enactment of characteristic culture. These fields are not independent but are dialectically related such that each contributes to the constitution of the other. Each field is characterized by its structures, including the time scales at which processes and events typically occur. On their trajectories through and across different fields, objects and people, marked by their own characteristic structures, find themselves interacting (being caught up) with objects and people, experiencing culture enacted with different structures. The relevant individuals in the school district offices may decide to have all students take a high-stakes standardized examination (in this case, the PSSA) and, on Monday morning, fax the instructions for Tuesday through Thursday testing. The fax considerably mediates events in the school and in the members' lives both on a short- and long-term level. In the short term, the exam mediates science teaching and learning as it disrupts classes for an entire week. In the long term, the outcome of testing has effects not only on students (whose college aspirations depend on these tests) but also for the school, whose very existence is at stake because the district office requires a certain minimum student achievement for the school to continue with its current teachers and administrators into the coming school year (Roth,

Tobin and Ritchie, 2003). That is, boundary objects may create a mix of circumstances where individuals no longer feel in control of events but feel swept away, becoming reactive. The feeling of being swept away and being reactive is an effect of boundary objects, because participants in a particular field do not feel that they have control over these objects in the same way that they have control over objects that originate in their own field.

The arrival of boundary objects in some field is inherently associated with contradiction and conflict because of differences in structure between source and target fields (e.g., Hogle, 1995). Administrators (assistant principal, SLC coordinators) feel the need to deal with unfolding events in a more or less immediate manner, which leads them to experience themselves as reacting to all the problems emerging in the course of the day rather than attending to a previously established work plan. This is evident from the situations I encountered at City High. (From a research perspective, this makes any interviewing of coordinators and assistant principal during the school day a difficult affair, because any session could be terminated or interrupted by one of the frequently occurring reactive moments of indeterminate duration.)

Early Monday morning, the school had received a notice from the head office (“downtown”) that PSSA testing would take place Tuesday through Thursday. The principals then communicated this information to the coordinators, who had to change their routines on the spot so that they could get all students to complete that portion of the standardized testing form that contains personal information items. To get the job done, the coordinator of SEM, Carambo, had asked three twelfth-graders to assist him by taking the forms to the classrooms and then picking them up again once they were completed. Classes were interrupted and planned activities were rescheduled. That is, an artifact that had transited from one field into another brought about a substantial change in how the time available in the day was used. All parts of the school were affected including principals, coordinators, and students.

Carambo felt constrained in his actions, having to require all students in his SLC to complete the coversheet while attending to the normal demands of his job, which included the needs of different people as they arose in a normal day in the SLC. He described the effect of the memo from the district office as “PSSA nonsense” (see below). While he was personally attending to this task, he also had to deal with students being excluded from the classrooms by teachers and with teachers who had particular concerns and wanted to see him. As a result, he was prevented from doing what he had planned to do.

The district fax had effects on other objects, including the bell schedule (e.g., Figure 4.1). The bell schedule is a boundary object for the explicit purpose of bringing different fields into or out of alignment by regulating their temporal unfolding. Students and teachers move from classroom to classroom, preparation and lunch periods, and begin and end their school day based on it. But between SLCs, lunch periods, for example, are scheduled differently (Figure 4.1), which decreases the number of students in the hallways and cafeteria and therefore increases the levels of control over students that can be enacted. When the fax from the school district arrived, it mediated teaching and learning on this Monday and brought about the creation of a new bell schedule for subsequent days that was distributed to all members of the school community. That is, while the content of the fax had served the needs of district personnel to make the different schools and students comparable by aligning their schedules, thereby preventing information about the standardized examination from moving between different schools and students, it brought about considerable interruptions within the fields that it had targeted.

The school administrators realize that such changes as those brought about by the fax upset “a lot of people” (assistant principal) because, for example, teachers are asked to create lesson plans and they do, but then they are pre-

ECO				SEM			
From	To	Min		From	To	Min	
8:05	11:05	180	test	8:05	11:05	180	test
11:05	11:18	13	adv	11:05	11:18	13	adv
11:21	12:15	54		11:21	12:15	54	
12:18	12:45	27	lunch	12:18	12:45	27	prep
12:48	1:42	54		12:48	1:42	54	
1:45	2:12	27	prep	1:45	2:12	27	lunch
2:15	3:09	54		2:15	3:09	54	

  

E&L	11:21	11:48
SEM	12:18	12:45
CEO	12:48	1:15
ECO	1:45	2:12
ITA	2:42	3:09

  

PREP
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**Figure 4.1.** Reworked bell schedule for two of the academies for the days on which the high-stakes examination were taken. Parsed out for the benefit of administrators are the preparation times for different academies.

vented from teaching according to their plans. Or teachers might have planned for and students have gotten ready for a unit test, which they can no longer administer when they are asked to attend a school-wide assembly without prior notice. The assistant principal realized that different constituents in the school are frustrated when they are asked to change the schedule without adequate advance notice, and she also felt frustrated by the necessity to align the teachers' and her timelines with those of the school district.

So it is an interesting dilemma because everything is reactive, because you don't have an opportunity to sit down and think. Well let's sit down and let's do that and do that. Everything comes at you. It is like being assaulted every morning. And there are very bad systems in place. (Assistant principal)

Carambo may be seen as reactive because he deals with the issues as they arise in real time. Having students complete the coversheet of the high-stakes exam is an instance of the timescale of the institution, shaping events in the classrooms, interrupting the flow of activity, and breaching the plans of science teachers. There is a contradiction in that an order that "comes down the pike" acts counter to the very goals of such tests—to hold teachers accountable for delivering high quality education.

In this section, I show how objects that originate in one field become resources for the enactment of organization in another. They constitute a central aspect of organizational phenomena and directly address the question of how meso and macro level phenomena ever arise from micro level interactions. However, researchers should not assume that such boundary objects *cause* the events in a particular field. It remains a task of the analyst to show whether the enactment reproduces and reifies the organization or whether it destabilizes and thereby changes it. Thus, for example, there are circumstances where administrators allow some teachers and classes to not follow the request (boundary object) for all members of the school to gather in the assembly hall.

I think a teacher should have the right to say, "Well my class can't go." I brought that up at the leadership meeting, because we did [have such situations] last year. Several teachers came to me complaining because this [call for an assembly] came up very quickly, and they said they've got a test, and I said, "Well, I will go down and say you are not coming." And I'd say this is how you get teachers to cooperate more, because you are respecting what they are doing in the classroom. (Assistant principal)

Rather than assuming that instructions, orders, and rules produced at one (meso, macro) level of a school organization *cause* the behavior of its members elsewhere, researchers need to consider how boundary objects are taken up as resources in a field and mediate actions. The fit between action on the one hand and instructions, orders, and rules, on the other hand, can only be established, even for the most accomplished practitioners, after the fact (Suchman, 1987).

### **Crossing Times**

Social structure is both a resource for and a result of social interaction. Through their actions in real places and under real and quite specific conditions of action, social actors structure schools as organizations. That is, schools are not fixed structures that exist outside, deterministically conditioning human actions and interactions. Rather, every day and in every instance, schools are reproduced, as they have historically evolved, and produced in new ways. Their inhabitants (administrators, teachers, students, support staff) continuously make and remake the organization what it is, all the while being oriented to what it historically has been. What needs explanation is this stability of organization in the face of the obvious human capacity to act this or that way.

Schools, like all social organizations, are unlike mechanical and simple physical systems whose behavior can be predicted fairly accurately. Unless there is some form of breakdown, a mechanized assembly line generates a continuous stream of products, one part of a machine interacting with another part in predetermined and infallible ways. Social systems, however, are never quite the same because they emerge from the dialectic of structure and agency, whereby structure itself embodies the dialectic of resources and schema. Dialectic means that there is an inherent, structural contradiction that leads to actions in a non-deterministic way. This is both a constraint, in that social actions are never quite the same and therefore are always associated with uncertainty, and an opportunity in that every social action can also contribute to changing the system. Most importantly, because of its non-deterministic nature, social action is flexible and can accommodate unforeseen circumstances. However, even the flexibility allows the reproduction and therefore reification of institutional structures as the following episode shows.

Thus far, I have shown that schools as organizations are made and remade when people use boundary objects, entities produced in another field, as resources for action in the field they currently inhabit. In the subsequent sections,

I show how a school is produced and reproduced as an organization in face-to-face interactions, which constitute times when the trajectories of institutional actors from different fields align and cross for at least a short time. The episodes shed light not only on the work of members that make school the organizational setting what it is, but also on the work done by one member in particular, Carambo, the coordinator of the SEM SLC. All three episodes show how organizational effects mediate science education in one form or another.

### Making Time for the “PSSA Nonsense”

Events such as those requested in the fax from the school district office do not just happen; they are not the outcome of a causal chain of actions that characterize mechanical engines. Rather, such events have to be brought about through embodied human action. Furthermore, their very occurrence needs to be made possible. However, making possible the taking of tests or completion of forms requested by someone in the district office also produces the organization. When the requested event takes place, one can say that subordinates have followed an order or instruction. In this episode, I analyze how an event—the completion of the biographical section on a standardized test—was enabled during the interaction between Carambo and Solento, one of the physics/chemistry teachers in the SLC.

The episode was recorded on the Monday when I visited the school. As a result of this brief interaction, both Carambo and Solento made time for a task that became a twenty minute disruption to a tenth-grade chemistry course. That is, in this situation, they were not merely subject to time, but also produced time as a resource required in and for subsequent action. This time, however, would constrain Solento, who had planned to take students to the laboratory, and was preparing students for the lab work at the moment when Carambo arrived in her classroom,

- 1 Carambo: You have eleventh or tenth graders?  
(0.41)
- 2 Solento: I have tenth graders
- 3 Carambo: I am going to interrupt your class a  
[little bit because they gave me all the P-S-S-A, P-S-A-T]
- 4 Solento: [Uh: um]
- 5 Carambo: non sense to do.
- 6 Solento: [Uh um]
- 7 (0.40)
- 8 Carambo: and I've got to come in and take about

- 9 (0.33)  
 10 Ten minutes so I'll . . .  
 11 Solento: See, okay, so I, okay, after ten, fifteen minutes will be in the lab,  
 so you're gonna have to come by=  
 12 Carambo: =You be in the lab?  
 13 Solento: Yea, so maybe you can, yea maybe one thirty five  
 14 Carambo: [MAy be WHY I don't come ↓ Right away  
 at the beginning so yea so I come to your class first ] yea o kay  
 15 Solento: [One thirty yea uh um yea ]  
 16 (0.25)  
 17 Carambo: ↓Aw'right. I'm gonna be right back.  
 18 Solento: °Yea, okay.°

In this episode Carambo and Solento, as social actors, make the organization what it is. They both use organization as a resource for their (verbal) actions and produce organization at the same time. Thus, Solento already acceded when Carambo, through his presence, indicated a wish of wanting to talk to her. Solento acceded and thereby made time for the interaction to occur, rather than saying, for example, that she was busy attending to the preparation of the lab. Making time to allow interactions to occur makes organizations what they are, even if these interactions are not planned but are made up and negotiated on the fly.

Carambo said that he was going to interrupt the class, but then placed the locus of control elsewhere, by indicating that an indeterminate “they” had given him “all the PSSA, PSSA nonsense to do” (lines 3, 5). Not only did “they” give him this nonsense to do, they are also powerful because they make him “come in” (line 8). “They,” whoever it is, become powerful agents because they are able to make him, Carambo, do PSSA nonsense, all the while he qualified as nonsense the things that he was made to do. “They” not only have power over Carambo, but also over Solento, who is not merely asked to give Carambo some time to do the PSSA nonsense, but is told that Carambo would be coming in. How actors describe the organization is also how they orient to it; the two are sides of the same coin.

In this episode, the two participants not only made the time required for the completion of the forms but also reproduce institutional relations of administrator and subordinate. Carambo vied for control of the situation by saying what he would do instead of asking if he could interrupt the class for a period of ten minutes to get the “PSSA nonsense” done. In addition, he overlapped Solento’s turn at talk, thereby vying for control over who was talking at the moment. Initially, he indicated that he was going to interrupt the class, beginning his utter-

ance while Solento was still in the process of articulating the specific class she had (line 2-3). In this instance it looks as if Solento was at the end of her turn anyway, so that abandoning it was easy enough. However, later on, Carambo began to speak prior to Solento's completion of an idea unit by a process called latching, whereby he left no pause (lines 11-12). Similarly, in the course of Solento's next turn (line 13), Carambo began to talk (line 14). Solento did not show signs of abandoning her turn; at the same time, Carambo not only spoke much louder than Solento but also much louder than he had spoken before and after that. He not only vied for the turn by overlapping Solento, but as she did not stop talking, he increased the loudness, which only faded away when she had stopped talking (line 14). Once the situation was navigated and Solento no longer vied for the turn, the volume of Carambo's voice decreased toward the end of the episode (line 17).

Initially Solento indicated that she would be in the lab after the first ten or fifteen minutes of the lesson. Carambo therefore *had* to come by at that place rather than where they just met. Carambo would therefore not be entirely free to do as he wanted, but was constrained to come where she would be with her students. More so, Solento asked Carambo to come by the lab at a specific moment, 1:35 (line 13). But Carambo proposed a different course of action, according to which he would come to her class first—he elaborated on what this might mean in his next turn, “I’m gonna be right back” (line 17). As Carambo suggested that he was coming “right away,” Solento began, overlapping with him, to revise the time to 1:30 and then acceded to his suggestion to administer the task “first” and “right away.” Solento not only acceded by using the affirmative “yea okay” (lines 15, 18) but also by the decreasing loudness of her voice, which faded away in the last turn (line 18).

Stepping back, we can see this episode as a moment where time was being made for administering a task to students, filling out the biographical section of a standardized examination to be held on the next day. Solento was unaware of this new task, and Carambo was constrained in his action, knowing that this had to be done before the end of the school day. The analysis shows that Carambo made moves to impose the interruption according to his schedule rather than asking Solento when it would be most appropriate and opportune given that her class was in the lab. Solento ended up acceding, so that in this situation Carambo's institutional power as coordinator of the SLC was reproduced.

In this situation, not only Carambo's institutional power was reproduced but also that of the central administration, which controlled the events not only of the day but of the entire school week. The power is not inherent in “school

administration,” but it is inherent in the system in the sense that Carambo’s and Solento’s actions reproduced a structure whereby the instruction to have the standardized examination this very week actually got all social actors in the school to align themselves to this instruction. This was not always the case as my example of teachers and classes excused from a general assembly has shown.

Although institutional power was a resource for the conduct of social interaction, it did not *determine* how interactions unfold. Rather, there is evidence that Solento made moves to structure the interruption according to her own, here unarticulated, temporal commitments and structures. Thus, she actively worked for imposing her orientation to time and space, though in the end acceding to Carambo’s schedule.

The outcome of the interaction had effects on science education in the sense that it directly constrained the laboratory activity, which Solento had planned (as per required lesson plan) and prepared. The completion of the forms taking place at the beginning of the science lesson, rather than when Solento had originally suggested, provided the opportunity for the process to take longer than the ten minutes that Carambo had forecasted. Thus, when all students were done, it had taken twenty minutes of the lesson, time that students could have spent learning science.

### **Setting up a Child Study Problem (CSP)**

Institutions are made not only in the recurring unfolding of nearly identical daily activities, but also in allowing special (series) of actions to occur when social actors recognize or establish a need for them. Because they are non-routine, such (series of) actions have to be set up and organized (planned), requiring the mobilization and coordination of institutional resources including relevant personnel. Furthermore, the bringing about is itself an aspect of the organization, especially because it is not a regular aspect. Thus, we know that meetings such as getting a student into a special education service constitute dynamic events in which students come to be constructed as having some problem (learning disability, social problem) and plans of action are established (Mehan, 1993). The institution may or may not have established protocols for conducting such meetings, which are resources for action rather than causal determinants of actual events. However, establishing the need for such a meeting is itself an aspect of institutional work that social actors do, and for which they make time, often in an ad-hoc fashion. Brief and innocuous interactions in a hallway or classroom

may contribute to the constitution of institutional processes that unfold with their own temporal dynamic and lead to resources (e.g., plans of action) that constrain the actions of others. Institutions therefore are not just made in important meetings or processes with a pre-established order for unfolding, they are also made in the short and insignificant moments when constituent actors decide to get some other process started. I exemplify these interactional aspects in the following episode, which led to a student becoming subject to a process called the “child study problem” or CSP.

According to Carambo, the first tier of a CSP involves the student’s parents, all his or her teachers, school nurse, counselor, special education teacher, and SLC coordinator. The purpose of a forty five minute CSP meeting is to arrive at a plan of action, a coordinated series of steps designed to ultimately lead to improved grades or social behavior. If these interventions turn out to be insufficient for addressing the problem, a decision may be taken to move to second tier processes, which normally include additional professional help.

In the following episode, Carambo and Solento make, almost in passing, a substantial decision that brings about a variety of events centering on a student failing physics and chemistry, and which involves different people, normally spread across space, who may seldom see one another face to face. In the process, they produce and reproduce the institution, and reify the CSP as a viable process for dealing with particular issues. More so, even this brief encounter concerned with a student and his problems, is a moment for constituting institutional relations between the SLC coordinator, on the one hand, and one of his teachers, on the other. In the process, they produce and reproduce school, organization, power relations, and their own identities.

- 1 Solento: And about Carley?  
 2 (0.52)  
 3 °↓Okay.  
 4 (0.23)  
 5 Carambo: WWho?  
 6 Solento: *Carley*.  
 7 (0.21)  
 8 Carambo: °↑Eche°vari[a?]  
 9 Solento: [Uh]um.  
 10 (0.31)  
 11 Carambo: °U:m:°  
 12 (0.90)  
 13 Solento: Doesn’t want to do anything. He is failing  
 14 (0.29)  
 15 like both class [es, chemistry ↑]and physics.

- 
- 16 Carambo: Good, so:?:  
17 Want to do a C-S-P?  
18 (0.55)  
19 Solento: Yes.

Immediately prior to this episode, Solento and Carambo had talked about another student, who had caused some problem in Solento's class because he wanted to sit in the back of the class and talk rather than in the front where she had asked him to sit. Only a brief pause after Carambo had articulated an action he was to take with respect to that student, Solento uttered "And about Carley?" which, because of the rising tone at the end, can be heard as a question, "What do we do about Carley?" There was a 1.15 second delay before Carambo spoke, bridged by Solento's utterance "Okay" (line 3). This utterance was not designed to take the next turn. Carambo took his turn with an especially loud "Who?," which can be heard as an indication that he was unclear both about content of the question, who the particular student is, and context, as if he was returning to a conversation that he had not attended to. The two elements together constituted a request for providing more specific information. In response, Solento simply reiterated the first name of the student, with emphasis (line 6). In this, she indicated that Carambo ought to know the particular situation referred to, and perhaps that she took the long delay as an indication that Carambo had not heard the name. Carambo then uttered a last name, which Solento confirmed even as Carambo finished pronouncing it (lines 8, 9). There is then a short and a long pause, surrounding Carambo's "Um," which indicates that he does not want to take the turn but is perhaps waiting for the problem to be further articulated by Solento, who did so by elaborating that Carley was not working and that he was failing both of the courses that she was teaching him (lines 13, 15). There is then a pause, during which Carambo could have started a turn but did not. A pause can serve as a request for further elaboration and provide the space for it. Once Solento's unfolding articulation was beginning to sketch the problem, Carambo utters what can be heard as a request for her solution, "Good, so?," and then he specifies whether she wants to have a CSP (line 17). After a (hearable) pause, Solento affirms.

In this situation, the two not only brought about a CSP for Carley but also enacted power in an asymmetric way. Although Solento identified the particular double problem at hand, the student did not want to work *and* was failing, it was Carambo who proposed the CSP. Equivalently, Solento might have requested a CSP. If she had asked for a CSP, she would in fact have attempted to make a

decision for which Carambo was responsible. Solento did not. His authority therefore had been reproduced and went unchallenged.

Despite its apparent brevity (less than twelve seconds), this unplanned meeting would have long-term consequences in the school and to the student. It is not just that these brief interactions bring about the alignment of temporal processes of different fields and of different scale, they also perturb other fields, such as the programs that are made available to students, and therefore the development of students. In this brief interaction, a decision was made to bring together the student's teachers, nurse, counselor, parents, and special education teacher to talk about a plan of action. Such a meeting results in a different trajectory for the student for the next weeks, months, and even years, perhaps until he completes high school. Yet more work needs to be done before this meeting can come about. Time and space are resources that need to be made available, necessitating that the schedules of the quite diverse membership are synchronized.

Whether the CSP would lead to an improvement in Carley's grades cannot be known. Nor can it be known how the CSP would mediate other aspects of Carley's life, reproducing failure or producing a very different trajectory altogether. Concrete analysis of the specific case is required to understand how particular structures created by actions become opportunities and constraints for subsequent actions. My research at CHS showed that even students apparently doomed to failure can participate in creating resources that ultimately lead them to successful high school and college careers.

### **Producing the Caring Coordinator**

As in all schools, there are many opportunities for contradictions and conflict to mediate particular fields, which prevent events from unfolding in the ways they are normally reproduced with little change. How conflict is dealt with contributes to making the organization what it is. In SEM many students and teachers recognize Carambo as a person who deals particularly well with students, especially in conflict situations. Carambo's orientation toward action is one that focuses on students and their needs.

Carambo's "students first" orientation would not have much purchase unless it was the outcome of interactions. Here, I analyze a brief interaction with Bobby, one of the students mentioned in the introduction to the chapter. Together with another student, he had been sent out of his classroom because of behavior perceived by the teacher as inappropriate. Due to a contradiction in the

way students are assigned to courses and classes, both students felt familiar with the content and were bored as the teacher attended to the needs of students insufficiently prepared because they lacked a prerequisite course. (A detailed analysis of these contradictions and the mediating effects to science learning is provided elsewhere [Roth, Tobin and Ritchie, 2003].) Whereas the other student attended to his homework for another course, Bobby, mediated by the onset of a flu infection, went to sleep.

- 1 Carambo: \* Bobby what's wrong with you man, you  
don't feel good?=You don't look good, first  
of all.  
2 (0.46)
- 3 Did you? WAIT, WAit, \*  
4 (0.83)  
5 What's the matter?  
6 (0.37)
- 7 Bobby: Oh I got a little headache is [ . . ]  
8 Carambo: [You] look funny.  
9 (1.03)
- 10 Bobby: I've got a headache.
- 11 Carambo: You're giving him the blues in there a little  
bit in that class, isn't you? \*  
12 (1.65)  
13 So when we finish me and you gonna go  
back and chat with him a little bit  
14 (0.33)
- 15 Bobby: Uh um.
- 16 Carambo: You can't sleep in there but you can sleep in  
the \* back corner over there.



Here, the student Bobby showed up in the science classroom that Carambo currently uses as his headquarters. Not only did Carambo know that there was a problem in general, but from a brief exchange with another student immediately prior to this episode, he was aware that Bobby had been sent from his science class because he had been sleeping. Carambo did not ask for an account of the events but inquired about Bobby's health (line 1). Bobby did not answer but turned around and began to walk away toward the back of the room. Carambo not only asked him to wait, implying that the conversation was not concluded,

but also reached out, taking the student by his arm, and thereby stopping him from proceeding (line 3; the asterisk coordinates text and offprint). But Bobby did not explain. There was a long pause, which, “predictably” (Boden, 1994), led to a reformulation or rather elaboration, “What is the matter?” Another brief pause followed before Bobby explained that he had a headache, an utterance that Carambo overlapped at the end by articulating a perception, “You look funny” (line 8). Bobby reiterated having a headache, and Carambo, now physically close to the student, asked in a conciliatory tone whether he was “giving [the teacher] the blues” (line 11). As there was no response for a considerable time, Carambo proposed a course of action of going back to “chat with him [science teacher]” (line 13). Bobby acceded, and Carambo elaborated that the student could not sleep in the science class (“in there”) but offered him the chance to sleep in the corner of the room where they were. As he uttered his offer, Carambo stepped even closer to Bobby, pulled on his side to encourage him to turn to the back of the classroom and gesticulated “over there” (line 16).

An important outcome of this interaction was the establishment of respect and a caring attitude. Although Bobby had been kicked out of his science class, he did not use the occasion to let off steam or to complain. When Bobby did not articulate his concerns, Carambo persisted in finding out matters concerning the student and proposed a course of action that itself foreshadowed mediation rather than punishment. Even for the time to be spent outside the classroom, Carambo offered Bobby the opportunity to sleep rather than asking him to engage in some irrelevant task for punitive purposes. Carambo emerges from such interactions as an administrator who cares, and students respond, as Bobby, by avoiding conflict.

The decision to have a chat with the science teacher is in fact a resource for dealing with the contradiction that had arisen. The chat led to a cogenerative dialogue, a form of interaction that provides all participants opportunities to contribute to a better understanding of the events in which they are caught up, and to resolve issues. That is, the interaction not only produced Carambo as a caring coordinator but also created the possibility for Bobby to return to the science class and to continue learning rather than to lose face and having to regain social capital through actions that somehow undermine the science teacher and constrain the science lessons.

Although episodes such as this lead to the construction of Carambo as a caring coordinator, and therefore the partial construction of the organization as caring, an asymmetrical relation was clearly reproduced toward the end of the episode, as Carambo articulated what Bobby could and could not do. Further-

more, when Bobby clearly wanted to stay out of an explanation—he turned to follow his classmate—Carambo stopped him by firmly but not violently preventing Bobby from moving away. At the same time, the action enacted closeness and caring. Carambo physically stopped Bobby, then, when the student did not answer by a direct question about his state, Carambo inquired, “What’s the matter?” (line 5).

### **Production and Reproduction of School Organization**

Science educators usually deal with knowing and learning in classrooms as if one could usefully separate them out as a field (unit of analysis) that is not influenced by events and structures elsewhere in the larger organization. What and how students learn and what and how teachers teach are then problems of individuals or, at best, of the classroom as a collective. In the present study, I show that fields interact and the events and entities in and from one field shape what happens in other fields, where they come to structure actions, being deployed as resources and schema. More so, I show how some organizational features of school structure emerge from the interactions of people in particular fields, the interfaces between fields, or by attention to objects that move across boundaries and contribute to shaping events in fields other than those that produced them. The chapter therefore shows how micro, meso, and macro level aspects of urban schools are different aspects of the same phenomenon; they are outcomes of collective life, continuously instantiated in human interaction.

Theorists have long thought that organizations are most efficient and productive when they are split into distinct physically separate and compartmentalized fields distinguished in terms of power, hierarchical leadership, and distinct status of individual members (Lindbeck and Snower, 2000). All of these features are consistent with a fixed and static conception of organization. However, I show that without the movement of objects and people and without the fluidity of face-to-face interactions, schools would not be what they are. The very fluidity embodied in the dialectic of structure and agency is a resource not only for reproducing schools as the rigid organizations that they are but also for producing them in new ways, more congenial for enacting their *raison d’être*. That is, organizations are not mechanical structures that are irrevocably fixed in how they operate and what they produce—although they frequently exhibit predictable collective actions, this predictability is itself an outcome achieved in indeterminate person-to-person interactions. Flexibility is a positive phenomenon,

because it gives us hope for changing situations, which we recognize as not working, and in fact, is consistent with a historical perspective on organizations, which evolve in time. Inflexible school systems would not be able to accommodate changes in external conditions or in response to internal contradictions.

Neighboring (linked) fields are often treated in educational studies as having little effect on one another (Lemke, 2000). For example, studies of learning science regularly look at processes not only independent of the school as a whole but also independent of processes that make a classroom what it is. However, in many instances, the coordination across fields is an organizational reality fraught with difficulty and contradictions. In this study, an instruction created in and disseminated by the head office of the school system becomes a resource that substantially interferes with the events in the school at multiple levels: the bell schedule had to be changed, teachers could not teach the lessons they had prepared, and students missed out on their science lessons. This is a very common phenomenon in human social activity and many aspects of social life can mediate the integration of social activities across different settings and timescales. Visual artifacts, architecture of rooms, layout of seats with respect to focal artifacts mediate events in the settings on smaller timescales such as the structure of the turn-taking in talk (Roth, McGinn, Woszczyzna, and Boutonné, 1999). They constitute material constraints or opportunities for interaction specifically and for making the school (as an organization) what it is in the daily praxis of its inhabitants.

Boundary objects—e.g., instructions from the school district office, or bell schedules for students—may give social actors the sense that they are reactive. The instruction generated in the school district office to administer a standardized examination had an influence on Carambo's day so that he had to stay to do after school what he, mediated by the "PSSA nonsense," was prevented from doing during the school day. How they deal with boundary objects mediates their careers, whether they are students, teachers, or administrators. Feelings of having to be reactive have repercussions for administrators; these feelings themselves are resources for action. If they do not accomplish what they had planned because of a need to attend to the contradictions and conflicts arising from aligning and accommodating objects stemming from and differing in temporality, often administrators will do their work when others are not in the building to disrupt them (e.g., before teachers and students arrive in the mornings, after they have left in the evening or on the weekend). Principals and some coordinators often find one another back at the school on weekends to "catch up" with their work. In fact, extending normal working hours is interpreted as an indication of

“commitment,” which becomes an interpretive resource when individuals are considered for new or vacant positions. This is particularly the case since this commitment is recognized as being at the cost of time to the family life, another field with its own temporality and time demands, rhythms, cycles, pacing, and events. That is, commitment, expressed in the willingness to give “extra time” (i.e., volunteering to tutor students during lunch and after school), translates into changes in another field, personal career trajectories (cf. Brett and Stroh, 2003). In fact, there were indications that administrators not only viewed science teachers as unprofessional (because they did not give extra time to tutor students after school, valuing family time more than an additional commitment in and to school) but also wanted to get rid of them—which would have tremendous influence on science teaching and its continuity in the school.

The bell schedule is another boundary object that is associated with contradictions and conflict. Students have little control over its construction, but its effects mediate practices that interfere with science teaching and learning. Thus, the bell schedule is a resource that not only contributes to the reproduction of schooling structure, but also to practices that disrupt and question it. For example, students who “come late” to science class show that they are masters (in control) of their time rather than being reactive. These students question the institutional structures built on a conception of time as something that not only unfolds linearly but also has become a commodity (“time is money”) which can be gained and lost. From this forced alignment, a number of contradictions and conflicts arise, such as when individuals more attuned to social time become aligned with a linear, machine-like, clock-time-driven schedule. Here, institutional power that attempts to entrain students into the bell schedule is explicitly undermined. School as an organization willing and able to educate the students is questioned in its very *raison d’être*. At the same time, because the school holds students accountable through testing, failed tests and low grades, by means of a chain of events and processes, ultimately lead to a reproduction of the underclass status of the students, their families and cultures. Hence, in science classrooms and school in general, contradictions are experienced by African American youth, who place high value on communalism, social connectedness, and social time (Allen and Boykin, 1992). The greater value placed on such characteristics supports practices that are often in conflict with those associated with an adherence to clock time.

Schools as organizations stand and fall with the face-to-face encounters and meetings that produce and reproduce them. During such crossing times, different stakeholders and peers can get themselves “onto the same page,” by aligning

their visions and actions. Informal and formal, brief and extended, and unplanned and planned meetings are at the heart of negotiating and coordinating the different fields and temporal zones. Agendas, actors, objects, times, and places vary, but meetings are the proper organizational activity for management, locating and legitimating both individual and institutional roles. However the alignment of different temporal zones and material resources, necessary to bring about a common meeting, is itself fraught with difficulties. It is difficult to schedule meetings, but meetings are the place where conflicts arising from temporal misalignment can be dealt with. I am certain that organizational studies will provide us with better understandings about the successes and failures of schools and schooling, and in particular the poor job society has done to generate more opportunities for the students that currently populate urban schools.

### **There is Hope**

In this chapter, I develop a view of schools as organizations that emerge from the movement of boundary objects and face-to-face interactions. Some readers may now ask: “How is this way of looking at school organization helpful? How are the understandings you develop useful to teachers and administrators? and Can teachers do anything other than reify and reproduce structures such as the CSP, since they represent school policies?” I begin by answering the last question as my response will also answer the previous ones. Teachers can do more than reify and reproduce structures; in fact, they continuously produce structure since every action, however similar to the previous one, is inherently different. All cultural phenomena undergo continuous, though often imperceptible change, which is brought about *because*, in acting, we also produce rather than merely reproduce structure. This perspective gives us, as urban educators, the hope we need in our work so that rather than taking schools and school districts as given conditions that we have to accept, we have the possibility and capacity of changing these conditions. This allows administrators, teachers, and students to understand that our actions, no matter how small, have effects: they produce and reproduce the organizational features of schools, including such programs as the CSP. We come to understand that things could be otherwise; and we come to understand that actions, such as those involved in “doing a CSP,” create resources and constraints which can have lasting impact on the person who is the target of the actions.

The perspective on schools taken in this chapter teaches us about the fundamentally dialectical relation between schools as organizations and the individuals (teachers, students, and administrators) that constitute them. My message is not only that we *re/produce* our schools but also that we re/produce our schools. Thus, each individual can contribute to changing both the schools and school districts, which currently contribute in significant ways to the reproduction of inequality. However, we cannot do it on our own: collective action and interaction change the practices rather than individuals. Even though an individual administrator may institute a new policy, its practical realization depends on the collective. Policies are only structures; they, too, are kept alive through reproduction and can be changed through our actions.

Ultimately, the perspective makes us administrators, teachers, and students aware of our individual and collective responsibilities. Our actions continuously produce and reproduce social structure and, therefore, we can always do otherwise. We therefore have the responsibility of choice. Do we want to contribute to the reproduction of poverty, inequality, and injustice that characterizes our society or do we want to contribute to producing a different world?

### **Editors' Perspectives**

This chapter examines science education in an urban high school through micro, meso and macro lenses. An important issue for researchers is to address macroscopic social issues, such as those that encompass more than one field. Social life is clearly more complex when individuals have to deal with different structures in the fields they populate, especially when those fields intersect or are nested within one another. The examples dealt with in this chapter are classic instances of nested and intersecting fields and the contradictions that arise when resources from one field are accessed and appropriated in another. It is apparent that adequate accounts of social life necessitate explorations of the manner in which interconnected fields structure social life and thereby afford the agency of participants.

Roth's contributes to the theoretical underpinnings of the study by regarding a school as a field consisting of an organization that contains numerous fields. In this way he is able to show that contradictions can be created by the different structures extant in a field. His study of temporal issues underlines their salience as factors that have not been studied as extensively as they might

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be. Additional studies of time, as a component of structure, are considered a priority for research in urban science education.

Uses of cogenerative dialogues have proven useful in identifying contradictions experienced by participants in a field. In instances such as this one in which many fields are nested and intersect, cogenerative dialogues should include participants from each of the relevant fields so that any collective decisions that are cogenerated can include participants with the necessary capital to initiate practices that will allow those decisions to be enacted to produce successful outcomes. For example, decisions about the roster are vital to the learning of students, teaching and the efficient use of human and material resources in a school. Hence cogenerative dialogues should occur among stakeholders to identify contradictions and resolve them.