Establishing Collaborations in Design-based Research Projects: Insights from the Origins of the MMAP Project

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Abstract: The success of design-based research projects depends on the quality of their collaborative teams. In this paper, I use a set of principles for fostering productive engagement to explain how the Middle-school Mathematics through Applications Project (MMAP) got its team of researchers, teachers, and curriculum developers off to a good start. First, MMAP fostered problematizing around MMAP goals by recruiting participants whose goals partially overlapped with MMAP's, and by demonstrating the importance of core goals like equity. Second, the project supported teacher authority by selecting staff already inclined to respect teachers, by showing teachers that their contributions were desired, and by setting expectations that teachers would have the ultimate authority for how curricula would be used. Finally, MMAP fostered accountability by recruiting participants with varied expertise, setting expectations that teachers would change their teaching practices, and encouraging everyone to begin engaging in focused discussions with each other.

Introduction

The success of design-based research projects is crucially dependent on the quality of the collaborations projects can forge between teachers, researchers, curriculum developers, and other relevant stakeholders on their teams (e.g., Collins, Joseph & Bielaczyc, 2004; Design-based Research Collective, 2003). However, previous research has highlighted many challenges involved in forming such collaborations. Many participants engage in collaborations on top of many other commitments, so simply finding times and places for groups to make focused progress together can pose significant challenges (e.g. Hindin et al., 2007). Also, as collaboration is not a primary feature of either teachers' or researchers' work, establishing norms for collaborating effectively can be a major undertaking (e.g., Cobb et al., 1990; Grossman, Wineburg & Woolworth, 2001; Lieberman & Grolnick, 1996). Finally, participants often differ markedly in terms of their goals, values, backgrounds, and external accountabilities, which makes is difficult to make progress on both joint and individual goals (e.g., Cochran-Smith & Lytle, 1999; Grossman et al., 2001; Wood, 2007).

How might projects go about establishing collaborative communities that can address these and other challenges? This paper contributes to a growing literature on how design-based research projects organize themselves to support effective collaborations (e.g., Cobb, et al., 1990; D'Amico, 2005; Greeno et al., 1998; Grossman et al., 1999; Palincsar et al., 1999). Specifically, I summarize selected findings from a larger study of how collaborations between a diverse group of teachers, researchers, curriculum developers, and other stakeholders were supported over a decade within the Middle-School Mathematics through Applications Project or MMAP (Engle, 2006). MMAP, which was funded from 1990 to 2002, was a design-based research project that designed and researched innovative technology-intensive middle-school mathematics curricula (Greeno et al., 1999). The curricula embedded mathematics within extended real-world scenarios in hopes of engaging a much wider range of students in math (see Goldman & Knudsen, 2004; Goldman, Knudsen & Latvala, 1998).

Here, I analyze how the project got started, focusing on how productive collaborations later on were supported by the decisions MMAP made about how to assemble its initial team and run its first orientation. My goal is both to share specific ideas that other projects can adapt from when initiating their own efforts while also contributing to the development of general theories about how productive collaborations among diverse stakeholders can be supported.

Theoretical Framework: Principles for Supporting Productive Collaboration

I organize my explanation of how MMAP initiated productive collaborations among its diverse stakeholders by adapting four principles my colleagues and I originally developed from existing literature and empirical work to explain productive engagement in classrooms (Engle & Conant, 2002; Engle & Faux, 2006):

1. *Problematizing* together: The group finds joint problems to work on that all members of the collaboration are committed to working on together, problems that are considered to be sufficiently unsolved, important, and accessible to all (e.g., Cobb, et al., 1990; Greeno et al., 1999; Lieberman & Grolnick, 1996; Stein, Smith & Silver, 1998).
2. Respecting everyone's *authority*: Participants are truly given the *agency* to contribute their own perspective on the joint problems (e.g., Cobb et al., 1990; Lieberman & Grolnick, 1996); in doing that they become true *contributors* (Palincsar et al., 2001; Grossman et al., 2001; Thomas et al., 1998) and

in some cases even *authors* of joint products (Hindin et al., 2007; Lieberman & Grolnick, 1996); and through their ongoing participation they may become oriented to as *local authorities* about particular aspects of the work (e.g., Greeno et al., 1999; Stein et al., 1998).

3. Engendering a dynamic internal *accountability* to others and to shared norms and goals: In the process of working together, participants are held responsible for accounting for how they are addressing what others have done (Greeno et al., 1999; Grossman et al., 2001; Lieberman & Grolnick, 1996) as well as agreed-upon norms and goals for their enterprise (e.g., Palincsar et al., 1999; Wood, 2007).[1]

4. Having access to sufficient *resources* to make all of the above possible: Resources may be as seemingly straightforward as having sufficient time or money (e.g., Hindin et al., 2007) to having access to specialists who can share relevant tools and means of addressing problems (e.g., Cobb et al., 1990; Stein et al., 1998). Some resources, like these, support productive collaboration directly while others support the embodiment of the other three principles as when one assembles a team with different perspectives on a key issue to encourage it to be problematized (e.g., Grossman et al., 2001).

The basic idea behind these principles is that problematizing provides worthwhile joint productive activities for design-based research groups to collaborate on (Stein et al., 1998; Tharp et al., 2000) while embodying authority provides opportunities for everyone to become engaged in them in increasingly deep ways (Cobb, et al., 1990; Palincsar et al., 2001; Stein et al., 1998). Accountability provides a check on untrammeled authority (Cobb et al., 1990; Grossman et al., 2001; Wood, 2007). A dynamic balance between authority and accountability helps form collaborative communities that: are supportive but challenging, in which relationships are built while productive work gets done, and in which ideas are incorporated from both inside and outside the community, only being ignored with justification (e.g., Borko, 2004; Grossman et al., 2001; McDonald & Klein, 2003). Finally, resources make productive engagement possible while supporting the realization of new norms around problematizing, authority, and accountability (e.g., Lieberman & Grolnick, 1996; Grossman et al., 2001).

Although these four principles were originally derived from the literature on effective classroom learning environments, as the citations above indicate, they also parallel findings from prior research on factors found to support productive engagement in teacher and teacher-researcher communities. Perhaps this is not surprising given that many design-based researchers, including MMAP's directors, seek to consistently embody their ideas about how to support effective learning communities in both classroom settings and their interactions with the teachers and other educational professionals with whom they collaborate (e.g., Cobb, Yackel & Wood, 1990; D'Amico, 2005; Greeno et al., 1999; Grossman et al., 2001; Palincsar et al., 2001). In fact, the four principles above arose through collaborative work Faith Conant and I were doing in another project directed by MMAP co-PI Jim Greeno (see Engle, Conant & Greeno, 2007). In addition, several ideas underlying them appear in MMAP's own effort to understand its collaborative processes (Greeno et al., 1999), and were spontaneously mentioned again in my interviews with participants in the project.

Data Collection and Analysis

The findings I report are based on 20 interviews with a diverse set of MMAP participants and a videotape the project made of its first orientation in May 1992. The interviews, which were conducted in 2003-2005 after the project had ended, included seven with former MMAP teachers, eight with former MMAP staff who served in a wide range of roles, and a long series of interviews, phone conversations, and email exchanges with primary PI Shelley Goldman and project manager Jennifer Knudsen. In order to glean participants' perspectives, most interviews were organized in the form of narratives about each person's experiences on the project (Linde, 1993). I supplemented these data with transcripts of 1996 interviews with many of the same teachers collected as part of MMAP's own paper about its collaborative processes (Greeno et al., 1999) and project documents provided by project members (see Engle, 2006, pp. 9-11, 90-93 for methodological details). Because of space considerations, I do not cite every interview or other data source supporting each finding, but most are supported by multiple data sources that are cited in the original report (see especially ibid., pp. 15-23).

Evidence for the Quality of the Collaborations in MMAP

Although interviewees disagreed about many things, they were unanimous on the high quality of the collaborations around curriculum design that they had experienced during the project. Teachers talked about there being "a lot of teacher buy-in" and "really feeling valued in a professional sense," something most had not experienced in the rest of their teaching careers before or after. They appreciated being exposed to innovative ideas, developing new instructional skills, being able to talk with others around curriculum issues, and learning how to design curricula for their own and others' use. Two teachers even said that MMAP was the best professional development they had ever participated in. These results were corroborated in an external evaluation of MMAP that concluded, "teachers felt professionally respected in MMAP in ways some had never

before experienced. Those who participated consistently spoke of MMAP not merely enthusiastically, but with a fervor that bordered on the evangelical" (Lichtenstein, Wiessglass & Ercikan-Alper, 1998, p. 50).

Staff members had similar perspectives on collaborations in the project. For instance, one programmer noted that, "This was truly a place where I felt like the whole was better than the sum of the parts, like the team worked as a team." Similarly, one graduate student and longtime staff member commented, "For me, I always felt unbelievably fortunate to have stumbled in there, and once I was there I never wanted to leave…. I was in heaven." The quotes could go on and on. Although to some extent these statements can be considered examples of what Greeno et al. (1999, p. 320) in their own analysis of MMAP's collaborations referred to as "how members of one mathematics learning and teaching community sing the community song that enables all those involved to work together," it is important to note that my interviews were conducted long after the project was over, with interviewees orienting to me as either an interested outsider or former peripheral member of the project with whom they were very comfortable complaining to about other issues. So there was probably romanticization in these interviews, but perhaps not to the same extent as one might otherwise expect.

In addition to self-reports from the interviews, the productivity of MMAP's collaborations can be assessed objectively by what was achieved by the project as a whole. In just over six years, the team designed a full middle-school mathematics curriculum that was later designated as a "promising" curriculum by two separate Department of Education panels, one on mathematics curricula and the other on technology curricula. An outside evaluation also found that MMAP met its equity goal of having "a broad range of students (regardless of gender, ethnicity, or ability level) [be] motivated by MMAP materials" (Lichtenstein et al., 1998, p. iv). At the same time, the project produced over 50 publications addressed to a wide range of audiences (see Engle, 2006, pp. 77-78, 94-99), with 6 being cited well over 20 times.

Explaining How MMAP Initially Supported Collaborations on the Project

In this account, we focus on how MMAP chose its initial set of participants and conducted its first orientation, as these activities are common elements of starting a design-based research collaboration.

1. Assembling a Team Ready to Collaborate

MMAP's project leaders began setting the stage for fostering productive collaborations between the wide variety of stakeholders that it wished to engage in its work by carefully assembling one of the most important resources for the project's collaborative work, its initial team of staff and collaborating teachers. I will show how MMAP specifically sought people for the project who were likely to serve as resources for realizing the problematizing, authority, and accountability principles.

Partial overlap in goals as a resource for problematizing

In recruiting MMAP's initial team of participants, attention was paid to determining whether there was some overlap in goals and interests between the project and them. Having some overlap in place from the start helped make it easier for the project to find relevant problems that participants would want to engage in, a resource for problematizing (cf. Lieberman & Grolnick, 1996; Stein, et al., 1998). Specifically, MMAP looked for math teachers who were interested in experimenting in their classroom while each teacher talked about one or more aspects of MMAP's initial vision that had appealed to them. Similarly, graduate students at Stanford were invited to consider joining the project when they expressed some overlapping research interests with the project. The overlap between the goals of particular participants and those of the project did not need to be extensive, nor did their goals need to be the same as those of any other participants. Instead each person's goal needed to be large enough to present rich enough problems to engage in with at least some others on the project.

Diversity in expertise as a resource for accountability and problematizing

At the same time, however, that the project sought to have a certain level of shared goals and values among its members, it otherwise emphasized the importance of having a diverse pool of expertise, perspectives, and values to draw upon. This was a key resource that it drew upon in its work for embodying both accountability and problematizing. For example, having different types of expertise represented in the project meant that when MMAP's participants held themselves accountable to the ideas of other participants, this in effect held their ideas accountable to the expertise and professional communities from which those people were drawn. In addition, diversity among MMAP's participants often led to productive problematizing of issues as not everyone immediately agreed with each other, so differences would be negotiated, strengthening solutions.

The Stanford dorm in which Goldman and co-PI McDermott served as faculty fellows was a particularly helpful source for recruiting staff with a range of expertise and perspectives related to MMAP's work. Students there were pursuing a variety of majors and extracurricular activities, all of which Goldman and McDermott became intimately familiar with while living with them. For example, during its first summer the project was able to recruit from the dorm a gifted physics student who was also an excellent tutor and

programmer. He successfully taught mathematics to the teachers, and in a single weekend programmed the first version of what became the project's population biology modeling program, HABITECH. Similarly, two students from the dorm who had won awards for their writing later became curriculum writers on the project, with one helping invaluably with organizational issues and the other providing "sparky writing that spoke directly to kids" (Knudsen interview 3/20/03). Because many of these people were not typically focused on mathematics education or even education, they provided expertise to the project that it might not have had were it to have recruited more narrowly within the school of education.

That there was such a range of skills and interests in the project also helped attract and retain both staff and teachers. In numerous interviews, participants told me about how getting to work with such cool, friendly, talented, and creative people was a key element that attracted them to and kept them engaged with the project. Participants also especially appreciated their interactions with MMAP's founders, with one of the writers from the dorm commenting, "people were drawn to them—they believed in their ideas, they're open-minded, they're successful, they're interesting, and they make things happen." Many people—both teachers and MMAP staff—also found the larger environment at the Institute for Research on Learning in which MMAP was situated to be incredibly stimulating to them, noting that it was a place in which cutting edge ideas could be explored, again further supporting problematizing within the project.

Respect for teachers by staff as a resource for supporting teachers' authority

One shared norm the project specifically selected for in its staff was people who already respected teachers and children. As PI Goldman explained:

> We didn't want anyone on the project ever who wasn't going to be collaborative with the teachers or had put-down attitudes about teachers or kids. You could not be thinking the problem with education was either the teachers or the kids and hope to get a job on the project. (Goldman interview 10/27/04)

For example, one programmer hired on the project described an interview in which he felt he was being carefully screened for his ability to be respectful of other people, especially teachers (something confirmed by Goldman and Knudsen). He was asked to meet many different people from the project, and got the sense that he was being watched for the extent to which he could listen as well as talk to make sure that "I wasn't, for lack of better words, one of those kind of arrogant engineers." Thus, in endeavoring to select staff who already respected teachers, MMAP stacked the deck with people who would be more likely to treat teachers as having authority, thus using the resource of MMAP's staff to promote this principle vis-à-vis the teachers.

At the same time, several of the initial set of MMAP teachers noticed and were attracted by the fact that this looked to be a project in which they actually would have some authority over what they would be doing. For example, two teachers noticed that the project was offering opportunities for them to be true contributors to the effort, with one seeing it fitting his own practices of designing project-based curricula and the other intrigued by the chance to make something new with a "consortium" of teachers, researchers, and scientists. However, initially others did not know what to expect and were pleasantly surprised when they discovered that the project actually respected them and their contributions.

Fundamental resources allowing and encouraging people to participate

None of the above people could have participated in the project, however, without the fundamental resources of money and time that supported the work. A generous NSF grant provided for staff positions and research assistantships so that researchers and curriculum developers would dedicate their time to the project. Teacher' participation in the project's three to six week summer institutes and once a month workdays was made possible and encouraged because the grant paid both the teachers as consultants (at NSF's maximum allowable rate) and their schools for the necessary substitute teachers. As a few teachers noted, it also did not hurt that they were "lavished with gifts," including a programmable calculator, an email account (unheard of in those days), and access to loaner computers and technical support with them for their classrooms.

2. Getting the Collaboration Off the Ground: MMAP's First Orientation

When MMAP's directors got its project underway, they hoped to create a community that would design and research innovative curricula, but would be characterized by respect for different people's authority and the marshalling of diverse expertise that the project as a whole would hold itself accountable to (e.g., Greeno et al., 1999). To do that, MMAP worked to create its own norms that included more respect for teachers' authority than is often practiced as well as lived expectations that everyone would be making important substantive contributions to joint design work. One key example of how the project began developing these norms was in how it conducted its first orientation in the spring of 1992 (MMAP orientation video, 5/1/92). In

particular, I will show how the principles of problematizing, authority, and accountability were embodied in remarks from MMAP PI's Goldman and Greeno as well as in an ice-breaking activity.

Problematizing using classroom design issues with practical and theoretical implications

In remarks from PIs at the orientation, MMAP problematized the classroom design work everyone would be doing as addressing important practical and theoretical issues. Coincidentally the orientation was held the day after the Los Angeles riots, and Greeno's introductory remarks made reference to them, which he used to vividly illustrate why the problems they would be working on together were important:

> Today particularly, we've got reason to want, very badly, to change the world so that some people who are left out, …who are kept away from a society's resources can get it so that separation, some of those blocks get a little less strong. And that frankly has been the lead paragraph on this project since the first time we started talking about it. There are many people in this society for whom the experiences that happen in school, and the rest of their lives, lead them to a belief that…the understanding of mathematics and science simply are not available to them.… So the experiment that we are engaged in, which from my academic standpoint is an experiment to help us understand the nature of learning better, is also this very important social experiment. (Greeno remarks, MMAP orientation video 5/1/92)

It was implied here and elsewhere that working together to create models to engage more students in mathematics had the prospect of addressing larger equity issues in society like gaps in school achievement and economic standing that occur in part because of the gatekeeping role of mathematics. At the same time, Greeno emphasized that these equity goals would be achieved through a "different kind of research" that they would be doing together. He said that his job was to "get a little bit more information, a little bit more insight, a little clearer theories about the processes that you all cause to happen everyday when you're in the classroom, getting kids to learn things," which is an "academic problem, but a lot more than that of course." Thus the idea was that making progress on theories of learning and on equity issues in mathematics instruction would go hand in hand.

How mathematics instruction is usually conducted was then further problematized during the ice-breaking activity in which the group became a class of students learning a new procedure for the first time, except the procedure was learning how to write shorthand. IRL's office manager instructed the group using the demonstrate-then-practice methods typical in U.S. mathematics classrooms. In the discussion that followed, the group reflected on their and others' experiences as students in such lessons, which led to ideas about how and why lessons like these might not fully support middle-school students' engagement in mathematics. This discussion, then, supported Goldman's earlier invitation that the group jointly develop a "new vision and a new practice for kids learning mathematics in our schools." Thus, in its orientation, MMAP's activities were problematized around addressing important issues of equity by rethinking standard instructional practices in ways to foster more student engagement with mathematics while leading to better educational theories.

Establishing expectations around teachers' authority

Many of the remarks by the PI's at the orientation were filled with language like "jointly develop" (Goldman) and "our shared activity" (Greeno) that presumed that teachers would function as equal-status participants in the project along with curriculum developers, educational researchers, and collaborating scientists (MMAP orientation video 5/1/92). Consistent with this, Goldman talked about being eager to "make use of everyone's knowledge, and energy, and good ideas" (ibid.) This statement implied that all participants, including teachers, would have some knowledge that they could contribute and that they were not just authorized, but encouraged, to do that. Later, when one teacher explicitly asked about the relative power of teachers versus researchers and expressed concern that the project could become a heavily top-down thing, Goldman made it clear that "we're trying not to have it be that way" and that "the spirit is of full participation and equal rights to planning something or suggesting something" (ibid.).

Later Goldman embodied the desire to support teacher authority in by specifically inviting teachers to share their ideas about real-world applications that could serve as anchors for the mathematics units, noting that "your idea for a project is as good as anybody else's" and therefore just as worth thinking through and considering. So in general, teachers were authorized and encouraged to share their ideas to the same degree as other participants. And in fact, in the discussion that followed the shorthand lesson, five of the six teachers made extended comments to the whole group about what they had learned. The fact that everyone in the room was new to shorthand may also have helped level the playing field of presumed expertise among the participants, making it easier for the teachers to contribute what they thought. In general, this began to create a pattern in the project in which diverse stakeholders were not just told that they were welcome to contribute to it, but were frequently given opportunities in which they could do just that and in which their contributions were taken seriously.

However, with respect to one specific issue, MMAP's PIs made it clear at the orientation that they expected teachers to function as the primary authorities within the project. As Greeno explained to the teachers:

> This is very definitively NOT a situation where the science of learning has a bunch of results that we are now going to explain to all of you, so that you can go into the classroom and use them…. [Instead we will] work with you…on the problem of figuring out how your teaching can make use of the resources that will get built…. How are you going to make use of that? What will be YOUR interaction with it? … You're gonna find that we are going to treat this as YOUR problem more than ours. (Greeno remarks in MMAP orientation video 5/1/92)

Thus, the teachers were positioned as the ultimate authorities for deciding whether and how to use the curriculum materials in their classrooms. From the project's perspective, this made sense given teachers were the ones who both knew their classroom situations the best and would be affected most directly by how well lessons went (Greeno et al., 1999; cf. Cobb et al., 1990). And in fact over the lifetime of the project, MMAP's teachers continued to hold the ultimate authority for making instructional decisions (Engle, 2006).

Encouraging accountability to others

In addition to supporting teachers' authority, during the orientation the project also set the stage for MMAP's participants to hold themselves accountable to each other. On several occasions the PI's mentioned the importance for the later productivity of the project of everyone getting to know each other and "the places that we're working from" (Goldman, MMAP orientation video 5/1/92). Co-PI McDermott commented that the project consisted of "four chunks of people [from schools, labs, universities, and R&D firms] who don't talk to each other a lot, or get paid off by institutions to talk to each other in particular ways" and that the goal was to get everyone's ideas and concerns "on the table as much as possible" to be able to eventually develop a consensus about some ideas for mathematics units (ibid.). To get started on this process, the schedule for the orientation and the first summer institute included time for various participants to introduce themselves and their contexts in greater depth. This then provided a stronger basis for participants to account for how their suggestions related to what other members of the project cared about or had already contributed.

Encouraging accountability for teachers to change their practices

At the same time, it was made clear during the orientation that although teachers were the ultimate authorities for deciding what would happen in their classrooms, they were expected to be accountable for somehow changing their teaching practices as a result of participating in the project. The clearest statement to this effect was made by Greeno in his initial remarks to the teachers:

> We're assuming that this is going to involve a change on your part. That you get some new [curricular] resources…it's going to change what you do. We hope. That is we hope they're useful in a way that will make that happen…. Because you have some [new] things to work with, or just because of whatever else goes on. Maybe the conversations we'll have about these things will be interesting and bring about some changes. (MMAP orientation video 5/1/92)

Later, Goldman talked about how the upcoming summer institute would result in the creation of initial materials teachers could then try out in some way during the fall (ibid.). Thus she provided some specific parameters about when and how teachers would begin experimenting with their teaching practices in the project.

Informality as an additional resource supporting problematizing, authority, and accountability

Finally, the orientation began a pattern that would grow in the project of using informal tones and activity structures to support collaboration (cf. Lieberman & Grolnick, 1996). Within its first orientation, MMAP participants laughed at the first of many community-building jokes by McDermott and participated in a catered lunch, small group brainstorming sessions, and several occasions for informal chatting. MMAP's participants later highlighted the importance of time to socialize and talk informally as being important for supporting collaborations by keeping everyone aware of what everyone else was doing, facilitating the sharing of new ideas, providing non-threatening ways to get feedback, and helping to develop the kinds of close personal relationships that helped keep everyone working well together on the challenging tasks to come.

Discussion

What MMAP did in assembling its collaborative team and orienting them to the work ahead during that first orientation was crucial for what it was able to achieve later. First, the project began fostering

problematizing around MMAP's goals by inviting to the project potential participants whose own goals already overlapped with them, and by demonstrating to the project as a whole the importance of core MMAP goals like enhancing equity and developing new models of mathematics instruction. Second, the project began supporting teachers' authority by selecting staff already inclined to respect teachers and their contributions, by both telling and showing teachers that their contributions were desired, and by setting expectations that teachers would have the ultimate authority for how MMAP materials would be used in their classrooms. Third, MMAP began fostering accountability by telling teachers they would be expected to make changes in their teaching practices; by selecting a diverse set of participants with various types of expertise; and by encouraging them to begin both getting to know each and engaging in focused conversations about their joint work. Finally, collaborations on MMAP were crucially supported by the fundamental resources of time and money as well as by an informal tone that made realizing problematizing, authority, and accountability easier.

These general patterns continued over the lifetime of the project. As the goals and contexts of the project shifted and new challenges arose, MMAP devised new ways of embodying problematizing, authority, accountability and resources, supporting productive collaborations among its team throughout its history (Engle, 2006). For example, it encouraged teachers to change their own practices in sought after directions without undercutting their authority by selectively but regularly asking them to account for why they were doing what they were doing (cf. Cobb et al., 1990). When those with relevant expertise were unwilling to respect teachers, the project draw on their expertise in a mediated way as when it had teachers shadow math-using professionals at their workplaces to identify the math they were using rather than having professionals on the design team.

Although much more could be said about MMAP's methods for fostering collaboration (see Engle, 2006, especially pp. 24-33), more relevant here are the lessons the case provides for other new design-based research projects as well as for general theory about initiating productive collaborations. I do believe that all four principles must be embodied together for a design-based research collaboration to be successful, but how they are embodied and how easily can differ depending on the particular contexts within which projects arise. Because MMAP was founded during the height of experimentation with math instruction in California in the early 1990s, this facilitated its ability to support problematizing and teacher authority. In contexts in which teachers are not given license to experiment in their classrooms, projects will need to spend extra effort to create new environments or transform existing ones so it can occur. Still many practices can be applied across projects. Projects can recruit broadly to include diverse perspectives and expertise while ensuring overlap in crucial goals and values. They can be upfront about their expectations. In their orientations, they can also allow participants to begin experiencing what the project will be like with activities that problematize key issues, include the full range of participants, and ask them to account for and thus learn about how their ideas compare with those of other participants. Finally, projects can combine a real push for continually improving on educational designs with a safe environment in which many different possibilities can be explored.

Endnote

(1) Here I expand Engle & Conant's (2002) notion of "disciplinary norms" to encompass efforts like MMAP in which disciplinary work is only one part of what people are doing together. What matters is that participants hold themselves accountable to those shared norms important for their type of enterprise.

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