Supporting Teacher Noticing of Students' Mathematical Strengths*

Lisa M. Jilk
University of Washington

Video cases and video clubs have become popular tools for supporting teacher learning. One concern is that many of the video projects discussed in the research literature may unintentionally continue to perpetuate deficit perspectives about students by focusing more on their gaps in understanding than on the strengths they bring to their learning. This article describes a video club that is part of a multidimensional professional development network that aims to re-culture mathematics classrooms so that all students have challenging and empowering learning experiences. I discuss shifts in teachers' ways of seeing and talking about students' mathematical activity that the video club has made possible, as well as features of the video club that have supported these shifts.

Key words: Equity; Mathematical strengths; Noticing; Teacher professional development

What and how teachers notice in their classrooms is the focus of much research and professional development because noticing informs instructional practices, and teachers' practices are consequential for students' learning. According to Mason (2011), noticing is a "collection of techniques for (a) pre-paring to notice in the moment, (b) post-paring by reflecting on the recent past to select what one wants to notice or be sensitized to particularly; in order (c) to pare, that is notice in the moment and so be enabled to act freshly rather than habitually" (p. 48). A focus on noticing supports teachers to practice attending to important features and critical events happening within the complex setting of classrooms before they are faced with them in real time.

Video cases can be useful tools for supporting teachers to take up new ideas and make sense of what happens in their classroom in new ways. Classroom videos have been used to facilitate teachers' learning to notice students' mathematical thinking and understanding (e.g., Goldsmith & Seago, 2011; Jacobs, Lamb, Philipp, & Schappelle, 2011; van Es & Sherin, 2008), instructional features of classrooms (e.g., Star & Strickland, 2008), and important mathematical moments during a lesson that a teacher might use to support students' learning (Stockero, 2014; Walkoe, 2014).

Recently, a study by McDuffie and colleagues (2014) used video with prospective teachers to help them learn to notice equitable instructional practices. In particular, the goal of this work was to help preservice teachers identify the multitude of intellectual resources students bring to math classrooms to which they can connect and build new knowledge. In math education, this type of video club is unique in its use of prompts to focus teachers' attention on "student resources," or students' mathematical knowledge bases (p. 111).

Similar to McDuffie et al. (2014), the video club I discuss here focused teachers' attention on resources (what students have) and students' potential rather than deficits (what students are lacking). Attending to resources rather than deficits is important for many reasons. When teachers focus on strengths, they position young people as competent learners (Cohen, 1994). In the process, they support students to create positive math identities (de Abreu & Cline, 2007; Jilk, 2014; Martin, 2000; Nasir, 2002) and help them value their peers as intellectual resources (Boaler, 2008; Boaler & Staples, 2008; Cohen, 1994). Additionally, when teachers emphasize strengths, they broaden school mathematics to include a rich set of skills, practices, and understandings that not only support students to see themselves in the discipline but also reflect disciplinary practices and norms more accurately (Boaler & Greeno, 2000; Featherstone et al., 2011). All of these are necessary to create a robust instructional program for all students. It is especially important for young people who have traditionally been marginalized by school mathematics.

The video club that I report in this paper connects to and expands on the important work of McDuffie et al. (2014) by attending to the practice of noticing with in-service, rather than preservice, teachers. This focus on in-service teachers matters because research shows that novice and expert teachers see, reason about, and respond to classroom events differently. These differences in what teachers notice make it necessary for those of us who support

* This is an invited manuscript. In accordance with journal procedures, the manuscript was reviewed by the editor and two members of the Editorial Panel. It did not undergo a double-blind review process.

teacher learning to develop and scaffold new learning opportunities appropriately in order to meet teachers' unique needs. In addition, the professional development network in which these in-service teachers were participating focused primarily on learning about the equity pedagogy, Complex Instruction (CI; Cohen & Lotan, 1997), and how to successfully implement, grow, and sustain CI practices in their departments. This particular perspective affected the design of the video club as well as the tools used to support it.

Why Noticing Strengths Is Hard

Believing that each and every student has mathematical strengths from which to construct new learning is counterintuitive for most Americans. American culture makes it quite difficult to see everyone as smart because we tend to focus on deficits not only in classrooms but also in our daily lives. We live in a society that constantly perpetuates messages about our inadequacy as humans and the necessity to change ourselves in order to be good enough. From a very early age, consumerism and mainstream media teach us to analyze, and mostly criticize, how we look and act. Many of us subscribe to an ongoing, lifelong journey of improving ourselves. Rather than noticing and celebrating our strengths, unique styles, and sense of selves, we often pursue a socially constructed version of the ideal person put forth by movies, billboards, magazines, television, and social media that keep us feeling deficient in some way, shape, or form (Jones & Hughes-Decatur, 2012; Hughes-Decatur, 2011; Orbach, 2009).

Similarly, it can be difficult for us as educators to shift our focus from deficits to strengths, because we are most often immersed in a culture that attends to students' shortcomings. We are unknowingly trained to identify learners' mistakes and misunderstandings. We analyze what students do not know or cannot do, and then we try to close the gap with what they need to understand. We zoom in on Jessica when she says that the addition of two negative numbers is positive. We swoop in to correct Shantell when she uses the wrong formula for finding surface area. We fail Jorge in algebra because he does not know how to add fractions yet. We often set our sights on what is missing and fail to see all of the good things that are happening while students are in the process of learning.

In addition, many of us experienced a very narrow and limited version of math as students, which can make it difficult to notice strengths in our classrooms. We teachers were often apprenticed into school mathematics communities with dominant cultural norms and practices that required us to memorize, practice, reproduce and solve problems quickly. (Hand, 2012; Secada, Fennema, & Adajian, 1995). Sadly, we might never have experienced the broad and beautiful practices that make up the field of mathematics, which makes it hard to know what counts as a strength.

It is not surprising, then, that research shows that even very well-intentioned teachers who profess a stance toward teaching for equity reproduce deficit perspectives in their day-to-day teaching practices. Noticing strengths is hard. Stigler and Hiebert (1999) convincingly argue in *The Teaching Gap* that teaching is a cultural activity filled with taken-for-granted assumptions and shared convictions and values that explain why teaching is difficult to change. Unexamined habits towards teaching as fixing students' problems and misconceptions often get in the way of being able to reimagine and invent teaching actions that instead focus on accessing and building on students' strengths and multiple ways of understanding (Ladson-Billings, 1994). My own experiences working with math teachers support these results. Even teachers who desperately want their students to positively identify as "math people" often struggle to know what "counts" as a mathematical strength or how to talk with young people about the strengths they have.

If teaching is a cultural activity, then noticing and any associated aspect of teaching is also a cultural practice. Hand (2012) argues that "dispositions relate to what teachers do or do not notice" (p. 234) in their classrooms and therefore drive instructional decisions. If teachers do not have a disposition toward strengths, then it is not likely that they will be able to notice them very easily in classrooms. We attend to the classroom events that we have been taught to value. Prior experiences in which we have been immersed essentially train us to see and hear what is important to us. It is reasonable then to expect that developing a strengths-based perspective about learning and a disposition toward students that focuses on intellectual resources rather than holes and gaps can be quite difficult. These are new skills that most teachers need to practice, develop, and learn. Teachers need repeated opportunities to practice seeing students' learning differently and naming what they see for students in ways that are authentic and convincing. Eventually, students will begin to shift their own beliefs about their strengths as mathematical learners.

A Strengths-Based Video Club

The video club discussed here sought to challenge and disrupt our collective tendency to look for students' mathematical shortcomings. The video club was designed to

provide a shared, local experience from which a heterogeneous group of teachers could learn to notice (Sherin, Jacobs, & Philipp, 2011; van Es & Sherin, 2008) students' mathematical strengths in ways that could be useful and usable in their classrooms. A focus on drawing attention to students' intellectual strengths is a noteworthy feature of equity teaching practices in general and of Complex Instruction in particular, a central feature of the professional development network in which the in-service teachers participated. In the following section, I describe CI in more detail, specifically its attention to status and how it relates to the noticing of students' mathematical strengths. Then I briefly explain the model for professional development in which this video club was situated so readers understand how this experience was connected to the other learning spaces in the professional development program and the decisions made about the development and facilitation of the video club.

Complex Instruction, Status, and Strengths

Complex Instruction (Cohen & Lotan, 1997, 2014) is a strengths-based equity pedagogy that requires curriculum and instructional practices that are grounded in the conviction that all students come with intellectual, social, and cultural resources and potential to learn. In addition, successful implementation of CI requires understanding the classroom as a "social system" rather than a collection of individual students. Within this system, the CI framework aims to "disrupt typical hierarchies of who is 'smart' and who is not" (Cohen & Lotan, 2014; Sapon-Shevin, 2004, p. 3) by developing a mixed set of expectations for competence (discussed below) and promoting equal-status interactions amongst students as they learn collaboratively (Cohen & Lotan, 1997). Teachers who implement CI build equitable classroom systems by addressing the central features of classrooms, such as tasks, norms for participation and access to intellectual resources, which often lead to predictable inequities in participation and consequently in achievement (Cohen & Lotan, 1997, 2014).

Status and status issues are at the core of CI pedagogy. The CI framework attends to the ways in which status hierarchies, based on inequities within the larger society, are often recreated in classrooms due in part to the structural features of classrooms. These hierarchies effect students' participation and often cause inequitable engagement in collaborative learning settings (Cohen & Lotan, 1997). According to status generalization theory (Berger, Rosenholtz, & Zelditch, 1980), hierarchies of competence are constructed when young people who are perceived to be more intellectually competent based on certain valued characteristics such as skin color, gender, or language, are assigned high status. Students who are perceived as less competent, again based on characteristics that are valued in a particular context, are assigned low status. Students with high status often participate more than those with low status. In other words, the students who are considered more competent and "smart" participate more and therefore learn more. Those who are perceived as less competent or less "smart" participate and learn less. This social phenomenon then reestablishes an academic and social hierarchy based on perceived differences in intellectual ability (Cohen & Lotan, 1997).

Although some educators have protested the use of the word *smart,* consistent with the argument used by Featherstone et al. (2011) I insist on using the word because young people use it often and apply it to themselves and others regularly. My goal when working with teachers and students is to "take back" the word *smart*. I am attempting to redefine its meaning relative to learning mathematics, to help students develop an expanded version of what it means to be smart in math, and to recognize that everyone is, in fact, mathematically smart as a result of living in the world.

Status and participation can be managed in classrooms both proactively and reactively in a variety of ways. First and foremost, the key to managing status and affecting students' assumptions about who is smart and who is not is by creating a "mixed set of expectations" for competence (Cohen & Lotan, 2014, p. 149), meaning that the students in our classroom recognize that every child has something intellectual to offer and something intellectual to learn. None of us knows everything, and we need each other to learn more. Mathematically speaking, this means that students must come to understand that everyone has mathematical strengths and these strengths are intellectual resources for new learning. In addition to strengths, everyone also has many things yet to learn. No one does everything well or understands the entire range of concepts and practices available in an expansive version of school mathematics. An emphasis on strengths is key for combating the deficit perspectives that students often bring with them into classrooms about their own and others' potential to learn rigorous mathematics.

In addition to a strengths-based orientation towards teaching and learning, successful implementation of CI relies on the use of a multiability curriculum, particular strategies for managing status and teacher moves that promote intellectual interdependence among students, and accountability for participation and learning. A multiability curriculum is organized around big math ideas

and stresses reasoning and justification with a strong emphasis on problems that are considered *groupworthy*. Groupworthy problems are those with high-cognitive demand that "illustrate important mathematical concepts, allow for multiple representations, include tasks that draw effectively on the collective resources of a group, and have several possible solution paths" (Horn, 2005, p. 219). With CI, norms for mathematical participation and student roles are modeled, practiced, and used to support small-group interdependence and accountability. Finally, and maybe most importantly, status and status issues must be anticipated, noticed, and managed in any classroom aimed at promoting equal participation and increased math learning.

Cohen and Lotan (2014) describe two specific teaching practices for addressing status issues in classrooms—a multiple-ability orientation and assigning competence. A *multiple-ability orientation*, used during the launch of a lesson, makes visible the array of intellectual strengths, including skills, understandings, and mathematics practices, required to be successful in a given groupworthy task (p. 148). When used consistently, multiple-ability orientations can change students' beliefs about what counts as school mathematics and can support them to become more aware of how they and their peers can contribute to each others' learning.

Assigning competence is defined as publicly naming an intellectual strength that is being used by student(s) in a moment to move the groupwork forward or further the team's mathematical understanding (Cohen & Lotan, 1997). In addition to being public, an assignment of competence must be specific and connected to learning. Assigning competence is not the same as complimenting a student. It is not about commending a student for being polite or commenting positively about someone's new shoes. Although compliments have their place in schools and classrooms, they are different from assignments of competence. When teachers assign competence to students, they have the power to shift students' perceptions about what it means to learn math and who can be a successful math learner. Both multiple-ability orientations and assigning competence are instructional practices that rely heavily on teachers' abilities to notice students' mathematical strengths in real time.

In short, successful implementation of CI requires teachers to use groupworthy tasks with high cognitive demand, observe students' mathematical activity and mathematical interactions with peers, listen to and make sense of students' mathematical sense-making in the moment, and monitor students' participation and understanding. Therefore, a strengths-based video club asks teachers to a) pre-pare to notice students' mathematical strengths by collaboratively doing the task with which students in the video clip will engage in order to anticipate what students might say or do as they make sense of new mathematical ideas, b) post-pare, or reflect on the video and name mathematical strengths heard or observed while students are learning new mathematics, such that c) teachers might "imagine themselves in the future acting (responding) more appropriately than before" when they return to their classrooms to work with students (Mason, 2011, p. 38).

It is important to clarify that I am not advocating for "feel-good" teaching practices that emphasize compliments and empty praise to help students feel better about themselves. Nor am I suggesting that teachers lower their standards for academic rigor or cognitive demand by searching for anything a student does or says that is remotely mathematical. Not everything we see or hear in classrooms is worth attending to. In a strengths-based video club we consider a rich and expanded view of math understanding that is conceptually demanding and includes both content knowledge and mathematical practices.

Context and Background of the Video Club

The teachers who participated in the video club that I describe in this article were members of a professional development network that I developed with my colleague, Karen O'Connell, for the purpose of supporting math departments to successfully take up, grow, and sustain CI as their primary equity pedagogy. In 2013–2014, this network was in its 5th year of implementation. (See Jilk & O'Connell, 2014, for more information about the program.)

The social system in which CI flourishes is quite different from the kind usually found in traditional classrooms, and we have learned that effective implementation and sustainability of CI often requires significant reculturing of math classrooms, department interactions, and dispositions toward the work of teaching and learning. To accomplish this in our professional development program, we provide math teachers and department communities with access to varied, ongoing, and coherent learning opportunities that are situated both inside and outside of their classrooms and begin with the department as the unit of change.

The six learning spaces in the professional development program include a week-long course about CI, in-classroom support/in-the-moment coaching, common planning time with course or grade-level teams, a monthly video club, peer-reciprocal observations, and teacher facilitator meetings (see Figure 1). Each space

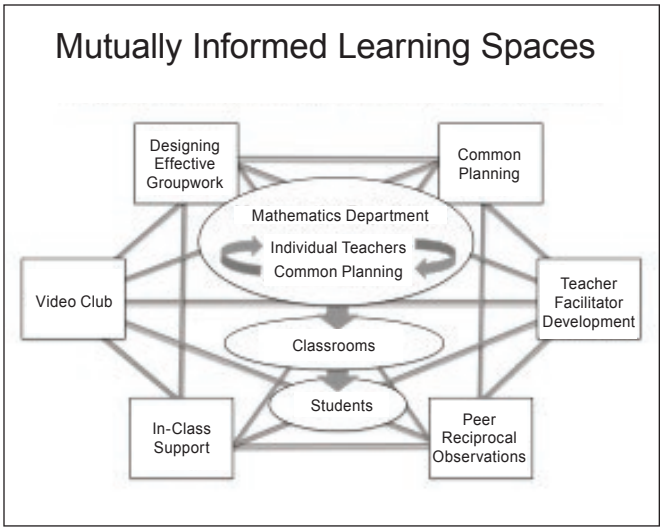

Figure 1. **Model of the professional development network.**

has a particular focus, as well as affordances, limitations, and overlaps. They are connected in many ways by the content, artifacts used for learning, and consistent attention to status in our professional community. The result is that teachers are engaged in professional learning that is coherent, connected, and collaborative.

The video club component of the professional development network was developed because none of the other learning spaces provided opportunities for both program facilitators and math teachers to observe the same classroom event simultaneously. The video club gave everyone access to a vision for learning math in classrooms where teachers paid attention to status and worked to develop collaborative learning experiences with equal-status interactions between students. In addition, the teachers who came to the video club had access to what their colleagues noticed in the video and named as mathematical strengths. Together teachers began to align their vision for high-quality student engagement and develop a new language for math strengths that they could use individually and across grades and schools, thereby providing some coherence to students' mathematical experiences in one school or across an entire district.

The video club met monthly for 2 hours each time. In 2013–2014, the video club was composed of middle and high school math teachers from three different math departments (one middle and two high school) in two urban school districts in the Pacific Northwest. Participants included all of the mathematics teachers who were members of the larger network, any student teachers who worked alongside these teachers, and the administrators and math coaches from participating schools and districts.

A typical video club meeting drew around 25 teachers from Grades 6–12 in three different schools and two urban school districts. Of the approximately 25 participants, there were usually two to three preservice teachers who attended each year. The remaining members came with 0–30 years of teaching experience and 0–8 years of experience with Complex Instruction. In the 2013–2014 school year, 19 of the 25 participants had been learning about CI for 3 years or less. There were 17 female and 9 male teachers, and of these women and men, 23 were White, 2 were Black, and 2 were Asian. Table 1 reports the demographics for the public schools in which the teachers worked during the 2013–2014 school year.

I share this data for several reasons. First, I want to be transparent about school demographics because this particular information contributes to readers' understanding of the context in which we work and affects their interpretation of the examples we provide of teachers' accomplishments in shifting aspects of their teaching practice. Second, the meaning of "urban school" varies across the country depending on the local context in which schools and readers are situated. I want to be clear about the meaning of "urban" in this particular locale as it relates to teacher and student demographics. Finally, I provide this data because culture matters. Skin color, gender,

Table 1
School demographic data (U.S. Department of Education)

	Male	Female	Multiracial	White	Black	Latino	Asian & Pacific Islander	American Indian	Free & reduced lunch	ELL
High school A	52.7%	47.3%	3.3%	5.5%	36.0%	10.5%	43.8%	.84%	73.1%	12.2%
High school B	50.0%	50.0%	3.1%	12.7%	33.2%	19.0%	31.0%	1.0%	65.4%	15.0%
Middle school	50.4%	49.6%	6.1%	14.0%	31.3%	19.0%	28.9%	.70%	71.4%	15.0%

language, and socioeconomic status, among other factors, shape our lived experiences, and these experiences act as lenses through which we notice and interpret classroom events. Since most of the teachers in this professional development network were members of the dominant culture and the young people with whom they worked were mostly working class and students of color, it is reasonable to imagine these teachers might be additionally challenged to perceive and interpret moments of classroom activity as strengths and potential resources for learning (Chazan, 2000; Hand, 2012; Ladson-Billings, 1994).

The video clips used in this video club came directly from the classrooms of teachers who participated in the network. Graduate students with a strong theoretical and practical understanding of CI consistently videotaped in all teachers' classrooms throughout the school year to create a video library of potential footage. Capturing video from different sites and math courses that afforded opportunities to see and hear a variety of strengths was sometimes quite challenging. (See van Es, Stockero, Sherin, Van Zoest, & Dyer, 2015, for a discussion of issues related to video capture.) We considered using published video that is available to the public. However, we found that teachers were less invested in thinking about students' strengths when we used footage from outside of their schools or districts.

The video clips that were used for video club showed a group of three or four students cooperatively engaged with a groupworthy task for 8–10 minutes without interruption. Video footage of this kind provided teachers with many opportunities to notice students' mathematical strengths. When students work unassisted by a teacher they often demonstrate a lot of resourcefulness and inventiveness, they wrestle with math ideas that they might not yet have studied, they get stuck and unstuck and make collective progress towards new sense making. These are all rich sites for teachers to potentially see and hear students using their intellectual resources, including each other, in the process of learning math.

Once a video clip was selected, we professional developers met with the Feature Teacher, whose students were in the video, and two Teacher Facilitators (TFACs), who rotated facilitation each month. Different cofacilitators were chosen from the TFACs group each month with attention to potential status issues within the network and a goal for developing distributed leadership and expertise across school sites. This small group collaboratively previewed the video, prepared for cofacilitation, and prepared the Feature Teacher to anticipate a range of observations and comments that might surface during video club. We recognized the huge risk any teacher was taking by offering his or her classroom practice as a public artifact for analysis. Therefore, we made time to prepare the Feature Teacher for any potential comments that might be interpreted as negative so that video club would be a positive learning opportunity instead of an experience to be endured. (See Jilk & O'Connell, 2014, for more information about this process.)

Learning to Notice Students' Strengths

Along with careful selection of video footage, careful coordination and attention from skilled facilitators were important. We program developers maintained constant attention to the video club community as a social system by extending the frame of CI and the lens of status to ourselves and to the teachers. This meant that in addition to a protocol that prioritized all voices and full participation by its members, we also proactively managed status and attended to status issues when they arose. We did this in a variety of ways that included rotating the math course and school from which video was shown each month, showcasing a clip of a particular teacher who might need a status boost, or using a video clip to highlight a unique participation structure as a way of assigning competence to an individual or course team. Additionally, we professional developers positioned ourselves as full participants alongside the math teachers at video club. We listened to others, contributed our ideas, and participated in the protocol process to demonstrate that we in fact practice what we preach. We are thoroughly convinced that the core tenet of CI is true: "No one of us is as smart as all of us together" (Cohen & Lotan, 2014).

In this next section I describe the norms, protocol, and focus questions used to guide the video club meetings. The video club protocol appears in the **Appendix**. The core tenets of CI were used to shape these structures. They supported our efforts to promote equitable participation and to help teachers further develop their abilities to notice students' mathematical strengths in the moment.

Community Norms for the Video Club

The guiding principles that supported learning at video club were the same as those we advocated for middle and high school math classrooms. Some of these guiding principles included: learning requires participation, we all have something intellectually valuable to contribute, we all have something to learn, and we are smarter together. We used CI pedagogy, including particular norms for participation, to model, practice, and reinforce ways of being learners that were inclusive. The norms for video club were:

- These kids are *our* kids! Don't make it personal.
- Monitor airtime. Share out and *listen*.
- We all have something to offer, and we all have something to learn.
- Take responsibility for our learning and understanding. Ask questions. Be willing to say, "I don't know and I want to learn more."

Focus Questions and the Video Club Protocol

Noticing and naming students' mathematical strengths in the moment can be difficult for many reasons, including those mentioned earlier in this article, and articulating mathematical strengths rather than deficits was initially a challenge for our group. Although teachers gradually moved to noticing strengths, they had a hard time stating them in ways that were generative and student friendly. When we began working together, teachers most often mentioned strengths in relation to state standards or learning objectives. For example, a seventh-grade math teacher might state that his students could "use proportional relationships to solve multistep ratio and percent problems" (NGA Center & CCSSO, 2010). This grade-specific objective does not easily translate into language that makes visible *the actions* of students as they make sense of ratio and percent problems or what they did and said to figure out such problems. In other words, the shift toward noticing strengths in students' mathematical concepts was a good start but in no way did the job of unpacking and naming the important mathematical thinking and actions (verbs) the students had engaged with when working on particular tasks.

In response to this particular challenge, we program developers created a structured evidence-based protocol to disrupt patterns of deficit talk about students' mathematical activity and to support teachers to generate descriptions and talk about students' strengths rather than deficits. The protocol (see the appendix) is organized by four central components of lesson planning and implementation required by a CI framework. These components include the learning objectives of the group-worthy task, evidence of students' mathematical understanding, participation norms, and mathematical strengths. We created sentence frames to support teachers to learn how to talk about students with a strengths-based lens and to use evidence to justify what they noticed in the video. Our assumption was that teachers were learning to speak and gain fluency with a new language (language of strengths), and this takes time and practice.

Unlike programs that use small-group discussions to support teachers' learning with video cases, we used a general go-round structure (McDonald, Mohr, Dichter, & McDonald, 2003), sometimes referred to as a round robin protocol, to organize how we responded to the focus questions. The go-round structure adhered to the norm, "We all have something to offer, and we all have something to learn." This structure is inclusive. It afforded each person an opportunity to share ideas, and it supported the expectation that each of us would participate. The go-round structure also gave us access to a vast array of ideas generated by the whole group about what might be considered a mathematical strength. It is likely that no one person would have noticed such an expansive set of ideas on her own. Each teacher had an opportunity to name at least one strength as we moved around the room, they did not repeat strengths, and we continued until all ideas were exhausted.

Agenda for the Video Club Meetings

Doing Math Together

Each video club started with teachers doing mathematics together to give them ample opportunity to consider the mathematical activity in which the students in the video would be engaged. Teachers worked cooperatively in heterogeneous groups of three or four to complete the same groupworthy task that students had done. Doing math together supported our professional community building. Teachers had a chance to collaborate on something they truly enjoyed—learning math—while also getting to know each other as people. Doing math together also gave the teachers a common experience and basis for discussion of the learning objectives for the task, students' prior knowledge, potential common mistakes and misconceptions, the flow of mathematical ideas throughout a task, task development, and the inclusion of CI structures that support participation, autonomy, interdependence, and accountability. These components of teaching and learning are potential sites for noticing students' mathematical strengths.

Watching Video

After teachers did the groupworthy task and discussed the learning objectives, they watched the video clip of students for the first time. Immediately following this first viewing, we used the round robin structure to share ideas about students' mathematical understanding as evidenced in the video. Teachers then watched the video for a second time before discussing participation norms. The video club protocol initially had teachers watching the video only once. This proved inadequate. The teachers

told us how difficult it was to give equal attention to both the mathematics and the norms, so we created a second opportunity to watch the video right after discussing students' math understanding.

Teacher Learning

To validate the use of our tools and video club to promote noticing and naming of students' mathematical strengths, I used action research methods (McNiff, Lomax, & Whitehead, 1996). I have collected my own observations and reflections, feedback from the teachers that participated in the video clubs, and observations of their teaching practices. I have involved other colleagues in these processes and ultimately revised and shared both the protocol and my observations more broadly with critical friends who have then used and validated the power of using sentence frames, in particular, to support teachers and prospective teachers in their noticing and naming of students' mathematical strengths.

Although we focused on math understanding and participation norms separately in video club before we considered students' strengths, in the next section I will highlight examples of teacher responses from item 7 (Strengths) in the protocol. My goal is to demonstrate how teachers took up ideas about math understanding (item 4 in the video club protocol) and participation norms (item 6 in the video club protocol) and reframed them as strengths that supported students' learning.

The following are some examples of students' mathematical understanding, which teachers reframed as strengths in response to item 7 in the video club protocol. I have included the sentence frame from the protocol and the responses from the teachers so readers can more easily make connections between them. These few examples come from different video club sessions throughout a school year with teachers who taught Grades 6–12.

> 7) Strengths
>
> ***What did students do or say that was mathematically smart?***
>
> I think it was smart when (name of student) did/said (evidence from the video), and I think this was smart because (how does this strength support students' learning?).

I think it was smart when . . .

- Damarius **translated** .40 into "four tenths," and then he was able to write it as fractions, 4/10 and 2/5. I think this is smart because these are three different representations of the same number.
- Rashida **created a system** for organizing and making zeros and then keeping track of them in an algebraic expression. I think this is smart because it allowed Rashida and her group to keep track of their terms and combine them correctly.
- Lydia **noticed a pattern** for how to use parentheses as a way to group algebraic terms in an expression. I think this is smart because this pattern allowed her to see the like terms before she combined them.
- Julian **made a connection** between the use of the minus sign when it is located outside of the parentheses (in the algebraic representation) and the placement of the Algebra Lab Gear on the work mat (in the geometric representation). I think this is smart because it helped him see how to deal with a negative when distributing.
- Tian **hypothesized** that the similar figure would be bigger and not smaller. I think this is smart because then Tian's group decided to try multiplying the lengths of sides with the scale factor instead of dividing.

Many would consider it enough for teachers to notice that Damarius understood how to convert decimals to fractions or that Rashida correctly combined like terms, especially if these noticings took place while students were interacting with content and making sense of this content with peers. However, referencing topics, objectives, or standards is not sufficient if teachers are to create classroom systems in which students choose to actively engage in learning, support each other in the learning process, and create positive math identities. Consider instead what the teachers in this video club were able to name as mathematical strengths, and what they were willing to count as important skills in the examples above. The statements teachers made based on their observations of students' mathematical activity and supported by a strengths-based protocol are not statements that one would readily find in a teacher guide or in a content standard document.

As I have noted earlier, equity-oriented teaching pedagogies such as Complex Instruction require an understanding of not only what students should come to understand and be able to do in a particular course but also the mathematical processes, skills, and actions they use as they come to know these things as well as how their informal and novice approaches to doing mathematics can be built upon. Rashida and her cooperative group will soon believe in her strengths as a math learner and likely come to rely on these strengths much more often if

Rashida's teacher is able to point out her system for keeping track of like terms and explain how this strength contributes to Rashida's learning. Teachers can more readily modify expectations for competence that produce equal-status interactions when they have an orientation toward strengths and a language to name them in real time.

The next set of examples illustrates how teachers interpreted the participation norms evidenced in the video as strengths and then justified how these norms supported students to move their mathematical understanding and group work forward. Again, I have included the sentence frame from the protocol and the responses from the teachers. These examples also come from different video club sessions with the same participants.

> 7) Strengths
>
> ***What did students do or say that was mathematically smart?***
>
> I think it was smart when (name of student) did/said (evidence from the video), and I think this was smart because (how does this strength support students' learning?).

I think it was smart when . . .

- Dariana **pressed for clarification** from her group about "what to go up by" when scaling the *x*-axis so that all of the group data could fit in the graph. I think it was smart because then Dariana had to explain how she scaled the *y*-axis, and Jason talked about the range of their data set. It helped the whole group learn more about how to create a more accurate graph.
- TJ **expressed confusion** about the different meanings of minus in both the geometric and algebraic representations. I think this is smart because knowing these different meanings will help him in other contexts that use minus.
- Mariela **referenced her notes** from a previous lesson to help her make sense of the problem today. I think this is smart because she seemed to understand that we were making connections between math ideas.
- Asad **made sure that everyone in his group understood the directions** before they started the task. I think this is smart because then the whole group could get started together and consider more than one way to do the problem.
- Xue **asked her team** if there were other ways to solve this problem. I think this is smart because then they were willing to look for other strategies.
- Sierra **took a huge risk** by sharing her ideas about combining like terms with the entire class. I think this is smart because learning requires intellectual risk taking and people usually learn more when they are willing to try something new.

Consider the participation norms that teachers noticed and articulated as strengths. The ways the teachers spoke about students are not compliments or attempts to boost students' self-esteem. These ways of being math learners are intellectual resources because they directly support students' learning in the moment. These practices provide a springboard into richer conversations, interesting questions, and cognitive spaces in which students make connections and build understanding about the content at hand. In fact, students are more able and often more willing to try making sense of math when they recognize how these learning practices help them become smarter!

Connections to Classroom Practice

> **I just start talking this way. These sentences [from the video club protocol] help me focus my thinking on students and their strengths when I'm back in my classroom.**
>
> **(7th grade math teacher)**

The small shifts documented here in the ways teachers are learning to notice and talk about students' strengths in the context of video clubs are hugely important because they carry into classrooms. Teachers who participate in these video clubs are thinking and speaking differently about the young people with whom they work when they go back into their classrooms. There is evidence from working with teachers in the other spaces in this professional development network that they are seeing and hearing strengths more often in real time, and they are more willing to speak a language of strengths with their students. Perhaps more importantly, teachers themselves are noticing their own transformation, as the quote above suggests.

Collectively, the math teachers in this video club were often reminded of the power they had to help students notice their own mathematical strengths, change their participation, and learn mathematics. The Feature Teachers, in particular, often reflected positively on video club after they had the rare experience of hearing their colleagues discuss the many ways in which their students were mathematically smart. Feature Teachers usually

returned to their classrooms feeling rejuvenated by this feedback and convinced that teaching practices grounded in strengths were well worth investing in.

Changing how we frame students and their participation in math classes is not easy. It takes a concerted effort to shift perceptions about students and learning we have been immersed in for many years. Even after a year or two of participating in this professional development network, teachers still found it challenging to articulate mathematical strengths in real time. The heterogeneity of the video club community addressed this challenge: Participants' experiences with a variety of grade levels and courses meant that they noticed a broad range of strengths to which everyone had access. What teachers noticed provided all of us with new ideas about what might count as a mathematical strength, how different student behaviors could be interpreted as strengths, and how to name strengths in real time. Additionally, the diversity of participants' teaching experiences afforded articulation that was rare and powerful for this community. Conversations from video club often contributed to improved course design and program development back at teachers' home sites. High school teachers heard middle school students make sense of math in ways they rarely considered. Middle school teachers got glimpses of former students on film demonstrating mathematical practices they never thought possible. Teachers often reported feeling more hopeful about their ability to impact students' learning when they had these opportunities to talk across grade levels.

Finally, and perhaps most importantly, I also noticed shifts in the ways the video club teachers talked about themselves and their colleagues. They often assigned competence to each other, sometimes playfully, but always with intent to bring attention to particular strengths. They highlighted something new they learned from a peer and described how it impacted their teaching. Sometimes they mentioned a particular way a colleague might draw out different strengths from others. These new ways of being professionals are not surprising. In addition to video club, these teachers are immersed in a culture of professional development in which the norm is to work from strengths rather than focus on deficits. We notice what we can do before addressing what we have yet to improve. We practice naming our resources so we know what we have to offer each other and our students. We ask our colleagues to show up and speak up and share their many ways of being smart so we can be more successful together. This is the kind of transformative professional development experiences all teachers deserve so they can support and sustain their equity work with students.

References

Berger, J. B., Rosenholtz, S. J., & Zelditch, M., Jr. (1980). Status organizing processes. *Annual Review of Sociology, 6*, 479–508.

Boaler, J. (2008). Promoting "relational equity" and high mathematics achievement through an innovative mixed-ability approach. *British Educational Research Journal, 34*(2), 167–194.

Boaler, J., & Greeno, J. G. (2000). Identity, agency, and knowing in mathematics worlds. *Multiple perspectives on mathematics teaching and learning: International perspectives on mathematics education* (pp. 171–200). Westport, CT: Ablex Publishing.

Boaler, J., & Staples, M. (2008). Creating mathematical futures through an equitable teaching approach: The case of Railside School. *Teachers College Record, 110*(3), 608–645.

Chazan, D. (2000). *Beyond formulas in mathematics and teaching: Dynamics of the high school algebra classroom.* New York: Teachers College Press.

Cohen, E. G. (1994). *Designing group work: Strategies for the heterogeneous classroom* (2nd ed.). New York: Teachers College Press.

Cohen, E. G., & Lotan, R. A. (2014). *Designing group work: Strategies for the heterogeneous classroom* (3rd ed.). New York: Teachers College Press.

Cohen, E., & Lotan, R. A. (1997). *Working for equity in heterogeneous classrooms.* New York: Teachers College Press.

de Abreu, G., & Cline, T. (2007). Social valorization of mathematics practices: The implications for learners in multicultural schools. In N. S. Nasir & P. Cobb (Eds.), *Improving access to mathematics: Diversity and equity in the classroom.* New York: Teachers College Press.

Featherstone, H., Crespo, S., Jilk, L. M., Oslund, J., Parks, A., & Wood, M. (2011). *Smarter together! Collaboration and equity in the elementary math classroom.* Reston, VA: National Council of Teachers of Mathematics.

Goldsmith, L. T., & Seago, N. (2011). Using classroom artifacts to focus teachers' noticing: Affordances and opportunities. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics Teacher Noticing* (pp. 169–187). New York: Routledge.

Hand, V. (2012). Seeing culture and power in mathematics learning: Toward a model of equitable instruction. *Educational Studies of Mathematics, 80*, 233–247.

Horn, I. S. (2005). Learning on the job: A situated account of teacher learning in high school math departments. *Cognition and Instruction, 23*(2), 207–236.

Hughes-Decatur, H. (2011). Embodied literacies: Learning to first acknowledge and then read the body in education. *English Teaching: Practice and Critique*, *10*(3), 72–89.

Jacobs, V. R., Lamb, L., Philipp, R. A., & Schappelle, B. P. (2011). Deciding how to respond on the basis of children's understandings. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics Teacher Noticing* (pp. 97–116). New York: Routledge.

Jilk, L. M. (2014). "Everybody can be somebody": Expanding and valorizing secondary school mathematics practices to support engagement and success. In N. S. Nasir, C. Cabana, B. Shreve, E. Woodbury, & N. Louie (Eds.), *Mathematics for equity: A framework for successful practice* (pp. 107–128). New York: Teachers College Press.

Jilk, L. M., & O'Connell, K. (2014). Re-culturing high school math departments for educational excellence and equity. In N. S. Nasir, C. Cabana, B. Shreve, E. Woodbury, & N. Louie (Eds.), *Mathematics for equity: A framework for successful practice* (pp. 207–232). New York: Teachers College Press.

Jones, S., & Hughes-Decatur, H. (2012). Speaking of bodies in justice-oriented, feminist teacher education. *Journal of Teacher Education*, *63*(1), 51–61.

McNiff, J., Lomax, P., & Whitehead, J. (1996). You and your action research project. *International Review of Education*, *44*(1).

Martin, D. B. (2000). *Mathematics success and failure among African-American youth: The roles of sociohistorical context, community forces, school influence, and individual agency*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Mason, J. (2011). Noticing: Roots and branches. In M. G. Sherin, V. R. Jacobs, & R. A. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 35–50). New York: Routledge.

McDonald, J. P., Mohr, N., Dichter, A., & McDonald, E. C. (2003). *The power of protocols: An educator's guide to better practice*. New York: Teachers College Press.

McDuffie, A. R., Foote, M. Q., Drake, C., Turner, E., Aguirre, J., Gau Bartell, T., & Bolson, C. (2014). Use of video analysis to support prospective K–8 teachers' noticing of equitable practices. *Mathematics Teacher Educator*, *2*(2), 108–140.

Nasir, N. S. (2002). Identity, goals, and learning: Mathematics in cultural practice. *Mathematical Thinking and Learning*, *4*(2&3), 213–247.

National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO]. (2010). *Common Core State Standards for Mathematics*. Washington, DC: Authors.

Orbach, S. (2009). *Bodies*. New York, NY: Picador.

Secada, W., Fennema, E., & Adajian, L. B. (Eds.). (1995). *New directions for equity in mathematics education*. New York: Cambridge University Press.

Sapon-Shevin, M. (2004). Introduction. In E. G. Cohen, C. M. Brody, & M. Sapon-Shevin (Eds.), *Teaching cooperative learning: The challenge for teacher education* (pp. 1–12). Albany, NY: SUNY.

Sherin, M. G., Jacobs, V. R., & Philipp, R. A. (Eds.). (2011). *Mathematics teacher noticing: Seeing through teachers' eyes*. New York: Routledge.

Star, J. R., & Strickland, S. K. (2008). Learning to observe: Using video to improve prospective mathematics teachers' ability to notice. *Journal of Mathematics Teacher Education*, *11*, 107–125.

Stigler, J. W., & Hiebert, J. (1999). *The teaching gap*. New York: Free Press.

Stockero, S. L. (2014). Transitions in prospective mathematics teacher noticing. In J.-J. Lo, et al. (Eds.), *Research Trends in Mathematics Teacher Education* (pp. 239–259). Switzerland: Springer International Publishing.

U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. Retrieved from http://nces.ed.gov.

van Es, E. A., Stockero, S. L., Sherin, M. G., Van Zoest, L. R., & Dyer, E. (2015). Making the most of teacher self-captured video. *Mathematics Teacher Educator*, *4*(1), 6–19.

van Es, E. A., & Sherin, M. G. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education*, *24*, 244–276.

Walkoe, J. (2014). Exploring teacher noticing of student algebraic thinking in a video club. *Journal of Mathematics Teacher Education*.

Author

Lisa M. Jilk, University of Washington, College of Education Academic Programs, Box 359485, Seattle, WA 98195-9485; jilklisa@uw.edu

Appendix: Video Club Protocol and Focus Questions

1. Do the math of the task

2. Learning objectives

What will students understand or be able to do as a result of completing this task?

3. Watch video

4. Student understanding

What do students understand? What are students on their way to understanding?

What is your evidence from the video to support your statement?

I think (name of student) understands OR is on the way to understanding (math concept or skill), because I heard/saw (evidence from video).

5. Watch video

6. Participation norms

What are the norms for participation that students are enacting? What are they saying and doing as math learners that supports their participation and learning?

I think the students understand that being a math learner requires (participation norm), and I think this because (evidence from the video).

7. Strengths

What did students do or say that was mathematically smart?

I think it was smart when (name of student) did/said (evidence from the video), and I think this was smart because (how does this strength support students' learning?).

8. Takeaways

What are you taking away from this conversation? (What have you learned? What are you left thinking about, wondering, asking? What might you do differently in your classroom as a result of our discussion?)

(Return to page 193)