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Learning to Look Beyond the Boundaries of Representation: Using Technology to Examine Teaching (Overview for a Digital Exhibition: Learning From the Practice of Teaching)

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Learning to Look Beyond the Boundaries of Representation

Using Technology to Examine Teaching (Overview for a Digital Exhibition: Learning From the Practice of Teaching)

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Figure 1

One day in Yvonne Hutchinson's 9th grade classroom in Los Angeles in which students discussed *A call to assembly*. (2001).

At first glance, the video tape of one day in Yvonne Hutchinson's classroom showed work that was effortless. Hutchinson calmly moved around among the ninth-grade students while they went over their homework and discussed their reading of *A Call to Assembly*, an autobiography of the jazz musician and 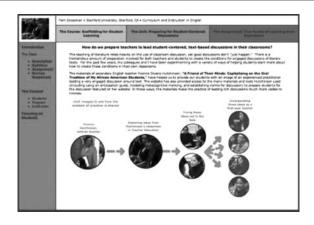professor Willie Ruff. There was some commotion in the classroom as Hutchinson organized a group discussion, but soon the students began talking, calling on one another, responding to one another, referring to the text they were reading, and making connections to their own lives. Hutchinson casually interjected a comment or a question here or there, but for the most part, the students seemed to be talking about the book among themselves.

From the perspective of the preservice teachers from the Stanford Teacher Education Program who were watching the video, Hutchinson's classroom provided a vision of the possible—an image of what a group discussion could look like. In some ways, however, the video also provided a vision of the impossible: How could these preservice teachers, many of whom had never seen or led a group discussion in their own teaching placements, produce or even approximate the teaching moves that Yvonne Hutchinson had cultivated over a career of more than 30 years?

For teacher educators and the novice teachers they seek to support, these kinds of representations of teaching provide a dual challenge: These viewers need to be able to see what is there and to see what is not; they need to be able to analyze the many elements of teaching and learning that are captured in video and other media, but they also need to have a sense of what those representations fail to capture—crucial details that might be obscured, larger contexts in which work may be situated, overarching purposes, histories, and long-term relationships invisible in daily interactions (Ball & Lampert, 1999).

Part of this challenge involves the difficulty of analyzing the highly complex practice of leading a rich discussion. Leading a classroom discussion involves multiple

Figure 2

Homepage of a Web site documenting a unit in Pam Grossman and Christa Compton's teacher education course Curriculum & Instruction in Secondary English. The unit uses Hutchinson's website as a central "text" for learning to lead discussions (2003).

components, including establishing norms for participation, assisting students in engaging in careful readings of text ahead of time, and modeling features of academic discourse. In other work, Grossman and her colleagues (Grossman et. al., 2009) refer to this as the "decomposition" of practice—breaking down complex practice into its constituent parts for the purposes of teaching and learning. If decomposing practice enables novices to "see" and supports them in enacting practice, how can multimedia records of practice illustrate both the fluid performance and the individual parts that contribute to such fluidity without making teaching seem rote or simplistic?

This challenge—to make teaching accessible for analysis while still capturing its complexity—serves as the focus of a digital exhibition that brings together four Web sites that represent teaching using group discussions in four different ways and contexts (A list of Web sites referred to is included at the end of this article).

This overview of the exhibition describes the background of the work on these Web sites, the conceptual framework that guides the development of the Web sites and this digital exhibition, and a discussion of the exhibition and the implications for the development and exchange of these kinds of multimedia representations of teaching, and their use in teacher education, in the future.

Background

This exhibition grows out of work begun at the Carnegie Foundation for the Advancement of Teaching, where Hutchinson was a member of the Carnegie

Academy for the Scholarship of Teaching and Learning (CASTL).[1] CASTL provided fellowships to faculty in both K-12 and higher education who had been nominated for both their excellence in teaching and their involvement in efforts to study and document their practice. At that same time, staff at the Carnegie Foundation including Thomas Hatch, Toru Iiyoshi, Desiree Pointer-Mace, and others were exploring the use of multimedia and Web-based forms of representation to document the practice of CASTL fellows. One exploration included a brief trip by Pointer-Mace to videotape one day in Hutchinson's class and a subsequent collaborative effort to develop a Web site that represented Hutchinson's teaching in that class.

Although the initial Web sites explored a number of different forms of representation of teaching, for the most part, the Web sites produced fit the general description of "records of practice" (Lampert & Ball, 1998; Le Fevre, 2004). Records of practice consist of "raw" materials (which may include largely unedited video but also curricula, student work, and other materials used in the course of planning, instruction, and assessment) as well as interviews, reflections, notes, and commentaries that relate to the raw materials but were not used in the course of instruction. We see this work as situated between efforts that focus primarily on the generation, exchange, and discussion of raw materials (e.g., Hiebert, Gallimore, & Stigler, 2002) and efforts to produce more polished cases and other products designed specifically to foster discussion of particular practices, problems, or dilemmas (e.g., Abell & Cennamo, 2004; Stephens, 2004).

Records and representations of practice vary considerably in terms of "grain size" (Goldman, 1995; Sherin, 2004) from those that focus on short segments of classroom interaction (like those used in "microteaching" analyses) to those that address entire courses or a year or more of teaching (Lampert & Ball, 1998). Many of the Web sites we produced, including those in this exhibition, focused on documenting the teaching of one teacher during one class period or one instructional unit. We selected this unit of analysis because teachers and researchers are both accustomed to talking about and investigating the work of teaching in this way, and it provided a reasonable boundary for the collection of data and information that would otherwise have been overwhelming (for related approaches, see Fishman, 2004, and Hiebert et al., 2002).

In contrast to approaches that seek to embed video or multimedia representations in particular educational programs or learning platforms, the Web site format was chosen so that these representations could be made freely available over the Internet to anyone who might want to

Figure 3

Homepage of a Web site documenting a unit on *Othello* in a ninth-grade Humanities class and that Travis Bristol—a student in Grossman and Compton's class in 2003—taught during his second year of teaching in New York City (2005-06).

view or use them. In addition, this public Web site format was designed to enable viewers to pass on to others and cite these representations of teaching, just as researchers might refer colleagues to their empirical studies or other publications.

The work on these Web-based representations of practice was also part of a broader effort to support and stimulate the development of new scholarly genres that might enable and encourage the development and exchange of representations of teaching produced by practicing teachers as well as others (Hatch, 2006). Consistent with these aims, the initial work sought to explore the affordances of different kinds of representations rather than to produce Web sites that would serve one specific purpose or one group of viewers. The point was to develop representations that would foster the analysis and discussion of many different aspects of teaching and learning rather than to promote particular approaches or "best practices." (For further discussion and commentaries on the development and uses of these representations, see Hatch & Pointer-Mace, 2006.)

Although the initial Web sites were not designed to be used in teacher education, Grossman and other colleagues, including Anna Richert, Kathy Schultz, and others, saw opportunities to engage their teacher education students in

Figure 4

Homepage of a Web site documenting a ninth-grade humanities unit that Emily Venson—another student from Grossman and Compton's class in 2003—taught during her 3rd year of teaching in New York City (2007). The unit was designed to help students to develop a critical perspective as readers and featured the use of literature circles—small group discussions of the books *Habibi, Princess*, or *Kite Runner*.

collaborative examinations of ideas and practices that were central to their courses but that their students did not necessarily have a way to observe in practice. To pursue these opportunities and consider the usefulness of these kinds of Web-based representations in teacher education, the Carnegie Foundation launched the Quest Project.[2] In the Quest Project, Grossman, Schultz, Richert, and other teacher educators incorporated one or more of the CASTL Web sites into a course that they were teaching, and they documented the results in Web sites later made available in an online gallery: *Inside Teaching*.

As part of the Quest Project, in fall 2003, Grossman developed a series of assignments in her methods course

After exploring Hutchinson's website and watching the video clips of her students discussing a literary text, I found myself initially amazed and inspired. Hutchinson's students were articulate, insightful, and engaged. They discussed the significant ideas in the text and connected those ideas to their own experiences and perceptions of the world. Hutchinson expertly inserted herself into and stayed out of the discussion at all the right moments. In thinking about my own students in the eleventh grade class I student-taught, replicating Hutchinson's class discussion seemed almost unachievable —. **Emily Venson, Commentary**

for secondary English teachers that involved the examination of Hutchinson's Web site. Although Grossman's students found the examination of Hutchinson's Web site productive and useful, their experiences also highlighted the problem that what Hutchinson was doing seemed to be far removed from what many of them felt might be possible in their contexts in the first years of their careers. They lacked examples of "near-peers" trying to enact similar practices in their classrooms. Therefore, when two students from that class in 2003—Travis Bristol and Emily Venson—moved to New York City to teach in public schools there, Thomas Hatch and colleagues at the National Center for Restructuring Education, Schools, and Teaching sought to develop Web sites to document the teaching of group discussion of these novice teachers. Bristol and Venson's Web sites were designed primarily for use by teacher educators like Grossman and Compton, but they also provided an opportunity for Bristol and Venson to reflect on what they learned from the representations of Hutchinson's practice and the role that these kinds of multimedia representations might play in supporting teachers' development over time.

> *As I reflect on the lessons learned from Hutchinson, I seem to have overlooked that her aim was not only to provide students with the skills to sustain discourse, but specifically to have "literate discourse" or discussion that allows students to engage meaningfully with the text.* –***Travis Bristol, Commentary***

Conceptual Framework

The key ideas underlying the design of these Web sites and the exhibition itself have evolved over time, but in general, they reflect conceptions of

- teaching as a complex, situated, and ill-defined activity.
- teacher learning as a long-term engagement in which both conceptions of practice and repertoires of practice develop over time.
- multimedia representation of teaching as a key means for facilitating collaborative examinations of practice from multiple perspectives.
- learning from representations of teaching as dependent on both the affordances of the representations and the settings in which those representations are examined.

In contrast to arenas in which problems are clearly defined, with well-specified and accepted technical solutions across a variety of contexts, teaching encompasses a wide range of problems and opportunities that are ill defined and are situated in particular contexts (Lampert, 1985, 2001; Leinhardt & Greeno, 1986; McDonald, 1992). Thus, teaching

strategies that seem to work for some students may not work for others, and different learning goals, different subjects, and different levels of learning all may lend themselves to different approaches to teaching. Classroom activity and student learning are also open to interpretation (Eisner, 1998; Lampert & Ball, 1998): What one person sees in one classroom or in the work of a teacher may be quite different from what others see. Complicating matters further, the long-term outcomes of teaching are unclear. Even with higher standards and better tests, teachers cannot be sure exactly what students will be doing in the future or whether what students do in the classroom one day or in one year will necessarily lead them to behave appropriately or act successfully in related situations in the future. Adding to the difficulties, teaching often entails dilemmas and choices among competing alternatives, each of which has costs and benefits (Lampert, 1985, 2001). Although many of those dilemmas relate to student learning, teachers' efforts to deal with a wide range of other issues—including maintaining student engagement, sustaining lesson momentum, and organizing their work and personal lives in manageable ways—also have an impact on their effectiveness in supporting student learning (Kennedy, 2005).

This complex, situated, and expansive view of the work of teaching suggests that teacher learning cannot be contained in a short period of formal education before teachers enter the classroom: Teachers learn to teach over time in ways that can be fostered both through formal teacher education and professional development and in informal learning on the job (Feiman-Nemser, 2001; Hatch, 2006). Consistent with this perspective, we view learning from practice as a long-term engagement that involves a series of opportunities to learn from one's own practice and the practice of others (Nonaka, 1994).

Whereas teachers may encounter many different kinds of opportunities to observe and learn from the practice of others throughout their careers, many novice teachers who take part in formal teacher education programs participate in field placements and internships designed to help them learn from the practice of more experienced teachers. Despite the potential benefits of such arrangements, the nature and quality of the teaching that can be observed in these settings vary widely, and teacher educators have relatively little control over what novice teachers observe and learn in these arrangements. In turn, teacher educators have limited opportunities to see and study the same practice that their preservice students do. As a consequence, learning from practice remains a relatively individual and idiosyncratic endeavor for both novice teachers and teacher educators (Lampert & Ball, 1998; Feiman-Nemser & Buchmann, 1985).

Given these challenges, we argue that learning from practice in teacher education can be enhanced by engaging teachers and teacher educators in joint examinations of a variety of representations of teaching. These representations can provide both novices and experts with opportunities to see and collaboratively inquire into a variety of aspects of practice amid the flux and ambiguity of practice in "real time" and in "real contexts" but to do so in the relatively controlled setting of the teacher education classroom (Derry & Lesgold, 1996; Grossman et al., 2009; Sherin, 2004).

Multimedia representations may serve as a particularly valuable means of supporting learning because they can represent many different aspects of practice at once, and they make it possible to examine those aspects from a number of different perspectives (Brophy, 2004; Derry & The STEP Team, in press; Spiro, Coulson, Feltovich, & Anderson, 1988; Spiro, Feltovich, Jacobson, & Coulson, 1992; Wetzel, Radtke, & Stern, 1994). Thus, one can both watch a video of an entire class as it unfolds in real time and stop the tape and review the details of particular interactions (Le Fevre, 2004), something that is impossible within the contexts of actual classrooms. Similarly, in addition to looking at the video, viewers can look at collections of materials and interviews that provide insights into the teachers' planning and reflections.

No matter how complete a multimedia representation may appear to be, however, there are always aspects of practice that remain unrepresented (Fishman, 2004; Miller & Zhou, 2007; Roschelle, 2000). Thus, videos may highlight the interactions between teachers and students at particular points in time, but they may fail to capture the planning that went into those interactions or the teachers' thinking and reasoning during those interactions. Similarly, collections of lesson plans may reflect what teachers wanted to do, but they may not capture what actually happened in practice. Lesson plans, by turning practice into a linear and discrete series of steps, also cannot convey the myriad subtle moves and adaptations that are necessary to enact a plan and achieve desired outcomes.

From our perspective, what viewers can learn from multimedia representations depends on three key factors (Grossman et al., in press; Little, 2003; Yadav & Koehler, 2007):

- the affordances of the representations
- the viewer's knowledge and familiarity with the form and content of the representations
- the settings in which those representations are examined

Affordances refer to the specific functions that can be carried out given the properties of a representation (or object or setting) and the people who use that representation (Gibson, 1979). What people recognize in and take away from a representation, however, also depends on the extent to which they have developed the prior knowledge and conceptual structures needed to interpret those representations (Bransford, Brown, & Cocking, 2000). Web-based representations of teaching are particularly demanding because their interpretation relies on viewers' knowledge of the relevant context, subject matter, and pedagogy, as well as the viewers' familiarity and experience with navigating these new forms of representation (Derry & Hmelo-Silver, 2002). Thus, a Web site that includes video of classroom interactions could offer preservice students an opportunity to see and hear how a teacher responds to students, but without some knowledge of the content, texts, and other materials being used, those students may not be able to judge or interpret the value and import of the teachers' responses.[3] In contrast, an experienced teacher or teacher educator may recognize specific strategies and "moves" the teacher makes (or could be making) to probe for a students' misconceptions or to differentiate their instruction to meet specific needs. Nonetheless, even an experienced teacher who is a novice when looking at Web-based representations of practice may have a difficult time figuring out how to navigate a Web site, where the most relevant materials are, or how they are related.

Rather than a static reflection of the properties of a representation and the viewers' knowledge, however, the settings in which those representations are examined also have a profound effect on what viewers pay attention to and do with representations (Grossman, Smagorinsky, & Valencia, 1999; Koehler, Yadav, Phillips, & Cavasos-Kottke, 2005; Kosma, 1991; Salomon, 1979). Drawing on Grossman et al.'s (1999) elaboration of the Vygotskian concept of activity settings in teacher education, we conceive of settings as "the contexts that mediate the development of consciousness" (p. 6). From this perspective, behavior, practices, and relationships are structured and constrained by the affordances of the settings in which they take place. On one level, simply watching and discussing video of a classroom activity with teacher educators, mentors, and others may draw the attention of novices to aspects of the interaction that they would never notice on their own. But, on another level, what novices see and pay attention to is also a reflection of the goals, values, and sociocultural history of the groups and contexts in which that discussion takes place: Novice teachers may look at the video clip entirely differently if they are a part of a long-standing teacher-reflection group or if they are looking at it in a professional development workshop designed to help novice teachers survive their 1st year.

Given these constraints on what teachers may (and may not) learn from multimedia representations, we argue that the design and use of these materials need to enable viewers to reflect on the aspects of practice that these representations make visible as well as to recognize what these representations leave out. Viewers need a sense of the distortions and misrepresentations that can grow out of different forms of representation, and they need to be able to see what is in the frame as well as to imagine what lies beyond its boundaries.

The Exhibition

To highlight the challenges of representing teaching while making clear the boundaries and limitations of those representations, this exhibition brings together materials from Hutchinson's, Grossman's, Bristol's, and Venson's Web sites in three different arrangements:

- *class anatomies* that facilitate the in-depth examination of a single class or a unit of instruction
- delineation of a *high leverage practice* that facilitates a comparison of approaches to the teaching of group discussion across four different classroom contexts
- reflections on the *learning trajectories* of these four teachers that facilitate a consideration of the development of novice and expert teachers

These three arrangements also offer different entry points into the work of these teachers that can facilitate the development of comparisons and contrasts among them.[4] Providing multiple arrangements also makes it possible to emphasize a wide variety of different aspects of the sites and points to some of the different ways the sites might be used. At the same time, juxtaposing these arrangements rather than focusing on a single one highlights the fact that each arrangement is necessarily only a partial and limited rendering of teaching and learning.

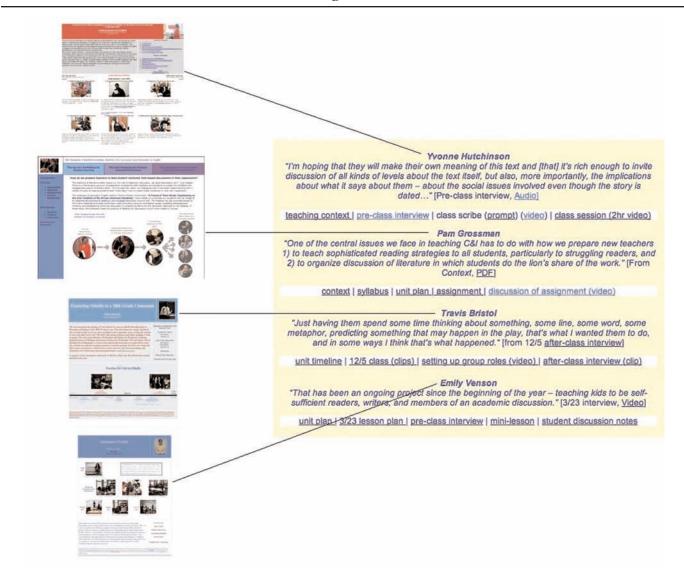### Beyond the Lesson Plan: Seeing the Complexity in Teaching

Each of the four Web sites includes representations that focus on a single class period (Hutchinson) or a single project/unit that stretches over several class periods (Grossman) or both (Bristol and Venson). Building on Shulman (1998), we refer to these as class or project anatomies because they are designed to expose the underlying structure of a single unit of instruction. Reflecting the different histories, purposes, and authors of these sites, the sites provide different examples of what class anatomies

might look like and what they might contain. In general, however, these class anatomies include any assignments given and curriculum materials used during the class or unit; video clips that illustrate how the class or activity unfolds; interviews or written texts in which the teachers discuss their plans and/or reflect on the class; and, in some cases, related student work or student reflections.[5]

In contrast to traditional lesson and unit plans—representations that present teaching as a relatively straightforward, linear sequence of events—class anatomies are deliberately designed to highlight the complexity in teaching. Although one could tightly link class anatomies to particular learning standards, instructional goals, or issues or problems of teaching (a key aspect of many video cases), the anatomies presented in this exhibition serve as looser collections of materials to provide viewers with opportunities to see some of the many different issues, goals, dilemmas, and ideas that teachers may be working with at any given time. In other words, rather than representing the lesson itself, the anatomies strive to signify the many elements that go into classroom activities even if they cannot capture them all (see Figure 5).

In Web sites like Venson's, explicit lesson plans are provided, but they are buttressed by a wealth of other materials that illustrate that behind a simple sequence of events lies a conception of the skills and content that students need to develop to complete their assignments and reach their learning goals as well as a conception of where individual students in her class are and what she needs to do to support their development. In Web sites like Hutchinson's, activities seem to defy reduction to a lesson plan—in fact, Hutchinson doesn't have one. Instead, the Web site tries to document how Hutchinson orchestrates her day and engages in a kind of planned improvisation that is grounded in her broader goals, in her knowledge of the content and her students, and in structures and routines that students know well.

To deal with the fact that this complexity of teaching can be overwhelming for many viewers, in particular novices, the Web sites are deliberately constructed to provide brief descriptions of the class or unit and overviews of how the class or unit unfolds over time that can help to give viewers a general sense of what they are looking at. The Web sites also provide artifacts that viewers may be able to download and use right away. By including the appropriate Web addresses, these artifacts also act as what Wenger (1998) refers to as "boundary objects" that can pass the multimedia representations on to others. In addition, many of the Web sites also include archives of materials and/or full-length videos for viewers who are interested in exploring the teachers' work in

Figure 5

Excerpt from class anatomy page of Learning from Practice exhibtion.

greater depth. Ideally, presenting material of varying types and at varying levels of depth helps to give viewers some of the initial knowledge of the context, content, and pedagogical approach they need to make sense of and begin to use the materials; correspondingly, developing class anatomies that use a familiar unit of analysis in the work of one teacher at one time and that share similar form and content may help viewers build the knowledge they need to learn how to navigate and comprehend this new genre of representation.

Beyond the Single Case: Seeing High-Leverage Practices Across Contexts

Although each class anatomy facilitates an in-depth look at the work of a single teacher during a limited period of time, these representations also create several critical problems for novices and teacher educators alike. In particular, the representation of a specific context may cause viewers to dismiss the representations as unrepresentative of—and therefore inapplicable to—their own contexts. Thus, critical features of the representation—the content, age, backgrounds, performance level of the students, and pedagogical approach—that enable viewers to focus on a particular instance of real teaching may also obscure more general aspects of teaching that might apply across contexts.

To address this problem, this exhibition brings together materials from each Web site that focus on what we are calling a high-leverage practice—in this case, orchestrating group discussions. High-leverage practices are approaches to teaching that can be used to address common problems

of practice that teachers face and that novices will almost certainly need to employ once they begin teaching. High-leverage practices also enable novices to continue to learn; for example, learning to elicit student thinking in discussions allows new teachers to learn about the different ways students may be thinking about a text or problem.[6] Thus, we consider orchestrating group discussion to be a high-leverage practice for English teachers because such discussions are ubiquitous in secondary classrooms, and orchestrating a good group discussion leads to opportunities for learning for both students and teachers. Teachers in many different contexts (including higher education) can use Hutchinson's "stock responses," which provides responses that students could give in a discussion if they are not sure of what to say, and her "anticipation guide," which helps students to identify and think about issues in their texts that they can discuss in class.

More than simple solutions to practical problem that teachers face, however, these strategies serve as what Vygotsky referred to as tools that novices can appropriate and that can help them to "approximate" the practice of experts like Hutchinson (Grossman et al., in press; Grossman et al., 1999; Vygotsky, 1978). Without tools such as these, novices may find that their discussions never get off the ground. Ideally, with these kinds of tools and the opportunity to try them out in a structured assignment and a relatively controlled setting like Grossman and Compton's classroom, novices will experience more initial success, may be more inclined to try this practice again, and will have further opportunities to develop their effectiveness over time. Beyond the immediate practical benefits of simplifying a complex task, when coupled with reflection and discussion, the use of these tools creates opportunities for novices to recognize connections to other theories and practices and to develop their conceptions of the purposes that group discussions can serve, when to use them (and when not to), and how to carry them out most effectively (Grossman et al., 1999).

Group Discussions as a High-Leverage Practice

Bringing together materials from the four Web sites can facilitate the appropriation of practical tools and the development of deeper conceptions of a high-leverage practice like orchestrating group discussions in several ways (see Figure 6). First, viewers get access to a number of different tools that they might be able to use (including Hutchinson's anticipation guide, Venson's mini-lesson for bringing a discussion back to the text,

and Bristol's technique of using paper balls as a means for promoting participation by all students). Second, seeing how these techniques work in practice and hearing the teachers' reflections can clue viewers in to both the potential and the problems with their use. Third, viewers can develop and examine hypotheses about what's working and what's not working in the group discussions and the use of these tools across these different contexts.

Focusing on the use of a high-leverage practice in limited segments of teaching across contexts, however, may also leave the impression that these high-leverage practices and the strategies and approaches that support them are relatively self-contained—that using the techniques and strategies seen in the practice of Hutchinson, Grossman, Bristol, and Venson will necessarily lead to powerful group discussions. But as Venson points out in her commentary for the exhibition, a lot of the work that lies behind good group discussions remains invisible even in these complicated representations:

> The students in her [Hutchinson's] class seemed to be doing all of these things automatically, but clearly they had practiced and practiced these skills all year long. I was impressed by the clips of her students discussing, but I was also overwhelmed by the amount of work it must have taken.

In contrast to a lesson or a unit that takes place during a limited period of time, the development of good discussions happens over time in a teacher's work, in many different activities. Even representations that seek to document particular group discussions in the work of different teachers may leave out how those discussions evolve over time and the routines, structures, and skills learned at other times that may help to create a culture and a setting conducive to productive discussion.

Representing some of these other aspects might be possible with additions to these Web sites or the development of other Web sites. After viewing an early version of Hutchinson's site, for example, Grossman advocated for the inclusion of material from earlier in the year that highlighted some of the explicit skills that Hutchinson taught—including annotating texts and asking questions of texts—to prepare students to participate in rich discussions (Grossman, 2005). Although this material was ultimately added, it was literally shoehorned in to the anatomy of the single class (in small arrows pointing either backward to indicate things that ordinarily go on at the beginning of the year or forward to indicate what some of the students were able to do the following year).

Reflecting this concern, Grossman's assignment and her site draw attention to the place of Hutchinson's unit

**Figure 6
Group Discussions as a High Leverage Practice**

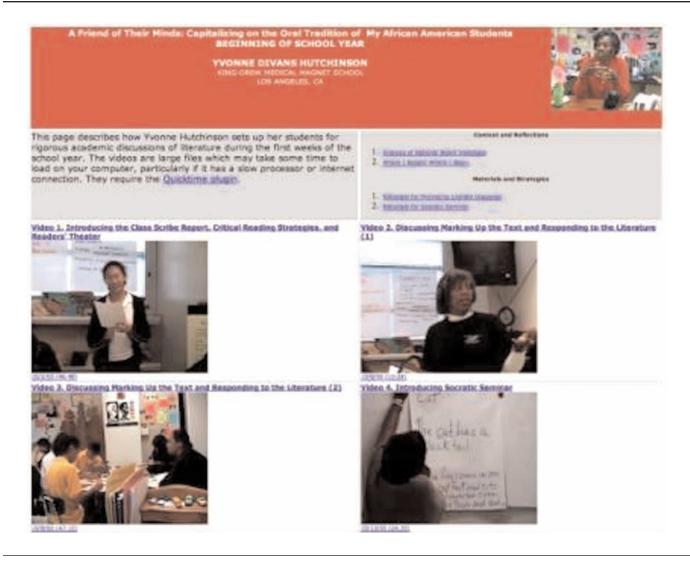| Tools & Routines	Discussion Excerpts (videos)	Discussion Reflections (videos)
Participation structures Stock Responses (Yvonne) Paper ball activity (9:20 after-class inteview) (Travis) **Scaffolding for reading and discussion** Anticipation Guide Discussing the AG (video) (Yvonne) Assignment (Pam) Guides & Notes (PDFs) Day 1, 2, 3, 4(Emily) **Norms/Routines** Norms & Routines Setting Expectations (video) (Yvonne) **Modeling** Mini-lesson: Taking it back to the text, 3/23 (Emily)	Set-up & Small Groups (Yvonne) Set-up Discussion Begins (Travis) Student-led Discussion(Pam) Small group discussion 3/23 Discussion 2 3/23 Discussion 3 (Emily)	Student Reflections (Yvonne) Student Surveys (PDF) Student Reflections (Pam) Discussion Wrap-up (Travis) Post-class Interview(Travis) 3/23 Class Reflection (Emily)

Excerpt from the group discussions page of Learning from Practice exhibition.

on group discussion within the course and the sequence of activities and skills that lead up to it. Grossman cues her students to look at what Hutchinson does early in the academic year that helps to explain the discussion in Hutchinson's class in the spring. In first introducing discussions, Grossman engages her students in thinking about how to prepare students for text-based discussions, focusing in particular on teaching students to annotate texts. To illustrate this strategy, she uses a clip (Video 3) from Hutchinson's Web site that shows Hutchinson teaching her students to annotate the text "Worry" (see Figure 7). In Grossman's assignment, several questions also ask students to investigate what Hutchinson has done earlier in the school year to prepare students,

including teaching strategies for reading literature and teaching students to annotate texts (see Questions 6 and 8 in Grossman's Assignment #2).

One could also imagine developing a series of class anatomies that focus on group discussions at different points in the year. Bristol's site, which documents a unit on *Othello* in the fall and links to a site documenting a class discussion of Byron's *Ode to the West Wind* in the spring, moves in this direction.[7] Or, Web-based representations could be developed to focus specifically on other high-leverage practices like building community in the classroom that might serve as critical supports for other practices, including group discussions and small group work. (For examples of a series of Web sites focusing on

Figure 7

Page from Yvonne Hutchinson's site documenting how she prepares students to participate in group discussions early in the school year.

another high-leverage practice–building community, see Davis, 2004; Maimon, 2004; Monesmith, Patel, & Santpathy-Lem, 2005; Schultz, 2006.)
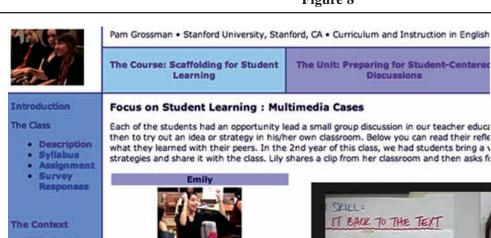
Beyond Teaching: Seeing Teacher Learning Over Time

Creating representations of teaching that reflect a developmental perspective is one way to try to document aspects of teaching that lie outside the scope of a single class. These representations might highlight the ways in which teachers build support for productive group conversations over time, steadily work to establish a productive classroom community, or sequence a series of readings and assignments to encourage students to gain a deeper understanding of a particular topic or issue.

Representations that strive to capture the developmental trajectory of teaching are also useful because they allow viewers to look at learning over time. To that end, each of the Web sites in the exhibition captures some aspects of student learning. For example, on the "Focusing on Students" page of Grossman's Web site, viewers can see a student, Lily, leading a discussion among her peers, leading a discussion in her high school classroom, and then later reflecting on what she learned from these experiences (see Figure 8).

However, another critical aspect of learning remains hard to see in each of these representations of teaching: teacher learning. Whereas Venson and her peers in Grossman's class found it difficult to contemplate all the work that went into Hutchinson's teaching, they also found it hard to imagine how to get from where they

Figure 8

Page from Pam Grossman's site documenting Emily Venson's work as a student teacher juxtaposed with a video of Venson leading a discussion in her own classroom three years later.

were to where they would like to be. Hutchinson's Web site provides some historical context and a retrospective account of development through Hutchinson's own written and videotaped reflections, but rendering visible what it took for Hutchinson to develop her practice calls for a series of representations of Hutchinson's practice over the course of her career.

Given the challenges of creating such a longitudinal series of representations in the work of one individual, this exhibition brings together materials that reflect what the practice of orchestrating group discussions looks like at different stages in several different teachers' careers. Thus, viewers can read and listen to reflections by Bristol and Venson on the use of group discussions when they were preservice teachers and when they were 2 and 3 years into their careers; they can see a video of Venson leading a group discussion as a student teacher in Grossman and Compton's class and in her own class 3 years later. Viewers can also view the videos and materials from Bristol's and Venson's first years of teaching in the context of Hutchinson's teaching after more than 30 years of experience, and viewers

can read the reflections of Grossman (an experienced teacher educator) on the use of group discussions in her teacher education class and on the learning that students like Bristol and Venson display over time. Although these are partial histories—fragments that hint at rather than define what a learning trajectory for orchestrating group discussions might look like—they may serve as a starting point for exploring the role that these kinds of representations might play in supporting the development of novice teachers in the future.

Understanding the role of representations of practice in teachers' development, however, demands reflection on the settings in which novices encounter these representations. Bristol and Venson are not learning to lead group discussions in the abstract; they are learning to do so in the context of Grossman and Compton's course and in the context of the goals and procedures of their teacher education programs and subsequent professional development activities. Bringing together representations of the work of teachers like Bristol and Venson with representations of the courses and activities in which they learned to teach enables teacher educators to examine

their students' learning, makes visible some aspects of the practice of teacher education and what might be entailed in developing that practice, and invites consideration of the effect of teacher education over time.

To foster the representation of what teachers learn and the settings in which teachers develop, a series of "teacher learning trajectories" in the future might draw from a collection of class anatomies that focus on the teaching of high-leverage practice in

- particular teacher education programs
- the teaching of novices who graduated from that program
- the teaching of more experienced teachers who exemplify the goals and values of the programs

Although some might argue that it would be preferable to produce these representations by following teacher education students throughout their careers, such longitudinal representations might well be out of date long before their production was completed: They might serve as useful historical artifacts but they might not help teacher educators or novice teachers deal with current conditions. In contrast, learning trajectories could be constructed in relatively short order by focusing on the work of teachers at different stages of development: preservice teachers, novice teachers, and experts, practicing in similar contexts. In fact, graduate students or teacher education students themselves could help to produce these learning trajectories as part of their internships and field experiences by completing assignments in which they document their own work and the work of recent graduates, exemplary supervisors, or mentors associated with the program.

Within and Beyond the Boundaries of Representation

This exhibition seeks to illuminate what novices and more experienced teachers and teacher educators can see in representations of practice and what they cannot. To do so, the exhibition looks at the practice of teaching from the standpoint of single classes or assignments, high-leverage practices, and learning trajectories. At the same time, numerous possibilities for representation of practice remain unexplored. For example, we do not address the organizational and institutional contexts in which Hutchinson's, Bristol's, and Venson's students learn. This omission has significant implications because it may obscure some critical factors that constrain and support teaching and learning in these different contexts. Thus, the ability of students to participate in the learning activities and group discussions represented in these sites

may depend to some extent on the fact that Venson's curriculum reflects considerable collaboration with a partner teacher and a schoolwide effort to establish some coherence and consistency across classes; in contrast, some of the work that students are asked to do in Bristol's class may be much further from what they are accustomed to in their other coursework. We could also have used these sites to focus on the teaching of controversial topics and content (the use of "explosive language" in Hutchinson's and Grossman's classes; religion and prejudice in Venson's; race and relationships in Bristol's), or we could have explored issues of race, class, and gender that are reflected across sites. Ideally, as more examples are developed that focus on these and other important issues, students in Grossman's class and in other contexts may be able to return to this exhibition and these sites and find more and more connections across them and further opportunities to deepen their understanding of the complexities of teaching and learning.

This exhibition also points to some of the other kinds of representations that might be useful to facilitate learning from practice:

- a set of class anatomies of individual teachers, in one class, in 1 year
- a series of representations of high-leverage practices within and across the work of individual teachers
- representations of learning trajectories that document both how a high-leverage practice might develop over time and the settings within which that development might take place

Even if it were possible to develop a large number of different kinds of representations quickly,[8] given the realities of teaching and teacher education and the normal constraints on attention, memory, and learning, trade-offs will always have to be made. Creating a series of representations of the work of a single teacher, a series of representations of a single high-leverage practice across contexts, and a series of representations of different high-leverage practices adds significantly to the complexity of the representations, the time it would take to navigate them, and potentially, the knowledge needed to interpret them. These constraints lead to fundamental tensions between scope (the range of the representations) and granularity (the depth of focus representations allow) (Hatch, Bass, Iiyoshi, & Pointer-Mace, 2004). If representations cover the use of a high-leverage teaching practice in a large number of classes in the work of a single teacher, it will take considerable time to take in and develop a detailed understanding of each one. Of course, spending that time investigating that same practice in the work of other teachers might be productive as well.

The development and use of the Web sites in this exhibition so far provide some indications of criteria that may help guide the production of Web-based representations in the future. Conceivably, these criteria might help explain what makes some Web-based representations more engaging and useful than others:

- relevance (to an individual's context and practice)
- applicability (ease of use)
- comprehensibility

At the same time, initial experiences with these Web-based representations of practice suggest that these may not be the same criteria that support long-term learning. Furthermore, the demands of long-term learning may heighten the challenges of navigating the tensions between scope and granularity. Thus, on the one hand, Web-based representations with a wide scope may foster long-term learning because they are applicable to many of the different settings and issues that teachers might encounter over the course of their careers; on the other hand, getting viewers to revisit representations may also depend on enabling viewers to go beyond the surface features and explore particular aspects of teaching in depth.

Efforts to address a number of research questions might help to weigh the costs and benefits of these trade-offs and may inform both the future development of new representations and the settings in which they can be used. In particular, the nature of the prior knowledge viewers need in order to interpret and learn with Web-based representations remains a crucial issue for further research. Furthermore, given viewers' experiences, beliefs, and knowledge, what aspects of representations are most likely to make them comprehensible? Similarly, how "real" do representations need to be to be relevant? And, how closely do the representations need to match viewers' own expectations and beliefs in order to engage them and support their learning?

In addition, given the reality that most novices will only have time to explore a limited number of Web-based representations of practice, when and under what conditions does it make sense for them to explore single representations in depth and when does it make sense to engage them in looking across representations? In turn, if novices benefit from looking across contexts, how many different contexts need to be represented to maximize their learning? Would having a common form for those representations facilitate comparisons or would providing different kinds of representations enhance the development of viewers' understanding of teaching? Given the importance of the settings in which novices examine these representations, what are the advantages of investigating (and perhaps producing) Web-based representations of practice in conjunction with field experiences or other practice-based activities? Given a long-term view of teachers' development and the possibility that they may gain different insights from Web-based representations of practice at different times, activities and arrangements that lead teachers to revisit some representations over time may also be worth exploring.

At the same time that researchers continue to pursue these kinds of issues, it is worth noting that these questions about the power and productivity of different kinds and different uses of multimedia representations are not just empirical questions; they are also questions of purposes and values. As Brophy (2004) points out in one discussion focused specifically on the use of video in teacher education, "attempts to determine when and how video might be used productively, as well as what kinds of content it might be used to convey, need to be considered with reference to a teacher education program's major purposes and goals" (p. 287). The same can be said of the development and use of Web-based representations of practice. From our perspective, those purposes and goals should include facilitating the decomposition of practice and fostering an appreciation and deeper understanding of the complexities of teaching at the same time—both identifying key tools and concepts that novices need to learn to use and problematizing the reduction of teaching to a "bag of tricks" that anyone with a little subject matter expertise can employ.

In and of itself, the development of a significant—and public—network of Web-based representations of teaching, informed by systematic research, could serve as a demonstration of the highly complex, situated nature of teaching and the kind of substantive learning that goes into it. It might also suggest another way to approach the problems encountered when trying to capture the "wisdom of practice" or produce a "knowledge base" for teaching (Hiebert et al., 2002; Shulman, 1987). These problems reflect the dual challenge of trying to conceptualize teaching expertise in ways that allow it to be developed "into" a knowledge base and then creating mechanisms that enable that knowledge to be made public and to be inserted "into" the practice of other teachers.[9] Although the development of a network of representations of teaching cannot solve these problems, it may sidestep these issues by bringing together a wide range of practical tools that many teachers could use right away and by providing the many other materials that invite in-depth examination and foster further learning across cases and contexts. On the one hand, the tools are "ready-mades" that can be adapted for use by many people; on the other hand, the complexity and variety of the representations may plant the ideas and raise the questions that make it more difficult to employ those tools in simplistic ways.

Web Addresses

A friend of their minds, Yvonne Hutchinson's Web site
   http://www.goingpublicwithteaching.org/yhutchinson/
Curriculum and instruction in English, Pam Grossman's Web site
   http://quest.carnegiefoundation.org/~pgrossman/
Exploring *Othello* in a tenth grade classroom, Travis Bristol's fall Web site
   http://www.tc.edu/ncrest/teachers/bristol/
A discussion of *Ode to the West Wind*, Travis Bristol's spring Web site
   http://www.tc.edu/ncrest/teachers/bristol_march/
Literature circles, Emily Venson's Web site
   http://www.tc.edu/ncrest/teachers/venson/
Making teaching public: A digital exhibition
   http://www.tcrecord.org/makingteachingpublic/
Inside teaching
   http://gallery.carnegiefoundation.org/insideteaching/
Commentary, Emily Venson
http://www.tc.edu/ncrest/exhibitions/learningfrompractice/materials/commentary_emily6.08.doc
Commentary, Travis Bristol
http://www.tc.edu/ncrest/exhibitions/learningfrompractice/materials/commentary_travis6.08.doc
Class anatomy page, Learning from the practice of teaching
   http://www.tc.edu/ncrest/exhibitions/learningfrompractice/class_anat.html
Group discussion page, Learning from the practice of teaching
   http://www.tc.edu/ncrest/exhibitions/learningfrompractice/group_disc.html
Beginning of the school year page, Yvonne Hutchinson's Web site
   http://www.goingpublicwithteaching.org/yhutchinson/beginningofyear.html
Video 3, Yvonne Hutchinson's Web site
   http://www.goingpublicwithteaching.org/yhutchinson/media/yvonneoct0903.mov
Assignment #2, Pam Grossman's Web site
   http://quest.carnegiefoundation.org/~pgrossman/assignment.pdf
Talk about a community: How does an elementary school teacher support classroom community through dialogue?
   http://www.tc.edu/ncrest/hatch/nd6505/index.htm
Building a community of writers in a first grade classroom
   http://gallery.carnegiefoundation.org/collections/quest/collections/sites/davis_mattie/
Creating structures that facilitate independence in a first grade classroom
   http://gallery.carnegiefoundation.org/collections/quest/collections/sites/maimon_gillian/
Using reading and writing to build community
   http://quest.carnegiefoundation.org/~kschultz/
Focusing on students page, Pam Grossman's Web site
   http://quest.carnegiefoundation.org/~pgrossman/zoomingstudents.html
Emily Venson leading a discussion, Pam Grossman's Web site
   http://quest.carnegiefoundation.org/~pgrossman/pam1111emily.mov
Emily Venson leading a discussion, Emily Venson's Web site
   http://www.tc.edu/ncrest/teachers/venson/Videos_revised/March23/March23MiniLesson.mov

Notes

1. The Higher Education Program of CASTL grew out of the work of Lee Shulman and Pat Hutchings, and Ann Lieberman and Thomas Hatch subsequently served as codirectors for the launch of the CASTL Program K-12 Teachers and Teacher Educators.

2. Ann Lieberman and Desiree Pointer-Mace served as codirectors for the Quest Project.

3. Relatedly, Yadav and Koehler (2007) point out that preservice teachers who believe that students learn slowly over time will focus on aspects of video and hypermedia materials that conform to their expectations, whereas those who believe that learning is innate will focus on other aspects that conform to their expectations.

4. See Derry and The STEP Team (in press) for a discussion of the value of providing multiple entry points into multimedia representations of teaching and learning and one example of a Web-based teacher education course designed in conjunction with a video case library.

5. Although Hutchinson's, Bristol's, and Venson's sites were deliberately designed to share some common features of a "class anatomy," Grossman's site was not designed to provide an in-depth look at a single class, instead focusing more on the sequence of an assignment that stretched over several weeks.

6. This conception of high-leverage practices was developed in conversation with Megan Franke, Anna Richert, and Kathy Schultz.

7. Technical difficulties that erased the audio track of the group discussion of *Othello* limit the comparison largely to Bristol's reflections on each one.

8. Although demanding, our experiences suggest that a class anatomy can be produced in a period of a few months by one or two students or research assistants as part of a class or while working on a part-time basis.

9. Using Cochran-Smith and Lytle's (1999) terms, a network of representations of practice might avoid some of the problems of focusing either on developing an abstract, formal knowledge base (knowledge for practice) or on enhancing the personal knowledge that each teacher demonstrates in the course of teaching (knowledge in practice). Thus, networks of representations of practice might provide a foundation for knowledge of practice by enabling many teachers to inquire about and examine many aspects of teaching in the context of both their own teaching and teaching going on in many different settings.

References

Abell, S., & Cennamo, K. (2004). Videocases in elementary science teacher preparation. In J. Brophy (Ed.), *Using video in teacher education: Advances in research on teaching* (Vol. 10, pp. 103-130). Amsterdam: Elsevier.

Ball, D., & Lampert, M. (1999). Multiples of evidence, time, and perspective: Revisiting the study of teaching and learning. In E. Lagemann & L. Shulman (Eds.), *Issues in education research: Problems and possibilities* (pp. 381-398). San Francisco: Jossey-Bass.

Bransford, J., Brown, A., & Cocking, R. (Eds.). (2000). *How people learn*. Washington, DC: National Academy of Sciences.

Brophy, J. (2004). Discussion. In J. Brophy (Ed.), *Using video in teacher education: Advances in research on teaching* (Vol. 10, pp. 287-304). Amsterdam: Elsevier.

Cochran-Smith, M., & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. In A. Iran-Nejad & C. D. Pearson (Eds.), *Review of research in education* (Vol. 24; pp. 249-305). Washington, DC: American Educational Research Association.

Davis, M. (2004). *Building a community of writers in a first grade classroom*. Retrieved November 14, 2008, from http://gallery.carnegiefoundation.org/collections/quest/collections/sites/davis_mattie/index.htm

Derry, S., & Hmelo-Silver, C. (2002). Addressing teacher education as a complex science: Theory-based studies within the STEP project. In P. Bel, R. Stevens, & T. Satwicz (Eds.), *International conference of the learning sciences* (pp. 611-615). Mahwah, NJ: Lawrence Erlbaum.

Derry, S., & Lesgold, A. (1996). Toward a situated social practice model of instructional design. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 787-806). New York: Macmillan.

Derry, S., & The STEP Team. (in press). ESTEPweb.org: A case of theory-based Web course design. In A. O'Donnell & C. Hmelo (Eds.), *Collaboration, reasoning and technology*. Mahwah, NJ: Lawrence Erlbaum.

Eisner, E. (1998). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. Upper Saddle River, NJ: Merrill.

Feiman-Nemser, S. (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. *Teachers College Record*, *103*(6), 1013-1055.

Feiman-Nemser, S., & Buchmann, M. (1985). Pitfalls of experience in teacher preparation. *Teachers College Record*, *87*(1), 53-65.

Fishman, B. (2004). Linking on-line video and curriculum to leverage community knowledge. In J. Brophy (Ed.), *Using video in teacher education: Advances in research on teaching* (Vol. 10, pp. 201-234). Amsterdam: Elsevier.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.

Goldman-Seagall, R. (1995). Deconstructing the Humpty-Dumpty myth: Putting it together to create cultural meaning. In E. Barrett & M. Redmond (Eds.), *Contextual media: Multimedia and interpretation* (pp. 27-52). Cambridge, MA: MIT Press.

Grossman, P. (2005). *How do we prepare teachers to lead student-centered, text-based discussions in their classrooms?* Retrieved March 1, 2008, from http://quest.carnegiefoundation.org/~pgrossman/

Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. (2009). Teaching practice: A cross-professional perspective. *Teachers College Record. 111(9)*, retrieved on December 30, 2008 from http://www.tcrecord.org/content.asp?contentid=15018.

Grossman, P., Smagorinsky, P., & Valencia, S. (1999). Appropriating tools for teaching English: A theoretical framework for research on learning to teach. *American Journal of Education*, *108*(1), 1-29.

Hatch, T. (2006). *Into the classroom: Developing the scholarship of teaching and learning*. San Francisco: Jossey-Bass.

Hatch, T., Bass, R., Iiyoshi, T., & Pointer-Mace, D. (2004). Building knowledge for teaching and learning: The promise of the scholarship of teaching in a networked environment. *Change*, *36*(5), 42-50.

Hatch, T., & Pointer-Mace, D. (2006). Making teaching public: A digital exhibition. *Teachers College Record*. Retrieved from http://www.tcrecord.org/makingteachingpublic/

Hiebert, J., Gallimore, R., & Stigler, J. (2002). A knowledge base for the teaching profession: What would it look like and how can we get one? *Educational Researcher*, *31*(5), 3–15.

Kennedy, M. (2005). *Inside teaching: How classroom life undermines reform*. Cambridge, MA: Harvard University Press.

Koehler, M., Yadav, A., Phillips, M., & Cavasos-Kottke, S. (2005). What is video good for? Examining how media and story genre interact. *International Journal of Hypermedia and Multimedia*, *14*(3), 249-272.

Kosma, R. B. (1991). Learning with media. *Review of Educational Research*, *61*(2), 179-211.

Lampert, M. (1985). How do teachers manage to teach? *Harvard Educational Review*, *55*(2), 178–194.

Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven, CT: Yale University Press.

Lampert, M., & Ball, D. (1998). *Mathematics, teaching, and multimedia: Investigations of real practice*. New York: Teachers College Press.

Le Fevre, D. (2004). Designing for teacher learning: Video-based curriculum design. In J. Brophy (Ed.), *Using video in teacher education: Advances in research on teaching* (Vol. 10, pp. 235-258). Amsterdam: Elsevier.

Leinhardt, G., & Greeno, J. G. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, *78*(2), 75-95.

Little, J. W. (2003). Inside teacher community: Representations of classroom practice. *Teachers College Record*, *105*(6), 913-945.

Maimon, G. (2004). *Creating structures that facilitate independence in a first grade classroom*. Retrieved November 14, 2008, from http://quest.carnegiefoundation.org/~rakin/gmaimon/index.htm

McDonald, J. P. (1992). *Teaching: Making sense of an uncertain craft*. New York: Teachers College Press.

Miller, K., & Zhou, X. (2007). Learning from classroom video: What makes it compelling and what makes it hard. In R. Goldman, R. Pea,

B. Barron, & S. Derry (Eds.), *Video research in the learning sciences*. Mahwah, NJ: Lawrence Erlbaum.

Monesmith, D., Patel, N., & Santpathy-Lem, S. (2005). *Talk about a community*. Retrieved March 1, 2008, from http://www.tc.edu/ ncrest/hatch/nd6505/index.htm

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, *5*, 14-37.

Roschelle, J. (2000). Choosing and using video equipment for data collection. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 709-729). Mahwah, NJ: Lawrence Erlbaum.

Ruff, W. (1991). *A call to assembly*. New York: Viking Penguin.

Salomon, G. (1979). *Interaction of media, cognition, and learning*. San Francisco: Jossey-Bass.

Schultz, K. (2006). *Using reading and writing to build community*. Retrieved November 14, 2008, from http://quest.carnegiefounda-tion.org/~kschultz/

Sherin, M. G. (2004). New perspectives on the role of video in teacher education. In J. Brophy (Ed.), *Using video in teacher education: Advances in research on teaching* (Vol. 10, pp. 1-28). Amsterdam: Elsevier.

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57*(1), 1-22.

Shulman, L. (1992). Toward a pedagogy of cases. In J. Shulman (Ed.), *Case methods in teacher education* (pp. 1-29). New York: Teachers College Press.

Shulman, L. (1998). Course anatomy: The dissection and analysis of knowledge through teaching. In P. Hutchings (Ed.), *The course portfolio: How faculty can examine their teaching to advance practice and improve student learning* (pp. 5–12). Washington, DC: American Association for Higher Education.

Spiro, R. J., Coulson, R. L., Feltovich, P. J., & Anderson, D. (1988). Cognitive flexibility theory: Advanced knowledge acquisition in ill-structured domains. In *Proceedings of the tenth annual conference of the Cognitive Science Society* (pp. 375-383). Hillsdale, NJ: Lawrence Erlbaum.

Spiro, R. J., Feltovich, R. J., Jacobson, M. J., & Coulson, R. L. (1992). Cognitive flexibility, constructivism, and hypertext:

Random access instruction for advanced knowledge acquisition in ill-structured domains. In T. M. Duffy & D. H. Jonassen (Eds.), *Constructivism and the technology of instruction* (pp. 57-75). Hillsdale, NJ: Lawrence Erlbaum.

Stephen, R. (2004). An old problem: Inert ideas. In J. Brophy (Ed.) *Using video in teacher education. Advances in Research on Teaching Vol. 10.* Amsterdam: Elsevier.

Vygotsky, L. (1978). *Mind in society: The development of higher psy-chological processes*. Cambridge, MA: Harvard University Press.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge, UK: Cambridge University Press.

Wetzel, C., Radtke, P., & Stern, H. (1994). *Instructional effectiveness of video media*. Mahwah, NJ: Lawrence Erlbaum.

Yadav, A., & Koehler, M. (2007). The role of epistemological beliefs in preservice teachers' interpretation of video cases of early-grade literacy instruction. *Journal of Technology and Teacher Education*, *15*(3), 335-361.

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