Resisting the New World: Constructions of Teachers and Change in Educational Technology Discourse

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Resisting the New World:
Constructions of Teachers and Change in Educational Technology Discourse

Qualifying Paper

Submitted by
Sarah Blum-Smith
Monday, October 31, 2016
Table of Contents

Introduction ................................................................................................................3

Background and theoretical framework ..............................................................5

Methods ..................................................................................................................7

Findings ...............................................................................................................15

Discussion ..........................................................................................................38

Implications .......................................................................................................50

References .........................................................................................................54

Appendix ..........................................................................................................66
Introduction

In contemporary discussions of educational reform, technology has been proffered as the solution to a range of perceived needs, including student engagement, differentiated instruction, preparation for “twenty-first century skills”, and teaching for deeper understanding. In my experiences as a practicing teacher, discussions of instructional technology frequently involved mandated use of new tools without discussion of the learning purposes served. I witnessed teachers’ attempts to raise questions about these purposes or the efficacy of particular tools in meeting them be construed as not being “on board” with school efforts towards improvement. This seemed to contribute to a cycle of frustration between teachers and administrators, where the perception of the former as resistant to change engendered efforts to force such change, which only created greater resentment and defensiveness.

Yet, in graduate school, I encountered a more nuanced discussion about both technology as a tool for meaningful instructional change and the role of teachers in that process. This discussion acknowledged conditions and realities that I witnessed teachers voicing as their own opinions only to be dismissed, including concerns about lack of time and training to learn new things (Hew & Brush, 2007), the need to clarify purpose of use (Ertmer, 2005), the potential for “new” instructional tools to simply replicate the traditional modes of instruction they were ostensibly in opposition to (Cuban, 1986; 2001), and the possibility that teachers could be both open to, yet also have trouble with, new ways of teaching (Demedtriadis et al., 2003). Possibly, then, there was something not about the instructional technology itself but about the conversation surrounding it—and specifically the way in which teachers were positioned in that conversation—that
might be serving to undermine the very goals of instructional growth and improvement that the introduction of educational technology was meant to serve. It is this conversation that the present study seeks to better understand.

In particular, I am interested in the creation of conditions that invite teachers into a holistic relationship to practice with technology (Franklin, 1999), a relationship in which they make purposeful, thoughtful, agentic decisions regarding what kinds of instructional tools to use and how in the service of a multi-dimensional, long-term vision of student growth and development. These conditions manifest in multiple areas: local and national policy regarding educational technology, the practices of teacher education programs, the form and content of in-service professional development, material and human resources available to teachers, and the explicit and implicit school-level policies and practices regarding what teachers should be doing and why. This study concerns itself with the way that discourse functions in the creation of those conditions, the way that instructional technology is discussed and how that discussion makes certain kinds of actions and ways of thinking more and less available.

This paper begins by reviewing the ways that the relationship between teachers, technology, and instructional change has been understood and investigated in academic literature. I then move to a description of the overall methodological approach and specific thematic analysis of articles from *Phi Delta Kappan* magazine. In the findings I explore the major themes that emerged from this analysis, including the call for a more learner-centered pedagogy, the justification of use of instructional technology in support of the development of 21st-century skills, and the importance of attending to the specifics of
implementation in practice. The discussion examines the significance of these discourses and the ways they are negotiated in the context of existing empirical and theoretical literature, particularly the extent to which these discourses invite teachers into a holistic relationship to practice with instructional technology. I conclude with implications for instructional change and reform as well as potential avenues for future research.

Background and theoretical framework

There has been a long-standing interrelationship between discussions of technology as a solution to educational problems and discussions of teachers as agents or impediments to change. Much work identified as a dominant narrative one that simultaneously claimed the primacy of instructional technology as a vehicle for necessary changes in practice, and positioned teachers as a potential obstacle to those changes (e.g., Christensen, 2008; Prensky, 2001). In his historical analysis of use of instructional technology, Cuban described this narrative as part of the “exhilaration/scientific-credibility/disappointment/teacher-bashing cycle” (1986, p. 5). While this narrative is still referred to as a dominant one (e.g. Demetriadis et al, 2003; Ottenbreit-Leftwich, Glazewski, Newby & Ertmer, 2010; Smith, 2013), more energy has been expended in its critique. This critique has taken two forms: empirical work which asserted a more complex reality, and theoretical work that questioned underlying assumptions of the dominant narrative about the purpose of education and the role of technology in society.

From early studies which emphasized that the existence of technological tools in schools did not, in and of itself, revolutionize classroom practice (Cuban, 1986, 2001; Schofield, 1995), empirical studies have challenged the dominant
narrative by exploring the multiplicity of factors that influence the extent and ways in which instructional technology is used. While some specific findings have been similar to aspects of the dominant narrative, such as teacher fears of a destabilized sense of authority and competence (Hodas, 1996; Schofield, 1995) or the need for teacher beliefs to align with recommended pedagogical shifts (Ertmer, 2005), the authors concluded that such concerns should be taken seriously rather than construed as evidence of teacher failure. Multiple studies have claimed the validity of teachers’ actual instructional practices, whether or not those practices perfectly align with the intentions of researchers, administrators, or product designers (Howard, 2013; Ottenbreit-Leftwich et al., 2010; Schofield, 1995). Noting that much impetus for technology in schools has come from outside of the profession (Buckingham, 2007; Cuban, 2001), other work has explored the ways in which school- and society-level conditions may invite resistance through practices such as top-down mandates that fail to acknowledge teachers’ perspectives and daily world of work (Grieshaber, 2010) or market forces pushing out products that aren’t ready or useful (Buckingham, 2007).

Alongside these empirical critiques have been ongoing calls to situate the study of educational technology within a broader socio-cultural context (e.g. Bowers, 1988; Bromley, 1997, 1998; Selwyn & Facer, 2013). Such work asserted that in order to understand both the normative and empirical impact of educational technology one must consider the contexts in which actions, language, and thinking are embedded. Some research has looked specifically at discourse around educational technology as an important feature of this context, an acknowledgement of the ways in which talk can both reflect and effect the
social conditions that surround it (Wodak & Meyer, 2010). For example, Selwyn, Dawes, and Mercer (2001) found that while the goals of national policy posited teachers as being equal and critical participants in the project of using ICT, these ideas were directly undermined by discourses in advertisements that disempowered teachers relative to technological tools and the educational technology companies.

However, the research that explores the impact of discourse around educational technology has mostly taken place outside of the US-context (e.g., Dussel, Ferrante, & Sefton-Green, 2013; Selwyn, Dawes, & Mercer, 2001) and focused on student use and experience (e.g., Buckingham, 2007; Ito, 2009; Selwyn, 2009). A few examples of US-based discourse analysis of teachers examined the constructs reflected in limited examples of teacher talk, such as a 4-minute conversation during a Professional Learning Community meeting (Curwood, 2014). There is continuing need for research that attempts to map these discourses more broadly and considers the potential sites of influence from which teachers may draw their ideas.

Methods

This study sought to investigate the following questions:

What discourses are present in a professional publication about the relationships between teachers, technology, and instructional change? What are the implications of those discourses for the way that teachers are invited to engage with the project of integration of instructional technology?

To explore these questions about the way that issues get talked about and understood, I used the qualitative methodology of thematic analysis (Boyatzis,
1998), a means by which we can see recurring patterns and relationships (Willig, 2013), with attention to the ways in which talk is not merely a reflection of understanding but itself does work to make particular actions and ways of thinking more and less available (Davies & Harré, 1990).

The goal of such a study was to name assumptions so that they can be interrogated, to understand how particular ideas become reified (Rogers, 2011, p. 4; Wodak & Meyer, 2010, p. 8), and thus open up questions that seem to be closed off. It is precisely because the past two decades reflect the ever-increasing presence of educational technology as an unquestioned feature of schools that it is even more essential to “acknowledge that notions such as ‘technology-enhanced learning’, ‘learning technology’ and ‘e-learning’ are largely sets of value preferences—that is, social imaginaries and ideological formations that present common (and often persuasive) understandings of how things ‘should be’ and ‘will be’” (Selwyn, 2014, p. 11). That is, such a methodological approach to this topic was valuable because what should be done in the realm of teacher integration of instructional technology, and the purposes of that integration, can seem so clear and unquestioned.

Data Collection

This analysis examined articles published in Phi Delta Kappan, an influential professional magazine. Aimed broadly at teachers, administrators,

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1 This publication has a circulation of 75,000. Data retrieved from Gale Directory Library (http://find.galegroup.com.ezp-prod1.hul.harvard.edu/gdl/breadCrumb.do?type=reviseSearch&src=bcrcmb&form=BasicSearchForm&inPS=true&userGroupName=camb55135&prodId=GDL&advancedSearchType=).
and other educational leaders, the magazine described itself as “the professional magazine for anyone who cares about classroom practice, policy, research, professional issues, and innovations in education” (Phi Delta Kappan, n.d.). Kappan both claims authority through publishing work by academic researchers but also targets practitioners in advertising and content, representing an important site from which ideas about educational technology practice in the field might emerge. Research has explored the role of professional publications in both reflecting and affecting educational discourse (Nash & Romero, 2012; Russell, 2011). Additionally, Kappan seemed an interesting source to analyze not only because of its straddling of the worlds of research and practice, but also because it seemed less likely to represent extreme views. That is, rather than wanting to find a source that would replicate the narrative of technological determinism and teacher resistance noted earlier, it was more interesting to explore what a more nuanced perspective could look like.

The articles chosen for analysis were published between 2012 and 2015. This period reflected the recent past from the time at which research began in the winter of 2016. A three-year (as opposed to one-year) period was necessary to generate the density of texts required for substantive analysis, but this particular study did not concern itself with change over time. To determine a sample set, I read the titles of all articles written during those years and selected articles whose titles and abstracts indicated relevance to the topic. From the initial group of 80 articles, I further narrowed by reading the content of all articles and selecting those that concerned educational technology as a primary focus and spoke specifically to teachers and classroom practice (as distinct from school-based management and organization). For example, while articles entitled
“Teaching STEM means teacher learning” (O’Neill, Yamagata, Yamagata, & Togioka, 2012) and “Technology weaves a tangled privacy web” (Darden, 2015) initially seemed relevant, a more in-depth reading revealed that the former focused on project-based learning in science classes (without attention to instructional technology) and the latter explored dilemmas of school security, not instruction. However, I included “New technology ‘clouds’ student data privacy” (Krueger & Moore, 2015) because the authors gave substantive attention to the justification for using instructional software and other online applications that would result in the collection of student data. The final sample set contained 29 articles.

Of these 29 articles, 9 were written by academic researchers and professors of education, 3 were written by authors affiliated with universities but not necessarily in research or teaching positions, 3 were written by practicing teachers, 6 were written by people from the non-academic world of research and policy (foundations and think tanks), 4 were written by members of the Phi Delta Kappan editorial staff, 2 were written by an academic in partnership with a non-academic author, 1 was written by a team from within a city department of education, and 1 article was written by a director of education policy at an industry organization. I interpreted the audience of most of the articles to be some combination of teachers and school-based administrators. Many articles used the word “educators” broadly to address the audience, as in an editorial note that stated, “Only when more educators step up in such fashion and look for that ‘little bit of sexy’ that will entice kids to learn will we ensure that we don’t miss the future rocket scientists like Adam Steltzner when they’re sitting right in front of us” (Richardson, 2012, p.4). An article on considerations to make
in implementing a flipped classroom approach seemed to target teachers (and, to a certain extent, principals) specifically with the subtitle, “Before you jump on the latest education trend, consider five questions to determine if this is the right plan for you and your students” (Moran & Young, 2015, p. 42), while the two articles that focused especially on the uses of student data (Krueger & Moore, 2015; Schneiderman, 2015) were targeted more to district-level administration. While parents and those responsible for making policy were sometimes mentioned, they were not explicitly the targeted audience. Of the 29 texts, 9 were from a themed special issue published in 2012 titled “New Styles of Instruction”, and 4 were from a themed special issue published in 2015 titled “Literacy and Technology” (see Appendix A for a complete list of articles included in the data set).

Data Analysis

I had previously engaged in in-depth thematic analysis of two texts from this sample set (Carpenter & Pease, 2012; Patterson, 2012). That analysis, following the steps laid out by Boyatzis (1998), generated a full set of codes. However, I did not want to begin by applying that code to the entire set of articles because it might close off the emergence of undiscovered themes present in other articles. I began by engaging in open, line-by-line coding of two texts: “Technology alone won’t transform teacher to facilitator” (Martinez & McGrath, 2014) and “The nerdy teacher: Pedagogical identities for a digital age” (Hull, Scott, & Higgs, 2014) (see Appendix C for examples of this initial coding). I selected these two texts to begin analysis because my initial read through of the sample set indicated that they had especially rich data in regards to the research
questions, and the two presented differing viewpoints regarding the relative positioning of teachers and technology in the process of instructional change. After an initial round of line-by-line coding (Charmaz, 2006) that attempted to articulate what was happening in the text, I moved up one level of abstraction to apply codes that connected sets of those line-by-line articulations to the research questions. I grouped these initial codes into conceptual categories, some with sub-categories within them (see Appendix D for examples of developing codes over time). The resulting code was similar to, but did not exactly replicate, the code generated by the preliminary analysis. I took this as confirmation that the overarching ideas were beginning to reflect the substance of the themes contained in the texts.

Following this initial coding, I engaged in repeated rounds of an iterative process of applying the emerging code to sets of two articles. As recommended by Boyatzis (1988), I selected each set of two new articles to explore how a contrasting viewpoint might further illuminate and refine the themes. I coded with attention to whether previously articulated themes were present but also open to new themes that would emerge. I noted if a section of text fit with a previously developed code, but also whether there were details of the specific iteration of that code in this article that suggested potential sub-themes. Following each round of this coding I wrote a reflective memo (Luttrell, 2010b) exploring potential sub-themes, reorganization or reconceptualization of the overarching code structure suggested by the new data, and ongoing questions (see Appendix E for examples of analytic memos).

As multiple rounds of this iterative process seemed to confirm the general code structure, I then moved to coding the full set of texts using NVivo coding
software. As I coded, I continued to make some adjustments to the naming and organization of the top-level codes, but focused primarily on articulating the emerging sub-themes. Drawing on Maxwell’s model of interactive research design (2013, p. 5), I moved continually between data analysis, goals, research questions, and theoretical framework. I struggled with the relative positioning of the three central ideas (teachers, technology, and instructional change) in the framing of the research questions, ultimately finding that it was this relative positioning itself that was part of what I was seeing in the data.

While I had begun memoing around specific codes and subcodes, in attempting to think through the conceptual connections between the codes, I returned to my research questions and tried to identify the assumptions about educational technology across the texts that seemed closed off, and the questions that seemed open. I then grouped sets of open and closed questions that were connected to one another. For example, while there seemed to be no question about the importance of moving to a more learning centered pedagogy, there were differences in how that pedagogy was understood. This grouping resulted in the three themes that structure the findings. Theme 1, *the call for a more learner-centered pedagogy*, draws primarily on the code of “called for instructional change”, including the subcodes “characteristics”, “role of technology”, and “role of the teacher”, as well as the code “contrast with past practices”. Theme 2, *justifying the use of instructional technology*, draws on the code “justification of change”, including subcodes “justification of different teaching” and “justification of use of technology”, as well as the code “benefit of change”, including subcodes “benefits to students” and “evidence given of benefit”. Theme 3, *the need to attend to the specifics of*
implementation, mostly contains data from the code “conditions under which change can occur”, including subcodes “conditions under which technology can enable change”, “conditions under which new teacher actions can occur” and “potential barriers”.

Limitations

In acknowledging the interpretative and subjective nature of this kind of analysis, and the central role that researcher identity plays in that process (Luttrell, 2010a) it is necessary to return to the concerns that brought me into the research. That is, I struggled to separate out my identity, and thus reactions and perspective, as researcher, from the identity of classroom teacher (with its own particular reactions and perspective) that still defines my core sense of being. As discussed in the introduction, it was the feelings of frustration and anger as a classroom teacher at the kind of relationship I felt I was being invited to have with instructional technology, resulting both from school-level discourse as well as media representations, that brought me into this work. I have had to push myself to overcome the instinctive skepticism of claims for instructional technology that was borne of perceiving a connection between the laudatory nature of those claims and the frequent denigration of teacher judgment and experience that seemed to undermine the potential for thoughtful and critical discussion of what tools should be used in the service of student learning and why. In the process of coding, I was aware of a hypersensitivity to anything I perceived as critical of teachers, and worked to be conscious of this reaction and the way in which it might serve to obfuscate important nuance and complexity in
analysis. I attempted to address this limitation through reading each text multiple times throughout the analytic process and pushing past initial reactions. I also searched purposefully for plausible alternative explanations.

It was a further limitation of this analysis that it did not attend to the important distinctions between types and forms of instructional technology. While the fact that such distinctions are often collapsed under the umbrella of “educational technology” is itself worthy of examination (Selwyn, 2014), it seems likely that specific discussions of areas like immersive technologies, assistive technologies, production tools, computer programming, and software for skill reinforcement differ in meaningful and substantive ways regarding how teacher practice in relationship to those tools and products are understood, and the purposes and justifications of use. Lastly, I did not explore the potential for change over time even within the relatively brief period in which the articles I examined were published. As suggested by the discussion of the practice of flipped classrooms in the findings, it is possible that even a three-year period may see important shifts in cycles of both hype and practice, with attendant consequences for discourse.

Findings

In this section, I examine the discourses that were present in this set of articles regarding the relationships between teachers, technology, and instructional change. In the discussion that follows, I consider the implications of those discourses for the thinking and actions available to teachers regarding their
work, and the extent to which that thinking and action would seem to enable a holistic relationship to practices with educational technology (Franklin, 1999).

Thematic analysis of 29 articles about instructional technology published in *Phi Delta Kappan* between 2012 and 2015 revealed broad areas of agreement across the texts in the call for a more “learner-centered” pedagogy and an understanding of the importance of technology within that framework, the justification of both new forms of teaching and greater integration of instructional technology in terms of preparing students for “21st century” skills, and the importance of attending to the specifics of the implementation of instructional technology in the service of those goals. However, within these broader themes, there were also important distinctions in how texts more specifically understood the roles of, and relationships between, teachers, technology, and instructional change. Texts that understood learner-centered as student construction of knowledge as opposed to individualized progression through a set body of knowledge foregrounded the role of teachers as designers of learning experiences, and technology as one of many legitimate options in meeting student need. Those texts which framed instructional technology as a tool that enabled the learning of necessary skills for the contemporary world, as opposed to technology as the key skill in and of itself, were more likely to assert that efforts to help students learn differently were not new, and that teachers played an important role in determining what students should learn and how. Lastly, agreement across texts within this publication on the importance of attending to the specifics of implementation, while frequently connected to calling out the existing hype around instructional technology, could not always completely escape those same narratives.
Theme 1: The call for a more “learner-centered” pedagogy

While broadly in agreement in calling for a more learner-centered pedagogy, the greatest element of consistency across texts were in the kinds of instructional practices that were put forth as negative examples, as the kind of instruction from which teachers and schools needed to move away. This image was characterized by teacher as lecturer, learning as knowledge transmission, whole-group instruction, and passive students, as reflected in statements such as, “Personalized learning challenges traditional school design by moving away from a teacher leading the whole class in a common lesson” (Childress & Benson, 2014, p. 34), “Rather than lecturing students and relying on outdated textbooks” (Martinez & McGrath, 2014, p. 42), and “The outdated, transmission model of education, through which teachers transmit factual knowledge to students via lectures and textbooks, remains the dominant approach to compulsory education in much of the world (OECD, 2009)” (Rosefsky Saavedra & Opfer, 2012, p. 9).

As these examples show, there was a consistent critique of a particular teaching style or set of practices, most easily captured in the shorthand of “lecture,” which was seen as unproductive or undesirable for its lack of differentiation among learners, privileging of factual information over conceptual thinking, and a model of teachers “telling” students ideas as the dominant means by which learning takes place.

It is interesting to note how strongly a particular idea of the past operated here, and the ways that idea functions discursively. It is not that this view of the past is surprising or inaccurate; there is ample evidence to support the claim that the dominant model of teaching practice in American schools has been a
transmission model (e.g., Cuban, 2013). Rather, it is the implied contrast between past and present (or future) that serves to lend validity and authority to the characteristics of instruction that are called for in these texts (Edwards & Potter, 1992). Further, this rhetorical construction of the past works to foreground the ways in which the instruction that is called for is defined by its newness, by “change” itself as a characteristic. As will be returned to later in the findings and discussion, not only does what is emphasized in the past hold clues to what is seen as important in the present, but how stark the contrast, or how discontinuous the relationship, presented between current and former efforts at instructional improvement has important implications for understanding the relationships between teachers, technology, and instructional change.

This conception of past instructional practices functioned as entry point to highlight the characteristics of instruction that authors thought should be employed in classrooms and schools, characteristics that could be grouped under the category of learner-centered pedagogy. This assumed contrast between the past and what was called for in the present was made explicit by Nolan, Preston, and Finklestein (2012), discussing the design and implementation of a blended learning course in digital literacies:

Traditional approaches to education center on curriculum or teaching methods. The true benefit of a blended model, however, is that it is student-centered. Rather than expecting students to fit themselves to the class, student-centered blended learning shifts the dynamics of teaching and learning in a variety of ways. (p. 44)

This contrast created what can be seen as an ideological dilemma (Edley, 2001) in which the assertion that the teacher is no longer the central focus of the classroom creates the need to assert what it is exactly that the teacher is doing, given that none of these texts forward an argument that the teacher is
unimportant or unnecessary to the learning process, or can be replaced by instructional technology.

However, the specific ways in which a learner-centered environment was described differed. The set of articles that focused particularly on blended-learning environments with online components emphasized the way in which such a model afforded personalization of student experience and fit with a conception of learning as competency-based, where students progressed based on demonstrated mastery of skills and concepts. In these texts, what was emphasized in relationship to an idea of the past was circumstances where the whole-class moved at the same pace under the teacher’s direction. In the descriptions of learning here, technology was used to deliver content, track student data and provide feedback mechanisms for students and teachers, and enable students to progress at an individual pace. In Krueger and Moore’s (2015) description of the valuable uses of student data, the example given of instructional application suggested a primary relationship between student and technology in the learning process:

Online gaming is perhaps the best example of how an application or program can learn about a player and then adapt the game to the needs, interests, and tendencies of that player. That level of personalization and progressive challenges gives a glimpse of what could be done with online learning activities. (p. 22)

Here the actions ascribed to the online gaming program (understanding the learner’s needs and skills and adjusting accordingly) are ones that might otherwise be understood as the work of the teacher.

Other texts seemed to understand learner-centered slightly differently. A distinct conception of the role of both the teacher and instructional technology was reflected in texts that emphasized the open-ended nature of a learner-
centered educational environment. A primary example of this was Mehta and Fine’s (2012) discussion of how the kind of “deeper learning” that they sought and found at San Diego’s High Tech High necessitated different forms of teaching. In an acknowledgement that it is not necessarily past instruction that is problematic, but present as well, the authors wrote, “academic work in most American high schools tends to be closed ended: There is an answer, the teacher knows it, and students are guided toward it” (p. 34). Then, the authors described the contrasting work at High Tech High, where students are engage in projects, utilize the Internet for research, and present their work in multimedia format:

By contrast, at High Tech High there is no clear answer. The teacher doesn’t know what students will produce, and students are responsible for navigating their way forward. There are plenty of parameters that include descriptions of the work to be completed, graded milestones, and assessment rubrics, but there is no single best or right way to complete a given project. (p. 34)

As reflected in the above selection, the teacher is not absent in this description of a learner-centered environment as one where students construct their own knowledge. Much work and thought has gone into the design of the project, and, while students are working, the teacher is described circulating around the room offering redirection, probing questions, encouragement, or support as needed.

This description of High Tech High and the open-ended nature of the work that teachers design for students stood in contrast to the descriptions of personalization and competency-based learning described previously. The latter did not necessarily seek to trouble the idea that there was a clear and predictable end-point to what students needed to know and the work they would produce to demonstrate that knowledge. Rather, there was concern with the need for individualized pacing and progression through that knowledge. Most
importantly, the difference between the presentation of learner-centered as student *construction* of knowledge and learner-centered as individualized progression *through* knowledge seemed to carry different understandings of what it was exactly that the teacher was doing (now that they aren’t standing at a chalkboard, lecturing to a whole group), alongside what the role was of instructional technology. As described earlier in the example from Krueger and Moore (2015), actions were ascribed to a technological tool that might otherwise be ascribed to teachers. In further illustration of this distinction, Childress and Benson (2014), in their discussion of a South Carolina public school adopting a blended learning model in the interests of raising student achievement, described teachers’ work in the following terms:

Teachers work with students to develop and execute learning plans carefully designed to meet them wherever they are, interact with students in small groups, and use data from assessment tools to gain a deeper understanding of each student’s individual abilities and needs. They are aided by support staff and empowered by technology to better tailor their instruction and reach each student on a more meaningful level. (p. 36)

Here teachers were making decisions about what it is best for students to do and when, providing differentiated instruction, and analyzing student data.

While there is some overlap in the teacher actions described, the set of articles that defined learner-centered in terms of student construction of knowledge, with an emphasis on the open-ended nature of learning, presented a slightly different picture of the work that the teacher is doing in this new instructional mode. This alternative picture of teacher work was connected to alternative ideas of learning in these texts, with the implication that learning was too complex and multivalent to be progressed through in a straightforward and linear manner. Particularly amongst four articles that focused on deeper learning
and deepening conceptual understanding, the most frequently occurring ways to
describe the work of the teacher had to do with guidance, facilitation, and, most
importantly, design. That is, teachers were designing learning experiences for
students, providing interventions (including direct modeling) to scaffold the
skills and understandings students needed to engage in those open-ended,
challenging tasks, and facilitating student exploration and discussion through
strategic questioning and prompting. For example, in their discussion of the
necessity for different instructional models to address “21st century skills”,
Rosefsky Saavedgra and Opfer (2012) noted the need for teachers to construct
experiences that would confront students with their conceptual
misunderstandings. Citing academic research to support the value of particular
practices in supporting student learning, they described a group of middle
school teachers modeling species extinction with yarn, noting how “this concrete,
tactile experience provided a forum through which teachers explicitly discussed
with students different types of causal relationships and how these relationships
played out in the model (Grotzer & Basca, 2003)” (p. 11).

Further, these different understandings of what teacher work looked like
given a different conception of the meaning of learner-centered seemed to carry
distinct ideas about the role of technology in the creation of those learner-
centered environments. In those articles that focused especially on
personalization of learning experiences, technology was put forward as an
essential aspect of the necessary instructional change, a defining feature. This
perspective is best represented in an interview with Michael Horn (Patterson,
2012), where Horn asserted:
Technology will be the backbone, if you will, that helps customize, individualize, and personalize learning for students who doubtless will have different needs at different times. I can visualize that one day one child will be working in a small group of students with a teacher on a concept, and the next day they’ll be going on their own path in an online learning modality. The day after that, they will be working with a tutor remotely on another concept. It will be a very flexible system underpinned by making progress and realizing success for each child. (p.16)

In this construction of learner-centered pedagogy, where the goal was a personalized experience that enables students to move at their own pace, there was an emphasis on the way that technology served as the primary mechanism that enabled students to disaggregate their learning experiences from those of peers and connect with content experts outside of their immediate environment.

By contrast, those texts that understood learner-centered as student construction of knowledge and teacher as designer in an open-ended environment were more likely to describe learning experiences that did not necessarily involve a technological component, and to focus on the affordances of technological tools and interventions in forwarding the goal of providing students with opportunities to engage in different kinds of thinking. Carpenter and Pease (2012) were two teacher educators who described a variety of instructional techniques that shifted greater responsibility for learning onto students, with attendant benefits to their understanding, metacognition, and engagement with school. After describing flipped classrooms as one model that could accomplish this, they introduced the next instructional model, the Question Formulation Technique, as “a more low-tech instructional tool aimed at activating student thinking” (p. 38).

Given that the criteria for selection amongst articles in the data set was attention to issues of instructional technology, I am cautious of drawing
conclusions from the fact that this presentation of an instructional mode that relied on technology as one of many (equally legitimate) options in accomplishing the same learning goal was only visible in a few of these texts. However, what is noteworthy here is that the seeming consensus about the importance of more learner-centered pedagogical methods (in contrast with the lecture model of the past) masked important areas of disagreement about the exact meaning of learner-centered, with attendant differences in an understanding of what role technology played in instructional change and what that meant for how teacher actions were conceived.

Theme #2: Justifying the use of instructional technology

Across this set of texts, there was again overall agreement on the importance of new instructional methods to preparing students for the contemporary world, and contemporary worlds of work. However, there were differences between whether instructional technology was seen as more an enabler of these “21st century skills” or whether facility with technology was seen as the salient set of skills in and of itself. While the assertion of the importance of technology to a project of instructional change is not noteworthy, it is interesting that a set of texts collected because of a shared concern with instructional technology were so dominated by understanding the use of that technology as part of the goal of enabling different kinds of teaching and learning. Broadly, there is a shared theme across the texts about the importance of what are frequently called “21st century skills” and the ways in which instructional technology can be utilized in classrooms to enable collaboration, communication, critical thinking, and problem-solving. This view was illustrated by statements
such as the following: “Educational technology is increasingly mission-critical to ensuring that students receive a world-class education and that the U.S. can compete in the global economy” (Schneideman, 2015, p. 33-34), “Collaboration skills are increasingly necessary for work and life success, and are vitally important to preparing students to compete in a global economy” (Carpenter & Pease, 2012, p. 40), and “The world in which teenagers live when they are not in school has changed profoundly, more so than at any time recent history. If high school is the home stretch in preparing them for life in the ‘real world,’ then we need to take a hard look at the policies and practices that currently define most American high schools” (Ferguson, 2014, p. 69).

Within this idea of the importance of new instruction in students learning 21st century skills, there were differences between texts in whether they presented the idea that instructional technology must be used in classrooms because “this is the way the world is now” or conveyed that technology is to be capitalized upon as part of a broader, and ongoing, quest to improve learning. This can also be understood as the difference between considering use of technology itself to be the skill(s) that students require, and the idea that particular technologies serve to enable the different kinds of teaching and learning required for that preparation. The former theme could include specific assertions that the tools that students use in life and work should be used in school. For example, in Journell, Ayers, and Beeson’s (2014) discussion of the benefits of using Twitter in a high school civics class, the authors offered the following justification:

Nearly every prominent individual around the world—politicians, celebrities, athletes, even the Pope—has a Twitter account. Twitter has become an essential way to distribute information and offers a free way to
extend the message that will reach the public in the quickest way possible. (p. 64)

In this framing, part of the grounds for the justification of Twitter as a valuable instructional tool lay in its widespread use outside of education, in its nominal ubiquity in society at large.

An understanding of the problem of lack of a particular kind of preparation was also made more broadly, locating the justification for both instructional change and use of technology in the purported disconnect between in-school and out-of-school practices. In a call for schools to make learning more connected to the rest of students’ lives, Kilfoye (2013) drew on the work of educational philosopher John Dewey to support this assertion, writing:

We’ve known for years that technology has dramatically changed how people work, think, research, become informed, collaborate, and communicate with each other and more...Public schools are the among the last institutions to accept this change. No wonder today’s students consider much of their time in school irrelevant and vapid. (p. 54)

The final sentence of the above quote illustrates an important connection between the justification of both instructional change and use of technology and the kinds of evidence given to support those justifications. That is, there was a potential slippage in these discussions of the justification of use of instructional technology between “this is what students are already doing”, “this is what students want”, and “this is what is best for students.”

Those texts that drew upon the idea that instructional technology is good because it is what students are already doing present the idea that in-school use should mirror, or pattern itself, on out-of-school use, as a given. For example, in advocating for the benefit of a blended learning model, Childress and Benson (2014) wrote:
The new model breaks down traditional school walls, allowing students to access digital content and lessons online so they can learn anytime, anywhere. For a generation that spends most of its time on mobile phones, this makes a lot of sense (p. 37).

Similarly, in locating the need for instructional change in the disconnect between use of technology inside and out of schools, Ferguson (2014) wrote:

The current generation of students—and even some teachers—has come of age in an era where information and speed triumph over everything, and most want the same dominion they have over their cell phones in all aspects of their life. Before and after school, they proactively control and manipulate forms of information and interaction they can access on their phones and computers. But once they get to school, their environment suddenly regresses 20 years as their access to technology is severely restricted. (p. 69)

Both of these texts reflected the assumption that there is some sort of normative benefit to schools engaging in practices that mirror students’ out-of-school lives. While 9 texts asserted that this is what students are already doing, one text raised questions about whether this kind of mirroring would actually be beneficial. In an exploration of the role that digital literacy can play in student motivation, Conradi (2014) cited academic research on students’ resentment of school “co-opting” their practices to caution against this mode.

What is at stake here is not the question of whether school should be responsive to the realities of students’ lives, a long-standing tenet of progressive and constructivist educational practice. Rather, it is the privileging of “what students want” (or an idea of what students want) as a driving justification of pedagogical decisions, including the use of the technology. What kinds of necessary decisions by teachers in the interests of student learning might this serve to close off?

These themes were related to, but slightly distinct from, the discourse around “digital natives” that has been more thoroughly explored in the research
literature. There has been extensive interrogation of the idea that there are natural, and beneficial, ways that students engage with new technologies, and that the assertion of this natural affinity detracts from the need for schools to teach students how to engage with technology (Buckingham, 2007; Selwyn, 2009). Other work has looked further at the implications for teachers of this rhetorical construction. In particular, Smith (2013) argued that the metaphor of “digital natives” serves to close off the possibility that teachers have the authority to question if and how instructional technology is used. While, as seen in the Ferguson example above, the texts represented in this sample less frequently used the kind of language that positions teachers and students in opposition to one another, using evidence or assertion of pre-existing student use as justification for why and in what ways teachers should engage with instructional technology also seems to close off some of these important questions.

Another set of texts offered a contrasting idea of justification in emphasizing the way that instructional technology could serve to enable new ways of teaching and learning deemed necessary for success in the contemporary world. In connection with issues raised in the first theme of the findings, there was frequently less emphasis on a break from the past here. That is, the claims for what was important and beneficial in the form of learner-centered instruction called for were less dependent on an idea of all past instruction being wrong. Indeed, Mehta and Fine (2012) also brought John Dewey in to their arguments, but in the service of asserting that their descriptions of teaching for deeper learning fell within the broader tradition of Progressive Education. This was a presentation of these called for contemporary practices as connected to past
efforts to teach for understanding, engage students in meaningful and authentic work, and build a sense of shared community. As the authors explained:

What is distinctive about High Tech High is not the presence of 21st-century technology, but the reimagining of schooling’s purpose and processes. In many ways, however, what High Tech High is doing is nothing new. Rather, the school is bringing the best version of progressive education into the present. (p. 34-35)

This acknowledgement that the idea of, and actions to enable, these kinds of teaching and learning could pre-date the existence of the Internet or other forms of computer-assisted learning, changes the justification of why instructional technology should be used. It is not because everything is different now, but rather because there are particular affordances of technologies currently available that lend themselves to these ongoing efforts. This is again an illustration of the difference between an assertion that technology itself is the essential skill that students need to acquire to be successful, and an assertion that technology can serve to enable the kinds of teaching and learning that would lead to that success.

This distinction seemed to frequently go along with different descriptions of the role of the kinds of decision-making made by teachers and the particular descriptions of how instructional technology was used. As has been noted above, these texts tended to offer some examples of new instruction that did not involve technology, along with those that did. In addition, they foregrounded teacher decision making about when and how to use particular instructional tools, with the implication that the decision-making criteria had to do with some overarching sense of what is best for learning. For example, in a text framed as questions that teachers should consider in deciding when it is and is not productive to use a flipped classroom model, Moran and Young (2015) asserted:
While some aspects of flipping work for math and science classes, that does not guarantee they’ll work in humanities-based classes. If a flipped approach is planned and implemented here, there are important ways the strategy can enhance student learning. The teachers in our research reported that they enjoyed the one-to-one student conferencing and felt that they knew each student’s level of mastery with the content in a way that they had not experienced previously. (p. 46)

In addition to asserting the need for decisions about use to be made in the context of the particular kinds of knowledge and knowing specific to different disciplinary areas, the evidence that these authors offered as the benefit of embracing a flipped classroom approach were examples of teachers finding the approach to enable kinds of interactions, both cognitive and affective, that they valued.

There were shared themes across texts on the importance of preparing students for success in contemporary worlds of work and ways of being in the world, as well as the significant role that instructional technology could play in that preparation. However, there was a difference between considering use of technology itself to be the necessary skill, as opposed to seeing technology as having the potential to enable the different kinds of teaching and learning that would result in the development of necessary skills, with the latter framing more likely to involve an understanding of the role of the teacher as one who makes thoughtful decisions amongst a variety of potential instructional tools in the interests of an overarching vision of learning.

Theme #3: The need to attend to the specifics of implementation

Across the data set was a shared theme that meaningful integration of instructional technology in the service of new ways of teaching and learning required purposeful attention to the specifics of how those technologies were
implemented at the school and classroom level. As part of this theme, many of these texts contained recognition of an existing, and unproductive, hype around educational technology, in which technology was claimed as a “silver bullet” that will solve all educational problems. Yet, there were also hints of how difficult it can be to fully escape this hype, one aspect of the dominant narrative around teachers, technology, and instructional change explored in the literature review of this paper.

This acknowledgement was usually in the service of setting up the claims of a particular article in opposition to that hyped narrative. For example, Nolan, Preston, and Finklestein (2012) claimed that:

Blended learning is more than the new face of educational technology. It represents a pedagogy-driven strategy to change the nature of students’ educational experiences and to build academic and personal habits and skills students need to be lifelong active learners and digital citizens. (p. 44-45)

Similarly, Phillips and Popovic (2012) concluded their discussion of the potential for games to serve as valuable assessment and learning tools with the assertion:

Games are far from a silver bullet. But, if they could help us instill in all students that relentless desire to seek what’s next, then we would ignite a love of learning that could last a lifetime. And that’s a game worth playing—and an investment worth making. (p. 30)

These authors were consciously engaging, or anticipating, a potential pushback to their arguments in acknowledging that others have touted instructional technology as a “silver bullet”. Nolan et al. distinguished themselves with the qualifier a “pedagogy-driven strategy,” similar to many articles that asserted that, in order for the introduction or integration of instructional technology to result in new kinds of learning, or improved learning, it had to be accompanied
by a rethinking of pedagogy. This was an assertion that pedagogical needs are the driver, rather than the technology.

In a further illustration of the concern with what is potentially unproductive in overinflated claims for technology that obfuscate the need to attend carefully to the specifics of what, when, and how teacher teachers use instructional technology, author and researcher Maryanne Wolf articulated the dangers of this approach in a 2014 Kappan interview with editor Joan Richardson. In response to a question about whether she knew of districts that had shifted to digital devices to the total exclusion of print, Wolf stated:

I do not. But I am sure there are people who are poised to do just that. There are schools that have gotten rid of every book and digitized everything. They did this before we had a shred of evidence either way. I look at that as a piece of a culture of lurch in the U.S. in which we go too quickly to whatever is the newest trend in education without sufficient evidence about what is best for whom and under what condition. (Richardson, 2014, p. 17)

Wolf located this “culture of lurch” not only within the realm of instructional technology but as part of education, and even society more broadly. Despite these clear (and occasionally even powerful) articulations of the limited productivity, or detriment, of sweeping claims for instructional technology that ignore the specifics of implementation, two other examples illustrated how pervasive those kinds of hyped claims can be, and the potential for conscious and unconscious impact on understanding and practice. While, as the sections of text above do, this first example located the source of this impact in the outside world, the second showed how such ideas could bleed into the rhetoric in Phi Delta Kappan itself, even when seemingly contrary to the nominal arguments and perspectives of the article, and the publication more broadly.
The first example was a series of three articles focusing on flipped classrooms. In a 2012 article, the two teachers credited with the development of the flipped classroom model described how they thought about its implementation, writing, “More than just a trend in education, flipped learning is a practice that is gaining momentum and is already making a difference for countless students” (Bergmann & Sams, 2012, p. 25). In this text the authors asserted that flipped classrooms were different from other approaches, partly locating that difference in the fact that the practice was actually being taken up, rather than just being talked about, and thus had a real impact on student learning. Interestingly, their language positioned the tendency to be swayed by trends as located within the culture of education more broadly rather than technology specifically. While the rapid turnover of reform efforts and ideas to “fix” education has been well-explored (e.g., Tyack & Cuban, 1995), this has a particular iteration in the area of technology. Elsewhere in their article, they also distinguished flipped classrooms as an instructional strategy that originated with teachers, motivated by teachers’ own desire to improve the learning of their students and enable them to utilize their time differently.

In the same special issue on “New Styles of Instruction” in which Bergmann and Sams’s article appeared, Fulton (2012) detailed the process by which one particular Minnesota school district embraced a flipped classroom model for math instruction, in response to the dual needs of limited budget and outdated textbooks as well as low student performance in the area of mathematics. While initially seeking out alternative solutions in response to practical constraints, Fulton detailed how teachers came to see the value in using flipped classrooms to enable them to differentiate amongst student needs, better
align curriculum to their particular learners, and deepen understanding. While these aspects of the article (such as emphasizing the way in which technology aids other learning goals, highlighting a gradual and thoughtful process of implementation) supported the theme of attending to the specifics of implementation, the text was more clearly a piece of advocacy than Bergmann and Sams, indicated by the title “10 reasons to flip”, and expressed perhaps most strongly in the description of the last of reasons, “Last, but certainly not least, is reason #11: Students like the flipped classroom!” (Fulton, 2012, p. 24).

Three years later, Moran and Young (2015), in their discussion of how to think about flipping classrooms as an instructional change, and how to consider different issues in making a thoughtful decision, noted that the hype around this particular practice had lead to pressure for implementation:

Despite these studies and the lack of much hard evidence suggesting that flipping results in more effective teaching or learning, many administrators are encouraging their faculty to try flipping. According to the Speak Up National Research Project (2013), 27% of principals wanted their teachers to try implementing flipped instruction during the 2013-2014 school year. The Flipped Learning Network encouraged a global initiative on Sept. 6, 2013, when all teachers in every content area were asked to flip one lesson. In a recent conference presentation about our research for the North Carolina English Teachers Association, all of the K-12 participants attending our session said their schools had pressured them to flip their instruction. (p. 43)

Part of the purpose of their article seemed to be to give teachers ways to consider how to make decisions about flipping. This implied an agency and knowledge on the part of teachers about under what circumstances this particular instructional practice would actually serve to meet the needs of their students’ learning. The authors were contrasting this with the reality they represented in which the hype around a practice, particularly a technology-based practice, could lead to teachers being told to do something in a less than thoughtful way.
All of these assertions were present in Bergmann and Sams’ original 2012 article (an article that was cited by others describing flipped classrooms as an approach, indicating that it has something of an origin status), where they emphasized the need for teachers to take up the practices of flipped classrooms in their own way, with any necessary modifications and adjustments, and to implement slowly over time, accompanied by professional development experiences and opportunities to connect with a community of educators similarly trying out the new instructional strategy. They didn’t attend as specifically to the concerns about match between content and tool as Moran and Young do, but the overall message about the relative positioning of teacher decision making and utility of different instructional technologies was similar.

One might speculate that the three-year gap between the publication of these articles represents something of a microcosm of the difficulty of holding on to this assertion of the need to attend to the specifics of implementation in light of the desire to make sweeping claims about the efficacy of a new approach. An original presentation of an instructional strategy that used the affordances of instructional technology in the service of a learning goal, with attention to the thoughtful consideration that should go into implementation, was followed by (as the data from Moran and Young assert) pressure for implementation in the world of practice, absent precisely that kind of thoughtful consideration. Flipped classrooms went from being one strategy among many for addressing fundamental learning needs, and instead became the new silver bullet. This prompted the need for another assertion that the instructional strategy, while it may be valuable, cannot solve all problems.
While this trajectory called attention to the difficulties of escaping hype around educational technology in practice, the triumphant language used in Fulton’s article suggested the difficulty of escaping the influence of this hype in rhetoric, even in texts that explicitly acknowledge the counter-productivity of that narrative. This was further illustrated in Mehta and Fine’s 2012 article, entitled “Teaching differently…learning deeply.” The purpose of the article, and the purpose of the Deeper Learning research project from which the authors drew their examples, was to identify schools engaged in the work of “deeper learning,” which, as the authors noted at the end, have been hard to find. The text primarily contained descriptions of instructional practices at High Tech High, a charter school in California, where the authors did see evidence of this kind of learning. There is nothing about the definition of deeper learning that means it has to involve technology. But the description of the school in the article emphasized technology. After an opening vignette that described students in a high school English class studying “fear-based rhetoric” and then producing “paranoid-style” documentaries, the authors noted:

In many ways, the approach to teaching and learning at High Tech High is as forward looking as the school’s name implies. The paranoid-style project is not an exception. Across the school, students are engaged in tasks that require them to explore and leverage the possibilities afforded by new technologies. (p. 33)

In describing the school itself, the authors wrote, “High Tech High even looks innovative. The building, which used to be a naval training center, feels like a cross between a technology startup and a science museum” (p. 33). There are implicit connections drawn here between “technology”, “forward looking”, and “innovative” in these descriptions. The descriptions of the school positioned
technology as a defining feature of what it is doing. One might argue that the very name of the institution being described did the same.

Yet, the authors’ fundamental argument was that it was not the technology that is responsible for the successes that they see at the school, but the successes of teaching and learning in different ways. In their emphasis (described in more detail in the previous two sections of the findings) on the continuity between past and present efforts to change instruction, technology as one of many possible tools to enable deeper learning, and the role of the teacher as designer in an open-ended, learner-centered environment, the authors situated the teacher over and above technology as driver of pedagogical decisions. Noting that “the presence of technology is no guarantee of meaningful improvement in teaching and learning” (p. 33), the authors suggested that what was most important at High Tech High was its “vision” of what teaching and learning can and should be, emphasizing again in the conclusion to the article that “What is distinctive about High Tech High is not the presence of 21st-century technology, but the reimagining of schooling’s purpose and processes” (p. 34).

It feels as though it would be easy for someone to read this article and miss the point that what is important is the vision, not the technology, because of the emphasis on the technology as evidence of forward-thinkingness. As described at the beginning of the findings, the narrative of a need to break from the past, and the location of undesirable instructional practices in the past, can more easily lend itself to changes becoming defined as good by virtue of their being new and different. In the example of Mehta and Fine, we have the simultaneous assertion that technology is the future of schooling (for a variety of reasons) and that technology alone cannot create that future. But it is easy to lose
the latter, and the complexity of implementation that it conveys, in the glare of the former.

As illustrated in this section, this set of articles reflected a strong concern with the ways in which a narrative of educational technology as panacea or magic fix could serve to obscure the primary importance of considering the specific ways in which teachers and schools implement instructional technology, including decisions about what kinds of instructional technology to use, when, and how, in the service of overarching learning goals. Yet, even within this seeming consensus, there were some indications of how difficult this narrative can be to move away from, in both practice and rhetoric.

Discussion

In a series of lectures broadcast on Canadian public radio in 1989, scientist and philosopher Ursula Franklin offered a framework for thinking about technology as practice. In particular, Franklin drew a distinction between what she termed “prescriptive” and “holistic” technologies, a distinction located not within the technological tool or apparatus itself but within the work being done with it. As Franklin asserted, these categories “involve distinctly different specializations and divisions of labor, and consequently they have very different social and political implications” (1999, p. 10). In this section, I will explore the ways in which the themes identified above, and their specific and differing negotiations, serve to invite teachers into a particular kind of practice with instructional technology.

The distinction between holistic and prescriptive technologies is characterized by differences in the knowledge required to do the work, the
extent to which the person doing the work is able to make decisions about both the means and ends of their endeavor, and the basis or criteria upon which those decisions are made. When practice with technology is prescriptive practice, workers carry out the plans of someone else (boss, supervisor, manager), applying the knowledge and skills relevant to the discrete task to which they have been assigned (p. 12). By contrast, Franklin’s description of holistic technologies begins with artisans and craftspeople, noting that:

Their hands and minds make situational decisions as the work proceeds... These are decisions that only they can make while they are working. And they draw on their own experience, each time applying it to a unique situation. The products of their work are one of a kind... Using holistic technologies does not mean that people do not work together, but the way in which they work together leaves the individual worker in control of a particular process of creating or doing something. (p. 10-11)

Particularly relevant here is the emphasis in this model of practice on the kinds of decision-making in which those doing the work engage, the way in which they do not follow a pre-determined script but rather make judgments and adjustments driven by their understanding of the needs of the situation in light of an overarching goal. I am primarily interpreting Franklin’s discussion of the “worker” to apply to teachers, but it is not unreasonable to think that how a teacher envisions their students’ relationship to learning also has implications for how they think about their own work.

While Franklin does broadly address the inappropriateness of education based on the model of production following from prescriptive technologies, I want to look more specifically at what it means to apply this framework to teachers’ practice with instructional technology. I am interested in the extent to which the discourses in the findings regarding the differing meanings of learner-centered as desired instructional change, the justifications of the importance of
instructional technology in that change, and the importance of attending to the
details of implementation in the context of hype around technology as solution to
educational problems, do or do not create conditions that invite the practice of
teachers with instructional technology as a holistic practice.

The call for a more “learner-centered” pedagogy

What kind of relationship to practice with instructional technology is
invited by the discourse of the need to move towards a more “learner-centered”
environment? While certain understandings of the meaning of learner-centered
lend themselves to a holistic model of practice characterized by responsiveness
to learner need and teacher design of the learning environment, those that
involve individualized progression through knowledge are less so in the ways in
which forms of teacher knowledge are disconnected from one another.

In a foundational review of existing research on cognition and learning
theory, the National Research Council concluded that one of the four necessary
characteristics of learning environments is that they must be “learner-centered,”
defined as responding to what students bring to the learning situation, including
their knowledge, attitudes, and beliefs, and be concerned with each child’s
individual progress in understanding (Bransford & National Research Council,
2000, p. 23-4). Yet, this seeming consensus about constructivism as a theory of
learning masks ongoing debate, even within research literature, about the
meaning of that theory for instructional practices, particularly around how direct
the interventions and instructions are of teachers working within that model
(Hmelo-Silver, Duncan, & Chinn, 2007).
Broadly, a learner-centered conception of teaching practice seems compatible with a holistic model, in that teachers are invited to act in ways that respond to the needs of the learners in front of them. The model of knowledge transmission to which “learner-centered” is opposed in these texts entails much less judgment and discretion on the part of teachers about what is important to learn and how. In a reflection of this, 7 articles cite accountability pressures as a barrier to the desired changes in instruction towards more “learner-centered” environments. That is, the pressure on teachers to produce student performance of knowledge on high-stakes, standardized tests is seen as undermining teachers’ ability to make decisions that are ultimately in the interest of long-term growth and development.

However, the particular ways in which some of these texts understand the role of technology in enabling more learner-centered environments, as well as the specifics of what it means to be learner-centered are less clearly compatible with a holistic model of practice. Some of the texts that emphasize personalization through technology as the defining feature of learner-centered environments present a model of teaching in which content knowledge is disconnected from other kinds of work that teachers are doing. As explored in the findings, this model is often one in which technology is the delivery mechanism for content, or the means of connecting students with “content experts,” in which learning remains a process in which a student progresses (albeit at an individualized pace) through a set body of knowledge and skills. Teachers might “curate” materials for students (Childress & Benson, 2014, p. 35) or act as “mentors and motivators to students” while others are “virtual content experts” (Patterson, 2012, p. 17). The importance of direct interaction with
students, and an acknowledgement of the herculean task of classroom teaching come through in descriptions of this model that present this redistribution of teacher responsibilities as in the interests of both teachers and students, as in Nolan, Preston, and Finklestein’s (2012) description of how “Teachers focus less on delivering content and instead spend more time on discussion, facilitation, formative assessment, small group instruction, and one-on-one interactions with students both online and in the classroom” (p. 44).

This disconnection of content knowledge from other kinds of knowledge stands in contrast to texts that emphasize teachers as designers of learning experiences, drawing on instructional technology as appropriate in ways that enable particular kinds of student learning, with attention to disciplinary-specific understandings. As noted by Lévesque (2008), there is a frequent danger of enthusiasm for the potential success of a particular program or intervention to overshadow the need for ongoing consideration of the particulars of how that program should be used within a specific content area. Further, Johnson (2005) has argued that the Shulman’s 1986 articulation of the concept of pedagogical content knowledge (then built upon by Mishra and Koehler (2006) as technological pedagogical content knowledge) served an important professionalizing function for teachers, because it asserted the particularity of the kind of knowledge that teachers needed to possess at the intersection of content, development, and pedagogy. That is, it is in the inseparability of these domains that the value of the work of teaching is located. I would argue that this inseparability of knowledge is a defining feature of holistic practice.

An illustration of the holistic orientation of this inseparability can be found in the writing of educational philosopher John Dewey, who, as mentioned
previously, is cited by some of these texts as a foundational thinker of learner, or child, or student-centered education. Dewey spoke to the dangers of overly binary distinctions between student and curriculum, and student and teacher. Writing over a century ago, Dewey noted how the assertion that school should be “child-centered” in opposition to the perceived dominance of a “curriculum-centered” approach (similar to the transmission of content articulated as past practice in these texts) obscured the necessary connections between those two orientations (1902, p. 16). His description of the work of teachers involved something similar to pedagogical content knowledge, in being able to recognize the significance of students’ understanding in a present moment in relation to the full scope of understanding within the discipline, in the interests of crafting learning experiences that would help students move further in their understanding. As he wrote:

Really to interpret the child’s present crude impulses in counting, measuring, and arranging things in rhythmic series, involves mathematical scholarship—a knowledge of the mathematical formulae and relations which have, in the history of the race, grown out of such crude beginnings. To see the whole history of development which intervenes between these two terms is simply to see what step the child needs to take just here and now; to what use he needs to put his blind impulse in order that it may get clarity and gain force. (p. 23)

The work of teaching described here is one that depends on tremendous knowledge at the intersection of domains, and the discretion to respond to students’ understanding with choices in the design of future experiences.

A holistic conception of learner-centered that means designing learning environments, including the choice of instructional tools and strategies, in ways that are responsive to the intersection of individual learner needs with the world of knowledge would seem to necessitate teachers remaining grounded in these
multiple domains of knowledge and competency, rather than dispersing them amongst adult roles.

The justifications of different teaching and use of technology

The overarching theme in the justification of the use of instructional technology is the importance of 21st century skills, those skills had students need to have to succeed in life. College and career success is not particularly distinct from life and work success. Some authors pay more attention to students’ happiness, and some authors frame the issue as one of society needing competent workers to fit jobs, a distinction between the purpose of schooling as one of social mobility or one of social efficiency (Labaree, 1997). The importance of instructional technology in this preparation has been found to be a common theme in policy documents justifying the need for investment in educational technology (Culp, Honey, & Mandinach, 2005). However, the distinction between texts in the extent to which technology (and technology in its present state in the world outside of school) is understood as the goal of skill preparation in and of itself as opposed to the enabler of other forms of understanding carries different implications for the kinds of thinking and decision-making open to teachers.

A holistic relationship to practice means that teachers must be able to make decisions not just about the means, but about the ends of their use of instructional technology in the service of student learning. The fact that these texts do attend to justification of use seems an acknowledgement that teachers are not just expected, as they would be in a prescriptive model of practice, to blindly follow the directives of administration regarding use, but rather that it is
important for teachers to understand the purposes behind the use. This seems a reflection of the understanding of Ertmer’s (1999) foundational research on integration of instructional technology in the service of more constructivist pedagogy, which emphasized the importance of addressing teachers’ beliefs about how and why to use technology. Yet, as Di Petta, Woloshyn, and Novack (2008) note in their study of teacher candidates’ views of technology, having a general sense that instructional technology is important to student learning does not necessarily mean that teachers have more specific and substantive ways to think about what they should be doing in their classrooms and how to make those choices. That general sense itself could serve as a form of prescription, foreclosing the necessary process of thinking through what is important in student learning.

What kind of relationship to practice is invited by the assertions that use of instructional technology is necessary because it is both the reality of the present world and the best way to prepare students for success in that world? In understanding this question, it is useful to consider a few different arguments about the role of schools in preparing students for life. Goldin and Katz (2008) provided empirical evidence that up until the 1970s people in the United States could improve their social/class status through gaining more education. That is, education had a real use value, as students were learning things in school that served them in the world of work. According to this argument, schools were actually doing a good job of preparing workers. In a similarly economically grounded argument, Murnane and Levy argued that, while this was once true, the skills that one once needed in order to be successful are no longer sufficient, and instead all students need to learn more communication, collaboration, and
problem-solving (Levy & Murnane, 2006; Murnane & Levy, 1996). While these were economists, making an argument about what the particular construction of the economy demands of its workers, they were concerned with inequality, both with a broad distribution of the skills necessary to be successful and with the declining power of schooling to promote social mobility, to give people a better life (in economic terms) than their parents. Reproduction theorists complicated this picture somewhat, arguing for the ways in which “preparing students for the world of work” could serve to replicate existing class structures and social inequality, whether done consciously or unconsciously (Anyon, 1980; Bowles & Gintis, 1976).

It is not, then, that the idea of the necessity of use of instructional technology to prepare students for life is unimportant, or untrue. However, the ubiquity of this justification masks how potentially narrow it is, and how it can serve to close off questions that teachers might need to ask and consider about what is most important for students to learn, and what values about learning, knowledge, and being in the world are communicated by particular forms of instruction. Giroux (1988) drew a connection between the assumption that schools will serve to further economic goals by producing successful workers, and the lack of opportunities for teachers to reflect critically on what they were doing and why in order to not simply replicate existing structures and ways of being. This critical reflection would seem to be a central feature of holistic practice. Similarly, in making an aspirational rather than descriptive argument, Dewey foregrounds the importance of asking for what purpose students are being educated. He argues for preparing students for a world that does not currently exist in order to bring that world into existence (1900; 1916). Multiple
texts in this data set do assert that part of the reason why past attempts at the integration of instructional technology have not resulted in substantive instructional change (or even improvement in student learning) is because they were not accompanied by a rethinking of the underlying purpose of school. However, I would argue that this construal of purpose is still troublingly narrow, as the purpose seems to be instrumental preparation (Dewey, 1916), albeit with an acknowledgement that the world for which students are being instrumentally prepared has changed.

The point here is that the justification of use of technology on the grounds that it is what the world is already doing involves a closing off of questions that teachers might ask about the underlying value of what students are learning and why it is important. The assertion that “this is the way the world is now” is one that philosophers of technology have frequently identified as central to a self-perpetuating justification for systems in ways that close off necessary questioning (Warren, 2008).

While some of the concerns raised above about the justification of student learning in the service of economic goals still apply, the alternative framework, of seeing technology as valuable in its potential to enable different kinds of teaching and learning seems to leave more room for holistic practices. This view is exemplified in the research literature by Wiske’s (2006) articulation that:

In a world that is complex and rapidly changing, effective citizens must be able to think for themselves and make thoughtful decisions about when and how to use their knowledge. They must learn how to generate new knowledge and cultivate habits of mind that support continual learning, reflection, and responsible action…New technologies can enhance meaningful learning in ways that are not possible with traditional educational tools. (p. 27-28)
If the importance of instructional technology lies in its ability to support this complex vision of learning, then teachers are in a position to make the same kind of reflective, thoughtful decisions about how to use knowledge that Wiske claims for students. In a holistic model of practice, teachers make informed judgments about what kinds of instructional tools to use, when, and how, because they understand these underlying principles of how students learn and the kinds of thinking that are valuable.

_The specifics of implementation_

Broadly, the texts in this data set noted that the hype around instructional technology, both as solution to all problems and as simplistic enabler of instructional change, was unproductive, and called for much more attention to the specifics of implementation. This would seem to invite a holistic relationship, in that there is attention to when, and to what ends, a teacher would use instructional tools, rather than a blanket admonition to do so. Yet, as noted in the example of Mehta and Fine (2012), this message seemed often to get lost. How can we understand this seeming contradiction? First, while these texts would generally seem to support an idea of technological neutrality rather than technological determinism, Bromley (1997) would argue that ignoring the meanings inscribed in production leaves users of technology vulnerable to succumbing to these meanings without critical thought. It is also hard to hold onto this because of the intertwined nature of the narratives of technological determinism and teacher resistance/incompetence. While these texts challenge the former directly, the latter is less explicitly addressed, and continues to impact the environment.
The history of the teaching profession is one in which a professional model developed where teachers had almost full autonomy at the classroom level but little power outside of the classroom (Johnson, 2005). As Lortie (1975) noted in his sociological study of the teaching profession, classroom teachers’ continuing investment in their professional autonomy and discretion, which could sometimes manifest as seeming resistance to reforms that would appear to threaten those qualities, must in part be understood as a need to assert control where they are able. Studies of teachers in the present have identified teachers’ sense of vulnerability and tenuous self-efficacy in the midst of policy initiatives such as new teacher evaluation systems (Day & Gu, 2010). As Cohen (1990) has articulated, teachers continue to be both object and agent of reform.

All of this is to say that the ubiquity of the hype surrounding technological interventions as solutions to educational problems seems connected to the long-standing lack of empowerment of members of the teaching profession to participate in making the broader decisions that impact their daily work. The ties between the claim of technology as solution and location of teacher as problem (Cuban, 2001) take place alongside the precariousness of teachers’ power and voice. Attention to the specifics of the conditions of implementation for instructional technology would seem to open opportunities for teachers to participate in decisions about that implementation. However, the precarious and vulnerable position of teachers to speak with authority amongst administrators, policy makers, and the community at large give extra weight to any admonishments of what teachers should do, even if this should be in the service of attention to these conditions. This tension is exemplified in Dussel, Ferrante and Sefton-Green’s (2013) case study of the One Laptop Per Child
program in Argentina which found that, despite rhetoric in program materials claiming an important role for teachers in the process of change, actual implementation prioritized getting technology in classrooms rather than thinking about how it would be integrated into existing practice. The authors asserted that there will be genuine conflicts between technology and practice, and that when teachers are brought into these conversations there is more space to actually wrestle with the conflicts in ways that result in meaningful change.

How can we understand the significance of this particular set of texts within this broader context of teacher vulnerability? As cultural theorist Stuart Hall (1980) reminds us:

Polysemy must not, however, be confused with pluralism. Connotative codes are not equal among themselves. Any society/culture tends, with varying degrees of closure to impose its classifications of the social and cultural and political world. These constitute a dominant cultural order, thought it is neither univocal nor uncontested. (p. 169)

Hall’s argument is that, while there are multiple possible ways that a given text may be decoded, or understood, the broader cultural context in which the text is read makes certain interpretations more or less likely. As highlighted in the findings, these discussions of instructional technology from Phi Delta Kappan do not themselves fit with narratives of technological determinism and teacher resistance to change that dominate an understanding of how and why instructional technology should be used. Further, they often call out the hype surrounding instructional technology, particularly what has been called “technological solutionism” (Morozov, 2013) as problematic.

This is not in itself surprising for this publication, and was partly what I was expecting going into the process of analysis. Yet, I interpret the seeming difficulty of entirely escaping the sweeping claims of the benefit and centrality of
instructional technology illustrated in the examples given in the findings from Mehta and Fine (2012) and Fulton (2012) as reflecting the impact of this dominant cultural order, despite the attempts to contest it. The easy availability of these dominant meanings is exacerbated by the context described above of the current feelings of vulnerability, of loss to professional autonomy, amongst the teaching profession. Lastly, I wonder about the impact of the connections between the narratives of technological solutionism and teacher resistance described in the literature review. While the hype around technology is called out by these articles, its frequent connection to denigration of teachers and teacher judgment is not. Does that further serve to leave open interpretations that subsume teacher agency and substantive decision-making in the primacy of claims for technology itself?

**Implications and avenues for future research**

A discussion of the implications of these findings begins from the assumption that a key condition necessary for the integration of instructional technology to serve meaningfully in forwarding the intellectual and social-emotional growth of students is for teachers to have a knowledgeable, purposeful, and agentic relationship to that process (Di Petta, Woloshyn, & Novak, 2008; Dussel, Ferrante, & Sefton-Green, 2013; Ottenbreit-Leftwich et al., 2010). I have argued that such a relationship is consistent with Franklin’s conception of a holistic practice of technology. As a teacher, this is the kind of relationship to practice that I want, one that allows for teaching to be intellectually challenging and emotionally satisfying work.
But further, I would argue that this holistic model of practice is not only consistent with research on the conditions that enable individual teachers’ meaningful integration of instructional technology but also those conditions that result in sustained and substantive instructional change at the organizational level. Within the field of research on teacher change, there has been a shift towards seeing change as coming from within individuals involved in the process through reflection and dialogue on underlying beliefs and assumptions (Richardson & Placier, 2001). As articulated by Hughes (2005), “The goal of professional development, then, is to help teachers make meaning of new constructs and experiences (technology, in this case) to determine its impact on education, including learning processes, access to content, and instructional methods” (p. 279). These goals necessitate a holistic, rather than prescriptive, model of teacher practice, one in which teachers engage in an on-going process of decision-making about the value of technological tools in their relationship to content learning and child development.

Similarly, Coburn’s (2003) discussion of different ways to think about the scale of reform emphasized both the depth of understanding and sense of ownership at the local level necessary for reforms to sustain in meaningful ways. This is compatible with an interpretation of Tyack and Cuban’s (1995) history of school reform as one that saw the ways that schools integrate new reform policies into existing practice as having some positive value. Both of these models of reform necessitate a high level of understanding and agency on the part of teachers, as well as an adherence to fundamental goals (regarding education and learning) that guide choices about what practices to employ and when.
Again, this is a conception of reform that would seem to be predicated on a holistic model of teacher practice, one in which teachers are not following directives but making continual, reflective choices about what to do and why. As Weick (1976; 1982) described in his model of schools as loosely coupled organizations, this organizational model can result in ongoing adjustments and localized changes that rely on the professional discretion and judgment of teachers, a model of change that is especially well-suited to the complex and unpredictable nature of learning, which can be understood as the work of schooling. As Weick (1982) noted, while school actors, such as teachers, are often criticized for their failure to fall in line with top-down directives, this can be understood as a strength if one trusts in those teachers to make situational decisions according to underlying values rather than prescriptive actions.

This study has only explored one potential site of discourses regarding teachers’ relationship to use of instructional technology. Research notes teachers’ increasing use of social media as a place to gain ideas about their work and issues in the field more broadly (Visser, Evering, & Barrett, 2014). It seems likely that the ways in which teachers utilize, and are influenced by, various print and media resources is not entirely rational or predictable, suggesting the need for further work that explores other sites. It would also be interesting to explore how (and how not) the discourses about teachers, technology, and instructional change have varied over time. As emphasized by both Bromley (1998) and Selwyn & Facer (2013), an historical perspective helps us better understand the social context of the present. What is and is not relevant from 1980s-2000s critiques that focus on computers and computerization to contemporary conversations about Web 2.0 and other digital technologies?
Lastly, it will be important for further research to identify what discourses are most relevant for teachers in their everyday work. When teachers talk about how they think about and make decisions regarding use of instructional technology, what ideas and frames are they drawing upon? What do they regard as sources of authority concerning how, when, and why instructional technology should be used? Where do teachers consciously think they have gotten their ideas about these issues? What are the implications for policy and practice of potential sites of disjuncture between those discourses seemingly most relevant to teachers and the range of other discourses available? An interview study asking teachers directly about these issues could further an understanding of what kinds of relationships to practice with instructional technology they are being invited into.

Media theorist Marshall McLuhan (1964) asserted that that it is through developing a critical awareness of how the discourses present in cultural representations impact our everyday lives that one can begin to achieve a more agentic and reflective relationship to the assumptions about the world that inevitably surround us. Beginning this process, and trying to untangle the many and complex messages regarding instructional technology present in publications like the one examined here, is a necessary condition to enable teachers to have a holistic relationship to their practice.
References


Appendix

Appendix A: Full list of *Phi Delta Kappan* articles.................................67
Appendix B: Final codebook.................................................................69
Appendix C: Examples of initial text coding..........................................94
Appendix D: Emerging code.................................................................113
Appendix E: Analytic memos...............................................................117
Appendix A: List of *Phi Delta Kappan* articles


### Appendix B: Final Codebook

*Note: Parenthetical numbers indicate number of incidents of theme in data set (might include multiple examples from the same text)*

<table>
<thead>
<tr>
<th>TOP-LEVEL CODES</th>
<th>SUB-CODES</th>
<th>SUB-CODES</th>
<th>DEFINITION/DESCRIPTION</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Called for instructi onal change</td>
<td>Characteristics</td>
<td></td>
<td>This is a description of the practices and forms of instruction being called for.</td>
<td></td>
</tr>
<tr>
<td>Authentic (5)</td>
<td></td>
<td></td>
<td>These portions of text illustrate or call attention to specific features of the called for instruction.</td>
<td>Martinez and McGrath, 2014 “Teachers constantly work to provide students with authentic experiences outside the classroom and the school. In this role, teachers are strategically identifying and networking with professionals in the community, including cultural, educational, or governmental institutions.”</td>
</tr>
<tr>
<td>Competenc y-based (4)</td>
<td></td>
<td></td>
<td>A description of called for instructional change characterized by being authentic instruction, based in real-world contexts, connected to real-world problems. The emphasis is that the content and context of instruction should not be removed from students daily lives.</td>
<td>Ferguson, 2014 “Policy innovations like “competency-based education,” where measures of student learning are based on the mastery of skills and competencies rather than on time spent sitting in a classroom, are helping schools create more personalized student-centered learning environments, a change that is most welcome to most high school students.”</td>
</tr>
<tr>
<td>Deeper learning principles (5)</td>
<td></td>
<td></td>
<td>These descriptions emphasize the principles of deeper learning, with attention to students’ conceptual</td>
<td>Rosefsy Saavedgra and Opfer, 2012 “Regardless of the skills included or the terms used to describe them, all 21st-century skills definitions are relevant to aspects of contemporary life in a complex world. Most focus on</td>
</tr>
<tr>
<td>Open-ended (5)</td>
<td>Descriptions of instruction called for instructional change that is characterized by being open-ended, with students engaging in projects, inquiry, and problem-solving where the end point has not been determined by the teacher and their is genuine investigation.</td>
<td>Kafai and Burke, 2013 “So what could computational thinking look like in schools? How could we teach it? The definition of computational thinking as designing systems, solving problems, and understanding human behaviors admittedly provides quite a broad berth here.”</td>
<td></td>
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<tr>
<td>Personalized (4)</td>
<td>A description of instruction that is characterized by being responsive to student need, including an emphasis on differentiation, tailored to individual interests, and personalized learning.</td>
<td>Krueger and Moore, 2015 “Since personalized learning is a high priority for parents and educators alike, we want to avoid passing laws that overreach and prevent online service providers from personalizing a student’s experience. Online gaming is perhaps the best example of how an application or program can learn about a player and then adapt the game to the needs, interests, and tendencies of that player. That level of personalization and progressive challenges gives a glimpse of what could be done with online learning activities.”</td>
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</tbody>
</table>
| Self-directed (3) | These descriptions contain an emphasis on the ways in which the called for instructional changes will enable student to have greater autonomy in their learning experiences and make decisions. | Zoch, Langston-DeMott, and Adams-Budde, 2014 “Another motivating feature of the camp was that students were given full autonomy in choosing their genres and topics. Some came with specific ideas; others chose topics after brainstorming and discussions with peers. “I like to just come up with ideas and write about what I want to,” said Allison. “But I don’t really like
| Appendix: Resisting the New World | 71 |

| Examples (31) | These are examples of what those practices look like in actual schools and classrooms, frequently bringing together more than one characteristic. Ferriter and Provenzano, 2013 “For example, Provenzano devised a project for his students at Grosse Point South High School in Michigan that connected students across time zones with Van Meter High School in Iowa to explore and discuss Shakespeare’s “Romeo and Juliet” in a new and exciting way. By using his connections on Twitter, Provenzano was able to find another teacher who shared his passion for English language arts and also was looking for a new approach to the classic play. Their students rewrote the play and filmed their own version that was webcast across the globe during a joint world premiere. Throughout the project, members of Provenzano’s network provided conceptual guidance and technical support, giving him the courage and skill necessary to create a new learning opportunity for his students.” |

| Role of technology | These pieces of text address the role of technology in making instructional changes. Hull, Scott, and Higgs, 2014 “Even during the current climate of accountability, high-stakes testing, and demands for higher academic standards, there are persuasive voices that urge a paradigm shift in how we think about the contents, processes of and purposes for learning. And in |
# Appendix: Resisting the New World

<table>
<thead>
<tr>
<th>Integration itself is a characteristic of that instruction or a goal of that instruction.</th>
<th>Virtually every reconceptualization, digital technologies take center stage.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One of many options (10)</strong></td>
<td>Moran and Young, 2015 “A unit on figurative language in which students are required to memorize literary terms such as “metaphor” or “simile” would work well, but part of the key also would be providing examples of the terms used in context. The teachers also found success with a video they created that showed students how to annotate a piece of text. Other aspects of the humanities classroom—dramatic performances, spoken poetry, literature circles, reading and writing workshops—would not be as appropriate for flipping and would still require an interactive and dynamic classroom approach.”</td>
</tr>
<tr>
<td><strong>Potential affordances (16)</strong></td>
<td>Conradi, 2014 “But motivation is a complex, multidimensional construct (Guthrie &amp; Wigfield, 2000), and the assumption that all kids are motivated by it or that technology is inherently motivating is a superficial one. It behooves us to consider technology integration at a deeper level. We must ask which dispositions and experiences might incline students to engage (or disengage) with digital literacies and which aspects of technology are likely to be motivating.”</td>
</tr>
<tr>
<td><strong>To be capitalized on (26)</strong></td>
<td>Colvin, 2013 “Much needs to be done before that vision becomes a reality in all schools. Teacher training is high on the agenda. “How do we fundamentally retrain teachers to create a new generation of engaging assignments that actually leverage the full power of the Internet and the power of the technology so students are learning to use the tools to think more deeply?” Cator asked.”</td>
</tr>
</tbody>
</table>
### Appendix: Resisting the New World

<table>
<thead>
<tr>
<th>Role of the teacher</th>
<th>These examples of text address what the teacher is doing, or the role that the teacher is playing, in the new forms of instruction that are called for.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative words for teacher (10)</td>
<td>Specific words to describe either the teacher or the act of teaching within the context of describing the new instruction.</td>
</tr>
<tr>
<td>Patterson, 2012 “HORN: Absolutely. I’ve seen some blended learning environments where teachers are really acting as mentors and motivators to students, while keeping students on task and answering basic questions—helping to keep people moving forward and tuned in. These environments will have virtual content experts, too. I can imagine that there could be a third set of adults, some who are caseworkers dealing with nonacademic problems that rip students up so much. You could have a very robust differentiated model that our current teacher training doesn’t prepare for well at all. Of course, that means the evaluation systems we’re putting in place right now wouldn’t work in this type of environment.”</td>
<td></td>
</tr>
<tr>
<td>Design (19)</td>
<td>Teacher actions that have to do with designing learning experiences, planning out what students will do, establishing the groups and expectations for what they will do.</td>
</tr>
<tr>
<td>Mehta and Fine, 2012 “Pedagogically, as Mr. Quinn and many of his colleagues report, developing and managing good projects is a complicated balancing act. The central challenge is that projects need to move along a clear trajectory, building in complexity and depth over time while also remaining student centered. There needs to be a balance of freedom and structure, improvisation and planning, ambiguity and clarity. Teachers manage these dilemmas by breaking projects into manageable but meaningful pieces, modeling the skills that lie at the heart of the work, and being specific about shared content while empowering students to engage learning in different ways.”</td>
<td></td>
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<tr>
<td>Appendix: Resisting the New World</td>
<td>74</td>
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</table>

| Explanation (5) | These texts emphasize the ways that teachers explain content and skills to students. This does not necessarily have to fit with a transmission model of learning, but does indicate that teachers are conveying important ideas directly to students.  

--- | --- |
| Rosefsky Saavedra and Opfer, 2015 | “Modeling misunderstandings and explicitly addressing them helps improve and deepen students’ understanding. For example, teachers in a middle school modeled for the students the problems created when a plant or animal goes extinct by connecting a group of students with one string of yarn that each held in their hand and then asking one of them to sit down to represent the disappearance of a plant or animal from the ecosystem. As students sat down others would feel the tug of the yarn. This concrete, tactile experience provided a forum through which teachers explicitly discussed with students different types of causal relationships and how these relationships played out in the model (Grotzer & Basca, 2003).” |

| Facilitation (12) | In contrast with design, these examples are less about setting things up and more about what the teacher is doing while students are working, circulating and asking questions, redirecting, providing feedback.  

--- | --- |
| Martinez and McGrath, 2014 | “Then students worked in pairs to practice honing their arguments, while Wise circulated the classroom, randomly sitting with students to check their understanding of the content, use of evidence, and ability to communicate their viewpoint. By structuring time for significant research and providing many opportunities for practice and feedback, Wise was a facilitator, helping students take responsibility for their own learning.” |

| Guidance (14) | These examples of text emphasize the ways in which teachers support students in moving along a learning trajectory, providing clear directions as well as intervention when students are struggling.  

--- | --- |
| Fulton, 2012 | “For example, in his precalculus class, teacher Troy Faulkner moves from student to student, cluster to cluster, watching, listening, noting who needs help, and working with students as needed. If several students are stuck on a problem, he might work through more examples on the board at the front of the class. And, just to be sure, there are daily spot quizzes, often using an interactive clicker to grade as they go. The instantaneous feedback allows for” |
### Instructional analysis (4)

**Descriptions of teacher actions with an emphasis on analyzing student data and making informed instructional decisions.**

*Carpenter and Pease, 2012*

“Effective assessment practice dictates that teachers should gather evidence of student understanding, analyze the evidence, make appropriate instructional decisions, and provide feedback to students to help them gauge their own learning in relation to goals.”

### Leadership (4)

**This image of teaching involves teachers in increased leadership positions within the school or the broader community, meaning that they are directing actions rather than just following policies made by others.**

*Berry and Hess, 2013*

“Expanded learning time may enable teachers to create new structures and tools to work together as professionals, escaping the isolation that has beset [p.60] the profession since its mid-19th-century origins. But a bold new brand of teacher leaders for extended learning opportunities won’t simply appear. Expanded learning time creates a new opportunity for change and need for leadership, but educators, would-be reformers, and policy makers must help cultivate the teacher leadership needed for such opportunities and commit to creating policies that establish and sustain it. Doing so requires creating room for teachers to think and lead, and this requires moving beyond outdated school models.”

### Support (6)

**These examples focus on the ways in which teachers respond to student need and understanding with particular actions and interventions.**

*Nolan, Preston, and Finklestein, 2012*

“Teachers oversee the online and classroom environments simultaneously after training in blended facilitation modes that include whole group instruction, small group instruction, peer interaction, and several one-on-one support modes that include online individual feedback, conferencing, and intervention.”
Far from replacing the teacher, this blended approach increases interaction between teachers and students.”

| Contrasts with past practices | These descriptions address the way in which the called for instructional change differs from past practices in schools and classrooms. | Mehta and Fine, 2012 “Underpinning this approach is a different view of knowledge and students’ relationship to it. Rather than seeing knowledge as something pre-existing that can be transmitted as a whole, this vision holds knowledge to be provisional and imagines students as active participants in its development. To teach with this view in mind requires that teachers not only think in a discipline but think about a discipline—to think about how knowledge in a field is created and discovered, and to invite students into the process of doing that work.” |
| Relationship to knowledge (5) | These examples address how students’ relationship to knowledge was different. | Carpenter and Pease, 2012 “Flipped instruction encourages students to become [p.38] more active in their own learning. Students watching a video at home are expected to stop, rewind, and review the lesson more than once if they struggle to grasp a concept. By moving lectures outside of class, flipping creates more opportunities for students to collaborate with and learn from each other in a face-to-face environment. The classroom thus potentially becomes a place where students spend less time passively receiving information and more time interacting with peers, teachers, and challenging content.” |
| Student role (13) | These examples emphasize differences in how students thought about their role in the classroom, or the kinds of work and actions they took. | Childress and Benson, 2014 “Personalized learning challenges traditional school design by moving away from a teacher...” |
| Teacher role (21) | These examples illustrate how the actions employed by teachers and... | Childress and Benson, 2014 “Personalized learning challenges traditional school design by moving away from a teacher...” |
| Use of Technology (3) | These examples specifically address how the use of technology should be different between present and past. | Zoch, Langston-DeMott, and Adams-Budde, 2014 “At school, student access to technology also was limited. They discussed how there were few computers in the classrooms. Grayson, a 4th grader, said, “We have three computers, but one is just for the teacher. We go to the computer lab once a week, but we don’t really get to do this stuff (create digital text with digital tools) there.” When asked what they did, he responded, “We mostly type up stories or play on pbs.com or starfall.com or some other web site.” Grayson’s explanation highlights two of the most common uses of technology in schools: putting writing in a final form, rather than as part of the writing process, and educational entertainment.” |
| Conditions under which change occurs | These descriptions address the conditions, at a variety of levels, under which instructional change can occur. | |
| Conditions under which technology can enable change | These texts address the specific conditions under which the integration of instructional technology will actually lead to substantive changes in instruction. | |
| Access (8) | These examples emphasize the importance of teachers and students having literally access to | Kilfoye, 2013 “The more we limit access to resources available from cyberspace, the more we marginalize the depth and relevance of education in public school classrooms. This is the |
| Hardware and Software. | same ethical dilemma that Thomas Serviovanni identified (Starratt, 2004) when he said that managerial imperatives and technical expertise without a moral or ethical compass results in inadequate decision making by educational leaders. Making decisions based on the technological concerns—without considering the essential mission of education in schools—undermines the ethical dimensions of preparing students for the adult world.”

| High Quality Tools (5) | These examples describe the importance of technological tools being high quality. Phillips and Popovic, 2012 “To be effective, learning games must adopt a key set of design principles: Stay true to learning science principles, not just game design principles; Optimize engagement and learning transfer simultaneously and avoid creating an uninteresting game or one with little learning; Continuously improve over time—the initial design of a game cannot be permanent; Include continuous in-game assessment, including assessing its own effectiveness for all learners; and Be optimized for multiple learning audiences: teachers and students in classrooms, parent-child learning, peer play and individual play.”

| Informed by Learning Theory (12) | These examples emphasize the importance of the design of instructional technology being informed by theory and research about how students learn, often specifically addressing industry and designers of technology (rather than educators). Richardson, 2014 (interview with Maryanne Wolf) “My question is how to best introduce technology in terms of reading acquisition, so I can be assured that children develop deep reading skills over time. I want children to look at reading in terms of how they personally contribute to what they learn. With a digital device, instead of their imaginative imaging, they just push a button and see a scene. I don’t want that from the start. I want to evoke their own imagination, their own thought. We don’t want to short circuit the development of these more sophisticated processes before they even begin.”


<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appealing to teachers (3)</td>
<td>These texts assert that it is important for technology specifically to appeal to teachers, with particular attention to the constraints of teachers’ daily worlds of work.</td>
<td>Elden, 2012 “We’ve been hurt before. Teachers want products that are user friendly and don’t leave us feeling used. It will be hard for us to trust you again if we have to find out about password problems in front of our students or troubleshoot during computer-based high-stakes testing. Please, work out your own issues before introducing yourselves.”</td>
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<tr>
<td>Match between tool and content (8)</td>
<td>These examples assert that for technology to aid in meaningful instructional change the particular tool has to be aligned with the particular content being taught, with an emphasize on disciplinary-specific skills and understandings.</td>
<td>Moran and Young, 2015 “However, new research indicates that flipping may be less effective in courses that lean toward discussions, performance, or writing (Johnson, 2013). Content areas, such as English Language arts (ELA) or other humanities-related subjects, may be less suited to flipping than math and science, where yes or no answers are more applicable (Moran &amp; Young, 2013). In a recent study of nearly 200 ELA students in the 7th grade, most found the flipped classroom method less engaging than a traditional classroom (Moran, 2014).”</td>
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<tr>
<td>Rethinking of pedagogy (14)</td>
<td>These texts emphasize that, in order for the integration of technology to result in meaningful changes in teaching and learning, it has to be accompanied by a more general rethinking of pedagogy, rather than using technology to replicate traditional forms of teaching.</td>
<td>Colvin, 2013 “The point is one that has been made over and over and over, ever since the days of filmstrips and movie projectors and television in classrooms. It’s not technology that will make a difference in how or what students learn. It’s how it is used. If schools use iPads and other mobile computing devices to do what they’ve always done but just more quickly, then it’d be better if they concentrated on keeping their No. 2 pencils sharp.”</td>
</tr>
</tbody>
</table>
| Teaching students how to use it (13)      | These examples focus on the importance of proactively teaching students how to use technological tools in the aid of their learning.                                                                           | McKenna, 2014 “The new literacies require a host of strategies that have few analogues in the world of print. Students must learn to navigate strategically within and between web sites. They must learn a burgeoning system of icons, color codes, and other conventions superimposed on
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<tr>
<td><strong>New teacher actions</strong></td>
<td>These examples address the conditions that enable teachers to teach in new ways.</td>
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<tr>
<td><strong>Culture</strong> (12)</td>
<td>Those conditions that manifest in, and as a result of, the culture in a school. As distinct from either explicit policy or infrastructure, these might be the kinds of actions that are encouraged and supported.</td>
<td>Bergmann and Sams, 2012 “Support from administrators—Flipping a class (or a lesson) is a different way to teach. Administrators need to support teachers who are willing to innovate and change. We have seen the most remarkable change happen when leadership—whether at the school or district level—embrace a flipped classroom approach and provide professional development, resources, and a willingness to embrace change of the sake of students.”</td>
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<tr>
<td><strong>Explicit policy</strong> (15)</td>
<td>The conditions that enable new teacher actions are located within explicitly stated policy, at the school, district, or national level, that is presumed to guide the practices of schools, to open up or close off particular avenues of action.</td>
<td>Schneiderman, 2015 “Schools must have sufficient flexibility to accommodate a wide variance of circumstances, including types of technologies, types of data, and local needs. New regulations intended to create a privacy and security floor could unintentionally create a digital learning ceiling. For example, we must avoid restrictions on using information for secondary purposes that could prevent teachers and parents from more effectively identifying a lesson or book appropriate to a student’s reading level in a manner long accepted in the analog world.”</td>
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| **Individual qualities** (4) | The conditions that enable new teacher actions are located within the qualities of individuals | Richardson, 2012 “Helping more kids want to learn and improving what they actually do learn begins with the changes that adults are willing to make in
involved, both teachers and administrators, such as bravery or thoughtfulness. themselves and in their work. That’s a whole lot harder than rocket science. Making personal and professional change requires courage and creativity, the creativity to look at old problems with new eyes and the courage to act with conviction that a new practice will yield something better than a traditional one. Only when more educators step up in such fashion and look for that “little bit of sexy” that will entice kids to learn will we ensure that we don’t miss the future rocket scientists like Adam Steltzner when they’re sitting right in front of us.”

| Infrastructural (21) | The conditions that enable new teacher actions that are housed within school and district structures, including material resources, or resources like the provision of time and training. This is distinct from policy in that something could be stated in explicit policy that is not supported by actual structures within the school. | Childress and Benson, 2014 “Through an extensive network of support and professional development, teachers receive the same benefits of personalization and feedback. The school is working with external partners who offer additional expertise and insight, including local higher education institutions and digital content providers who will help ensure students receive quality digital instruction that works for them.” |
| Learning Environment (24) | The conditions that enable new teacher actions that are housed within the environments in which teachers learn, with an emphasis on professional development settings or teacher education (formal or informal). | Hull, Scott, and Higgs, 2014 “Relatively little attention has been paid to articulating the kinds of professional development experiences that educators require in order to support students’ expressive and intellectual engagement with new media. Professional learning around digital media often focuses on tool use and neglects consideration of teachers as interested, creative producers of digital media artifacts. In our work with preservice and after-school teachers, we aimed to approach digital media education differently, providing teachers opportunities to work as artistic communities in designing and |

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<tr>
<th>Potential barriers</th>
<th>Related to, but distinct from, the conditions described above, these texts focus specifically on potential barriers, or things that can get in the way, of necessary instructional change, including integration of technology.</th>
<th>producing multimedia artifacts and digital videos.”</th>
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<tr>
<td>Accountability pressures (11)</td>
<td>These examples locate potential barriers to change in the formal and informal pressures on school to produce standardized and measurable student achievement results.</td>
<td>Carpenter and Pease, 2012  “Instructional innovations present opportunities to enhance learning at the same time that external forces push teachers toward limited notions of teaching. Budget and accountability pressures have taken their toll on teacher morale, instilling a sense of anxiety in many educators. The need to prepare students for end-of-course tests frequently sends teachers on a 10-month slog through content, exhausting themselves and bewildering many students. This coverage-based, test-focused approach leaves little room for exploring interesting facets of material. Worse, many teachers pour energy into preparing PowerPoint-dominated lessons, forcing students to become passive recipients rather than active learners.”</td>
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<tr>
<td>Changing culture (11)</td>
<td>These texts emphasize the difficulties of changing the culture (manifested in routines, expectations, and norms) around teaching and learning demanded by new instructional models.</td>
<td>Patterson, 2012/2013 (Interview with David Denton)  “Despite its advantages, MACOS defied traditional approaches to teaching and learning. This caused an unsettling effect on parents and educators, leading many to abandon it in favor of conventional alternatives. An important lesson to learn from MACOS is that effective practices and methods are not easily implemented or readily accepted.”</td>
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<tr>
<td>Internet restrictions (3)</td>
<td>These examples focus on the way in which school, district, or state-level regulations that limit the use of the Internet can interfere with the ability of teachers and students to utilize technological resources in support of learning.</td>
<td>Kilfoye, 2013 “A decade ago, a national survey by Digital Media Forum found that most Americans supported Internet filtering in public schools to protect students from the dangers lurking on the Web. Although 86% of the respondents said they believed the Internet was a valuable means for teaching and learning in schools and that it was a vital tool for developing skills for the next century, many said they were concerned about access to inappropriate material, thereby making it difficult to take full advantage of the resources (New York Times, 2000). Today, with federal laws mandating safeguards for schools and libraries and many public schools seemingly more interested in adopting policies geared toward avoidance of, rather than education through, the Internet (Chamberlain et al., 2010), the sentiment seems little changed.”</td>
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<tr>
<td>Teacher frustrations (5)</td>
<td>These texts emphasize the ways in which teacher beliefs, feelings, or past experiences with instructional technology can serve as a barrier to present use.</td>
<td>Elden, 2012 “You’re not the only one we’re seeing. When teachers claim our calendars are full, we’re not just playing hard to get. We’ve probably had several other tech dates this month, including multiple computer-based reading programs that saw us herding kids into the school library to use the computers. Each of these probably involves a diagnostic assessment plus corresponding practice and makeup assessments that require the library to stay closed for the day. The result is that kids can’t check out books until well into the third month of school, once we’ve finished assessing why they’re not good readers.”</td>
</tr>
<tr>
<td>Motivation for change (11)</td>
<td>These examples of text describe what is motivating individuals, institutions, or districts to embrace new forms of teaching and learning using</td>
<td>Childress and Benson, 2014 “When Summit administrators analyzed data on the school’s graduates who went on to college, they noticed that many were not prepared for college-level math. They needed remedial courses, which slowed them down and often led to them</td>
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<tr>
<td>Justification of change</td>
<td>As distinct from motivation, these examples speak to why a change in teaching, or a change in the way that technology is used, is necessary or important.</td>
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<tr>
<td>Provenance of ideas for change</td>
<td>These examples speak to where the ideas for different ways of teaching came from, whether from within schools themselves, the world of industry, or academic research.</td>
<td></td>
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<tr>
<td>Justification of different teaching</td>
<td>These texts specifically address why different kinds of teaching are necessary or important.</td>
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Technology. As distinct from justification, motivation focuses on specific things that prompted change, such as practical or budgetary concerns. Summit’s leaders didn’t want their graduates to struggle in college. So they began looking at ways to improve math preparation. After consulting faculty and outside experts, they became convinced that a blended learning model could help students improve. Eventually, Summit partnered with the nonprofit Khan Academy, which offers more than 3,000 free, online math and science video lessons and practice exercises. Teachers worked with Khan Academy staff to develop a blended math model that would personalize learning for students.”

Kafai and Burke, 2013 “But this is changing. In the past five years, we’ve seen a newfound interest in bringing back learning and teaching programming on all K-12 levels. But it’s digitally based youth cultures, not schools, leading this revival (Kafai & Peppler, 2011). Computers seem to be accessible everywhere, particularly outside school, where children and youth are innovating with technology—often with hand-held devices—to create their own video games, interactive art projects, and even their own programmable clothes through electronic textiles. What’s more, the same computers on which they create these items connect them to wider networks of other young users who share common interests and a similar commitment to connecting through making.”

Rosefsky Saavedgra and Opfer, 2012 “Globalization, economic necessity, and low civic engagement compound the
necessary. urgency for students to develop the skills and knowledge they need for success. The interconnectedness of our global economy, ecosystem, and political networks require that students learn to communicate, collaborate, and problem solve with people worldwide. Employers demand fewer people with basic skill sets and more people with complex thinking and communication skills (Levy & Murnane, 2005). Low levels of civic engagement highlight the recognition that rote learning about government is not a sufficient way for students to learn how and why to be engaged citizens (Levine, 2012).”

<p>| Justification of use of technology | These texts specifically address by the use of technology is necessary or important. | Journell, Ayers, and Beeson, 2014 “Nearly every prominent individual around the world—politicians, celebrities, athletes, even the Pope—has a Twitter account. Twitter has become an essential way to distribute information and offers a free way to extend a message that will reach the public in the quickest way possible. Tweets from President Obama’s official Twitter account (@BarackObama), for example, are sent to each of his over 28 million followers, and it is not uncommon for those tweets to be retweeted by thousands of users.” |
|-----------------------------------|----------------------------------------------------------------------------------| Kilfoye, 2013 “However you want to define Internet technology in the classroom, whether you call it technology-mediated education, online learning, or cloud-based teaching and learning, many thought leaders today believe it can become the great equalizer in education. Internet technology is the foundation for the next wave of democracy in American education and the society beyond |
| What students are already doing (19) | These texts justify the use of instructional technology on the grounds that students are already using technology in their out of school lives. | Ferguson, 2014 “And then there is technology, omnipresent in all aspects of everyone’s life, yet relegated to the sidelines in most American high schools. The current generation of students—and even some teachers—has come of age in an era where information and speed triumph over everything, and most want the same dominion they have over their cell phones in all aspects of their life. Before and after school, they proactively control and manipulate the multiple forms of information and interaction they can access on their phones and computers. But once they get to school, their environment suddenly regresses 20 years as their access to technology is severely restricted.” |
| What students want (5) | As distinct from what students might already be doing in a descriptive sense, these texts assert of a justification of the use of instructional technology based on the idea that students want to be learning using those tools. | Fulton, 2012 “Last, but certainly not least, is reason #11: Students like the flipped classroom! BHS math teachers survey students at the start and end of each course. A sampling of their comments (names removed) provides a window into why students seem to prefer the flipped classrooms:” |
| Will improve learning (9) | A justification of the use of instructional technology that foregrounds the ways in which such technology will serve to improve student learning. | Journell, Ayers, and Beeson, 2014 “Moreover, a growing literature base advocates using Internet-based networking technologies in academic contexts, with research suggesting that these tools deepen understanding of content, offer greater opportunities for diverse instruction, and provide students with needed skills (Heafner &amp; Friedman, 2008; Journell &amp; Dressman, 2011; Reich, Murnane, &amp; Willett, 2012).” |
| Benefit of change | These texts describe the specific benefits resulting from teaching in new ways, including the school walls.” |</p>
<table>
<thead>
<tr>
<th>Benefits to students</th>
<th>This code focuses specifically on the benefits that are claimed on behalf of students, including both affective and cognitive factors including increased motivation, deepened conceptual understanding, and digital literacy.</th>
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<tr>
<td>College and career readiness (4)</td>
<td>An emphasis on the benefit of the instruction in terms of preparation for life beyond K-12. Nolan, Preston, and Finklestein, 2012 “The success of the DIG/IT program has prompted City as High School Principal Alan Cheng to enroll as many students as possible in it. The school offered 14 sections of the course, serving 280 students during the program’s first year. “Students are using technology more adeptly, seeing revision as an important step in their work process, and developing college and career-ready skills,” Cheng said. “Digital literacy benefits students academically in all course.””</td>
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<td>Deepen conceptual understanding (16)</td>
<td>These benefits have to do with deepening (as opposed to broadening or accumulating more knowledge) understanding of academic content. Conradi, 2014 “Having students collaborate also leads to better comprehension. Chinn, Anderson, &amp; Waggoner (2001) stress that in collaborative tasks, students combine their background knowledge and skills, and together build comprehension. By asking students to collaborate on a Google doc or blog or VoiceThread®, we are in fact providing opportunities for deeper meaning making.”</td>
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<td>Increased SMEFT (30)</td>
<td>These benefits address students increased feelings of self-efficacy, motivation, engagement, flow, and tenacity. McKenna, 2014 “Other factors include value, interest, and attitudes. When students are afforded the opportunity to explore existing interests through online projects, she argues, the value they ascribe to reading increases and their attitudes toward reading grow more</td>
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</table>
positive. Likewise, Diane Carver Sekeres and her colleagues (p.44 this issue) illustrate how collaboration can be the social engine that motivates students as they engage in structured online inquiry tasks.”

| Learn more (16) | As opposed to deepening conceptual understanding or building skills, this is more narrowly an assertion that, with these new forms of instruction, students will learn more. | Patterson, 2012 “HORN: With a system that is set up for every child to realize success, they would actually just fly faster in some sense. They would learn more; they would be able to absorb more, work with more people, attack more interesting problems, go deeper on interesting concepts where they really want to excel and pursue their passions. I think about my own experience in middle and high school and the amount of times I said, “Gee, I get the game, I can just skate by here and do great,” and yet I was sort of missing the big picture of how much more I could have done.” |

| Non-content skills (32) | These benefits include skills that go across content areas, including communication, collaboration, meta-cognition, independence, critical-thinking. | Nolan, Preston, and Finklestein, 2012 “Communication and collaboration—Students develop the ability to navigate today’s flexible and open workplaces, to work as members of a team, to present ideas effectively, and to communicate with others using a variety of styles and approaches in accordance with the purpose and context of the work.” |

| Individualized/differe.ntiated instruction (23) | The benefits to students of receiving instruction that addresses their particular areas of need and struggle. | Fulton, 2012 “In traditional math classes, teachers see evidence of student struggles when homework papers are turned in—or not—incomplete, or riddled with errors. But exactly what was it that confused the student? With flipping, the teacher is there looking over shoulders as students work on problems in class, where struggles are obvious, and mistakes can be nipped in the bud.” |

<p>| Benefits to teachers | These descriptions of benefits emphasize what is gained from the teacher’s |</p>
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<tr>
<th>Collaborates</th>
<th>These benefits emphasize the ways in which teachers value and benefit from opportunities to collaborate with colleagues.</th>
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<td>Berry and Hess, 2013 “Technology can free the teacher from having to shepherd 25 to 35 students throughout a prescribed curriculum from start to finish. Twenty-first-century teaching can unshackle us from our ingrained disputes, obsolete arrangements, and inept anxieties. Teaching for 21st-century learning is too complicated for one teacher to do it all—and demands a larger array of experts, specialists, and generalists working as a team.”</td>
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<tr>
<td>Target</td>
<td>These texts emphasize teachers’ satisfaction in being able to target instruction more precisely to the needs of their students.</td>
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<tr>
<td>Instruction to needs</td>
<td>Moran and Young, 2015 “If a flipped approach is planned and implemented well, there are important ways the strategy can enhance student learning. The teachers in our research reported that they enjoyed the one-to-one student conferencing and felt that they knew each student’s level of mastery with the content in a way that they had not experienced previously.”</td>
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<td>Use time</td>
<td>These examples frequently emphasize the ways in which teachers are frustrated by constraints on their time and attention and the benefits of new instructional forms and uses of technology in allowing them to be more strategic in their use of time.</td>
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| differently | Phillips and Popovic, 2012 “In a Bill & Melinda Gates Foundation/Scholastic survey of 40,000 teachers, 92% said formative assessments are more important in measuring student academic achievement. While feedback and assessment help teachers differentiate instruction and reteach material according to each student’s needs, too often they lack the tools or time to get that information. As one elementary school teacher reported, “Just thinking about the time it takes to review student data and prepare for and deliver instruction to growing numbers of students, who all require ongoing formative assessments and differentiated instruction, leaves me breathless.” Gaming technology can enable personalized learning by immediately showing students
<table>
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<tr>
<th>Evidence given of benefit</th>
<th>This code describes specifically the type of evidence used to claim a particular benefit. That is, if it is argued that the called for instructional change will benefit student learning, the evidence in support of that claim might be standardized test scores, or teacher surveys, or students’ own descriptions.</th>
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<tr>
<td>Classroom anecdote (5)</td>
<td>These uses of evidence draw on descriptions of incidents from classrooms to illustrate the benefit of new ways of teaching and using technology.</td>
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<tr>
<td>Research citation (23)</td>
<td>In these texts, authors bring in citations to academic research to support their claims about how new ways of teaching are benefiting students and their learning.</td>
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Conradi, 2014 “Literacy is an inherently social experience (Street, 1995), and learning is optimized in an interactive, social context (Vygotsky, 1978). We are motivated by the notion that we can share our reading and writing (including multimodal compositions) with one another, and technology provides opportunities for discussion and collaboration in ways that traditional practices do not always allow.”
Perhaps a reason that the social aspect of technology is so motivating is that it gives our literacy activities and experiences purpose, which Daniel Pink (2009) highlights as one of the three essential elements of motivation, which include autonomy and mastery. In coconstructing meaning with peers and with the possibility of sharing written, multimedia products with a global audience, we are providing students with purposeful opportunities to engage with literacy.”

| Student achievement data (3) | These examples use aggregate data on student achievement (not necessarily specific standardized test metrics) to illustrate the benefit of instruction. | Mehta and Fine, 2012 “Although the school has not been rigorously evaluated, the prima facie evidence is impressive. The schools have done well on a variety of measures: 100% of their graduates have been accepted to four-year colleges, including the roughly 35% of their students who are the first in their families to go to college, and the 37% who qualify for free and reduced-price lunch. According to National Student Clearinghouse data provided by High Tech High, 77% of their graduates have finished or are currently enrolled in postsecondary education, including 69% of students who were the first in their family to go to college, and 67% of students who qualified for free and reduced-price lunch. The Jacobs’ campus also scores in the top 20% of schools [pg. 33] in the state on California’s Academic Performance Index, a composite measure of test scores.” |
| Student voice (12) | As distinct from classroom anecdotes, these examples show students in their own words describing why they like particular forms of instruction and technology use and why it benefits them. | Zoch, Langston-DeMott, and Adams-Budde, 2014 “Students understood that technology enhanced their writing. “I might add more detail on the computer because it is harder to transfer things from paper to the computer,” Emma said. In her case, writing on the computer allowed her to increase the volume of what she wrote. Matthew saw VoiceThread as a mode for enhancing his writing. “They have actual pictures and what you are saying. You get an idea of the writer’s emotions as they are...” |
Appendix: Resisting the New World

| Teacher testimonial (11) | These examples give direct quotes from teachers talking about their own work within the new instructional framework and the ways in which it is better for them or for students. | Martinez and McGrath, 2014 “Productive collaboration is also a result of how teachers set up the roles within the groups. Teachers carefully define what the group is expected to produce, identify the associated tasks related to the product, and then help students divide tasks and assume individual roles in the group for producing the product. Rochester students must sign a group contract that identifies each student, his or her contact information, assigned role, self-identified strengths and areas of growth, and lists the project’s goals and tasks that must be completed as a team as well as the team agreement. Teachers across these schools are continually working, as one teacher says, to “find the balance between holding onto the reins and letting the groups go.” Another teacher said, “I have to keep reminding myself that I can’t monitor every individual and group action….I have to give space for the students to be productive collaborators.” |

| Miscellaneous Interesting | This code encapsulated sections of text that felt connected to the broader questions under investigation but did not clearly fit into existing categories. | Nolan, Preston, and Finklestein, 2012 “Blended learning is more than the new face of educational technology. It represents a pedagogy-driven strategy to change the nature of students’ [p. 44] educational experiences and to build academic and personal habits and skills students need to be lifelong active learners and digital citizens.” |

| Acknowledgment of hype (12) | These examples contained text that directly addressed the idea that there was (or had been) hype around educational technology, with the implication of overpromises, quick fixes, or ideas of a “silver bullet.” This was seen as hype because these ideas were contrary to reality or |

<p>| Speaking,” he said, referring to the multimodal components of images and sound that VoiceThread offers.” | | |</p>
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<th><strong>Appendix: Resisting the New World</strong></th>
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<td><strong>Counterproductive to actual change.</strong></td>
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<td><strong>Assertions of what teachers think (11)</strong></td>
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<td>These descriptions contained assertions by the authors (who were most frequently not themselves teachers) about what teachers thought, wanted, or felt regarding student learning, teaching, or technology.</td>
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<td>Carpenter and Pease, 2012 “Our work with preservice teachers suggests that few, if any, educators pursue teaching to become solely knowledge transmitters. Those entering the profession anticipate the joy of light bulb moments, when they see students finally grasp new content. But such occurrences don’t happen when students sit passively and listen to lectures. Light bulb moments happen when students grapple with material and come to realizations at least partially due to their own exertions.”</td>
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<tr>
<td><strong>In-school/out-of-school use debate (6)</strong></td>
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<td>This code reflected sections of text that directly addressed the relationship between students’ use of technology in school and their use of technology out of school, such as the integration into daily lives of social media and other digital technologies.</td>
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<td>Kilfoye, 2013 “Public schools are among the last institutions to accept this change. No wonder today’s students consider much of their time in school irrelevant and vapid. What’s needed is a sustainable, accessible, [p. 55] economical, and straightforward approach to using Internet technology in schools. This approach mirrors the use of technology outside the school building. At the same time, we need a responsible framework that abides by federal law and local school board policies.”</td>
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Appendix C: Examples of initial text coding

The nerdy teacher: Pedagogical identities for a digital age

The best way to help teachers learn about and adapt technology in their classrooms is by immersing them in hands-on work in the same way their students use social networks and other technology applications.

Some see a revolution afoot, and not the quiet kind. Almost everyone at the current moment is affected by vast shifts—economic, social, and cultural—set in motion and then propelled by new and evolving digital technologies and related infrastructures.

Consider the ubiquity of social media platforms like Facebook, Twitter, and YouTube. These did not exist just a few years ago, but they quickly spawned practices that now organize the social aspect of our everyday lives. Our historical moment, with its exceptional rate of far-reaching change, its compression of time and space, and a connectivity that juxtaposes diverse geographies, ideologies, and languages, is a radically different one, demanding a reimagining of how we live, work, learn, and play.

Learning scientists Hagel, Brown, and Davison call this moment the “big shift” and predict the changes we’re experiencing are “redefining what success means in a wide range of endeavors for both individuals and society” [p. 56] (2012, p. 31). They also try to predict the skills, strategies, and dispositions that our new world seems to demand and, along with a host of other educational visionaries, call for what amounts to a revolution in how we imagine learning, education, and schooling. Even during the current climate of accountability, high-stakes testing, and demands for
higher academic standards, there are persuasive voices that urge a paradigm shift in how we think about the contents, processes of and purposes for learning. And in virtually every recontextualization, digital technologies take center stage.

We ask *Kappan* readers to join that conversation by considering some of the pedagogical implications of this new digital world that are important for classroom teachers and for those who prepare teachers-to-be.

**Institutional barriers**

We have high hopes for certain types and uses of digital technologies and believe that such new tools—along with the innovative social practices that can develop around them for creation, communication, and problem solving—have great potential to energize and inspire teachers and students. However, we also acknowledge that schools change at a glacial pace and that teachers experience myriad pressures not only to innovate but to hew to customary and sometimes anachronistic ways of doing school. Educational historian Larry Cuban (1986) has startlingly revealed that across time and each new technology teachers’ initial optimism gradually devolved into frustration and limited uptake.

When we examine the most recent research, we find that the center still doesn’t hold in terms of technology’s power to transform education. For example, a recent survey of 1,441 literacy teachers showed an increase in teachers’ confidence around using information and communication technologies during instruction, but it also revealed that they did not use these tools in service of 21st-century literacies (Hutchison & Reinking, 2011). Similarly, a Pew survey of 2,400 Advanced Placement and National Writing Project teachers found that while a variety of digital tools were available in classrooms—laptops, tablets, mobile phones—there was little innovation in how they were being used (Purcell, Heaps, Buchanan, & Friedrich, 2011).
In the remainder of this article, we focus on one essential part of the solution: positioning teachers to develop the competencies, habits of mind, pedagogical relationships, and dispositions needed to deploy new technologies—pedagogical identities, if you will, for a digital age. Most teachers-to-be are introduced to educational technologies during their teacher education programs for initial licensure (Kleiner, Thomas, Lewis, & Greene, 2007). This is done through stand-alone courses that feature widely used tools—spreadsheets, PowerPoint, digital portfolios—or through integrating such tools into courses on theories, methods, and subjects of teaching.

There is much interest in improving such courses and in figuring out how teachers might best develop "technological pedagogical content knowledge" (Angeli & Valanides, 2013). We are interested in this, too, but via a different path than is customarily taken. Rather than ask teachers and teachers-to-be to learn about digital tools in a mostly decontextualized way—as discrete skills to acquire and then use at a later time—we advocate immersing them in tool use and artifact generation in much the same way that kids acquire expertise in using digital technologies out of school to socialize, solve problems, explore interests, and make things. We refer to such immersion as "creative action spaces," and, as we will illustrate, such
spaces can be virtual as well as brick and mortar. Their most important feature is organizing participation so students acquire technical skills in tandem with developing dispositions toward digital tools and learning.

To illustrate, we draw upon two related examples from our research around online social networks and multimodal designing. Each involves teachers’ uses of our custom-built, online social networking platform, Space2cre8.com, a private site created especially for youth and their teachers in extra-school and school-based sites around the world (Hull, Stornaiulo, & Sahni, 2010; Hull & Stornaiulo, 2014). The examples we offer here are from our work with preservice teachers in a university preparation program and with teachers of after-school digital media programs. We highlight some of the ways in which the after-school teachers engaged digital tools to create multimedia projects and used Space2cre8 as a way to share their work and to connect as members of an artistic community. We also illustrate the importance of offering educators opportunities to collaborate with peers in supportive design and learning communities.

In each context, we sought to position [p. 57] participants as artists and designers of multimodal digital artifacts and to enable them as a community of tinkerers and experimenters with creative habits of mind and problem-solving approach to changing times and challenging problems. We asked participants to learn form one another as they developed competencies in using digital tools and to experience firsthand pedagogical strategies that they could deploy or adapt for students. Each project was organized around principles for fostering creative action spaces.

**Principle #1: Teachers and new media tools**

Relatively little attention has been paid to articulating the kinds of professional development experiences that educators require in order to support...
students' expressive and intellectual engagement with new media. Professional learning around digital media often focuses on tool use and neglects consideration of teachers as interested, creative producers of digital media artifacts. In our work with preservice and after-school teachers, we aimed to approach digital media education differently, providing teachers opportunities to work as artistic communities in designing and producing multimedia artifacts and digital videos.

Our approach included organizing learning activities into team-based "missions," where instructors worked with one another alongside researchers and media specialists to complete a series of digital art [p. 58] challenges. In the case of the after-school instructors, while they arrived at the first workshop with varying levels of experience using video-editing software, video cameras, and social media platforms, the team structure and missions helped scaffold tool learning within the context of doing and making while also modeling an effective pedagogical strategy to use with students. One such mission asked participants to explore the collaborating university's campus through a video scavenger hunt that required them to find and record a number of university buildings, landscapes, and happenings. While completing the mission, they were shooting, editing, and sharing a digital video on the Space2create network, developing relationships with one another, and receiving support from more knowledgeable team members.

One participant, in fact, found the scavenger hunt mission to be so engaging and the product that he made so compelling that he began making videos of his weekend nature hikes, putting to personal use the editing skills he had developed during the workshop and sharing the results on YouTube. He then used these videos as models for his students, focusing his early classroom efforts around having student produce similar videos of natural wonders around their own school.
Principle #2: Working across multiple modes of meaning through creative media production

Although print-based reading and writing are and have always been multimodal in that they require interpreting and designing visual marks, space, color, and, increasingly, image (Jewitt, 2005; Kress, 2003), the proliferation of digital media tools has widened the lens of multimodal composing to include genres such as digital stories, computer programming, and podcasts (Hull & Katz, 2006; Peppler & Kafai, 2007; Soep & Hachez, 2010). Engagement with a wider range of modalities has enabled us to produce new texts for new audiences, transcend local and global boundaries, and develop and express identities across the production of multiple forms of text. For an increasing number of educational researchers and practitioners, young people’s “do it yourself” production of media across modes (Kafai & Peppler, 2011; Lankshear & Knobel, 2010) holds promise as a method for positively developing their identities as writers (Lam, 2000), boosting their “creative confidence” (Carroll et al., 2010), and fostering problem-solving skills (Barseghian, 2009). Keeping in mind the affordances of multimodal composition in a digital age, we wondered what our after-school instructors and preservice teachers might gain from expanding their creative capacities and exploring new ways of communicating ideas. Accordingly, we designed workshops and graduate courses to help them experiment with multiple modes and develop their technical and aesthetic abilities.

Principle #3: Providing a welcoming community for creative design

Teachers, like students, need access to contexts in which they can develop as creators of media. This development doesn’t happen in isolation; being situated in and supported by a community of practice that links
to other people, forms of participation, and collaborative opportunities (Brown, Collins, & Duguid, 1989) is key to moving beyond interaction with media and into creation (Brennan, Monroy-Hernandez, & Resnick, 2010). Participating and collaborating in a community also can help teachers develop as creators of media.

Building community starts with establishing a common purpose among members and includes opportunities to build relationships when members share responsibility for one another’s learning. Digital tools can provide these opportunities. In our preservice English education courses, students reflected on their participation on the Space2cre8 network as vital to their coming together as a class and juxtaposed this experience with more traditional online learning management systems, such as Blackboard, which they criticized as aesthetically bland and not conducive to sharing multimedia artifacts and building an online identity. Unlike their previous experiences [p. 59] on Blackboard, which one student described as making her feel like “a number on an assembly line” or “just a faceless person commenting on a discussion thread,” students felt motivated and purposeful when sharing and participating on Space2cre8 because of the enhanced capacity to craft a multimodal digital body and share multimodal texts. Important choices about tool design can powerfully affect participation and learning.

For after-school teachers, a sense of community was fostered in multiple ways and spaces. Professional workshops in the state-of-the-art media lab at a collaborating university gave teachers access to an abundance of tools, resources, and shared space for creative action. Along with working on the various project missions, instructors had multiple opportunities to share student work, reflect on pedagogical strategies they used in their respective after-school contexts, and devise improvements and adaptations suited to their community provides opportunities for collaboration
- helps move into creation
- digital tools support community building
- some platforms better than others
- better ones allow for multimodal products
- feel connected
- motivation

building community through collaboration and local university
sharable student work, reflect on practice
Appendix: Resisting the New World

needs and abilities. Seeing the work shared by another teacher (e.g., a digital move project) or hearing a teacher articulate a successful strategy (e.g., helping students stay on task during projects) inspired another teacher to take similar actions in her own practice. To promote a community of reciprocity, researchers and media specialists also visited teachers at their respective schools as helpers and to problem-solve various issues. These multiple [p. 60] spaces and pathways for community building promoted an atmosphere of collegiality and support that was vital to the teachers' growth and the community's successful production of rich artistic works.

Conclusion

There is no doubt that the world has changed and continues to shift, requiring intellectually fresh and ethically tuned responses to economic, social, health, and environmental challenges. Nor is there debate that digital technologies and related infrastructures have been prime movers in this big shift. But how can we marshal digital tools to prepare young people to participate effectively, for themselves and their communities, in new times? Can transformative uses of new technologies help foment a revolution of sorts to speed a shift in how we imagine doing school by extending the rejuvenated benefits of the reach of education? Some scholars over the years have answered a resounding "no," but optimists, their visions and their examples remain. We wish to emphasize the power of teachers to innovate as well and to call for conceptions of teacher education that integrate digital technologies in ways that enable creativity, agency, and community. If this call is answered, a revolution in education driven by a changing world and digital technologies may indeed be afoot.

SIDEBAR

10 things everyone should know about K-12
## Students Views on Digital Learning

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1. Use the Internet to help with homework at home?</td>
<td>Over 50% of students in grades 6-12 say that they do that at least weekly; for 29% of high schoolers, it is a daily event with 68% saying their primary Internet access is through a 3G/4G device.</td>
</tr>
<tr>
<td>#2. Learning anytime, anywhere, any pace?</td>
<td>41% of students who have not taken a fully online class would like to take a virtual class; they see the #1 benefit as being able to learn at their own pace.</td>
</tr>
<tr>
<td>#3. What do kids think about flipped classrooms?</td>
<td>3 out of 10 students say it would be a good way for them to learn.</td>
</tr>
<tr>
<td>#4. Pixel or print: What is your reading style?</td>
<td>One-third of students in grades 6-8 say their preference is to read a digital book for schoolwork. Put that hard copy book away—44% of students want to read on a digital reader.</td>
</tr>
<tr>
<td>#5. Learning via YouTube?</td>
<td>Yes, 29% of students have used an online video to help them with their homework.</td>
</tr>
<tr>
<td>#6. Teacher, I have a question!</td>
<td>30% of students say that being able to text their teacher during class (and getting a personalized response) would help them be more successful in science.</td>
</tr>
<tr>
<td>#7. Who is today’s gamer?</td>
<td>75% of students in kindergarten through 2nd grade are using computers and mobile devices to play educational games on a regular basis.</td>
</tr>
<tr>
<td>#8. Tweet-tweet?</td>
<td>34% of high school students are Twitter users now—a</td>
</tr>
</tbody>
</table>

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**What does it imply just to have this?** This is what students want.
threefold increase since 2011 when only 11% of students acknowledged tweeting as part of their social media profile.

#9. Where do kids do school group projects in 2013? They do them on Facebook—38% of students say that they regularly use Facebook to collaborate with classmates on school projects.

#10 Students are mobilists! Students’ personal access to mobile devices has reached several significant tipping points: 80% of students in grades 9-12, 65% of students in grades 6-8, and 45% of students in grades 3-5 are smartphone users now; middle school student tablet access doubled from 2011 to 2012 with 53% of those students now tablet-enabled.

Appendix: Resisting the New World

Technology alone won’t transform teacher to facilitator. Technology holds part of the answer to improving teaching, but it must be combined with sharp and thoughtful changes in how teachers design curriculum and how students learn.

Education leaders, principles, teachers, policy makers and researchers increasingly agree that the traditional role of the teacher must change. Having a new conception of the teaching role is a significant move in encouraging teachers to shift their role to that of facilitator. But the argument oversimplifies the complex process required to shift roles and thus fails to acknowledge the depth of strategic thinking and careful planning that goes into the role of effective facilitator. Furthermore, the technology as a facilitator too often is reduced to merely by external forces, and teachers roles won’t change by simply positing up and connecting to the Internet. Instead, the new model requires empowering teachers to break out of their isolated roles and act collectively in flat organizations with strong professional communities where they can also roles as peers, and other professionals.

Education leaders, principles, teachers, policy makers and researchers increasingly agree that the traditional role of the teacher must change. Having a new conception of the teaching role is a significant move in encouraging teachers to shift their role to that of facilitator. But the argument oversimplifies the complex process required to shift roles and thus fails to acknowledge the depth of strategic thinking and careful planning that goes into the role of effective facilitator. Furthermore, the technology as a facilitator too often is reduced to merely by external forces, and teachers roles won’t change by simply positing up and connecting to the Internet. Instead, the new model requires empowering teachers to break out of their isolated roles and act collectively in flat organizations with strong professional communities where they can also roles as peers, and other professionals.
Facilitating learning

At the eight schools profiled in Deeper Learning: How Eight Innovative Public Schools are Transforming Education in the 21st Century (New Press, 2014), teachers collectively share a vision of promoting deeper learning in all students and have collaboratively redesigned the teacher role to that of a facilitator who uses technology as a tool. As facilitators, teachers become learning strategists who constantly plan ways to enable students to master complex content knowledge and develop their critical thinking, problem-solving, communication, and collaboration skills. In this construct, technology has a small, disruptive, yet supportive function in changing the role of teachers. Teachers in these schools recognize that only by carefully constructing learning experiences can they fully assume their role as facilitator. To do this, teachers have to return to their core role as curriculum designer of meaningful learning experiences for students that provide opportunities for them to engage in the deliberate practice of deeper learning skills.

Rather than lecturing students and relying on outdated textbooks, teachers design assignments and activities that fully engage students and have them regularly practice higher-order skills as they develop and practice collaboration and communication. For example, Socratic seminars are the signature pedagogy for English classes at Impact Academy in Hayward, Calif. The intent is to help students develop the skills required to interpret a complex text as well as articulate a well-developed view to others. However, these teacherless conversations require extensive preparation if students are to function well on their own. As an Impact Academy teacher explained, "I am a ringmaster. My role is to frame and emphasize what we are about to do. I set it up; students do the work, analyze the work, and discuss it."

This example doesn't have any specific mention of technology. It is examples of new teaching different from characteristics.
In describing shifts in instruction, what do teachers need to believe, what do teachers need to do.

The work...I channel the discussion so the students find their way. Then I provide the postanalysis...which prepares them to do even better the next time.

Teachers at other schools assume this same facilitation role when using student debates to develop students' critical thinking, communication, and collaboration skills. At High Tech High in San Diego, we saw students successfully participate in 35-minute debates with the teacher as moderator and timekeeper. Former teacher Dan Wise was strategic in designing the learning experience and scaffolding the skills the students needed. Wise first assigned students to conduct extensive background research on their chosen social issue. Next students synthesized and formulated their findings into a research brief. Then students worked in pairs to practice honing their arguments, while Wise circulated the classroom, reminding students to check their understanding of the content, use of evidence, and ability to communicate their viewpoint. By structuring time for significant research and providing many opportunities for practice and feedback, Wise was a facilitator, helping students take responsibility for their own learning. Through these activities, students recognize that they aren't just memorizing facts to be regurgitated on a test, but they're developing carefully considered viewpoints for discussion or debate. This role of teacher as learning facilitator does not go unnoticed by the students. As a sophomore student said, "The projects are set up so that we have to do the work and research to learn what we need to know."

Facilitating group work

The teachers at the schools we profiled believe students must be able to work productively in diverse [p.43] teams. This requires teachers to carefully strategize about the kind of group work students will be required to do, group composition, and group
Appendix: Resisting the New World

dynamics. A project is group ready when individual roles are clearly defined and students can work together productively to create a quality product. "When teachers facilitate and support group work, they need to frame the problem and help focus the direction and scaffold it but then have each other to work through their work," said Rochester Corp. (Ind.) Supt. and former high school principal Dan Ronk.

Collaboration at these schools is successful because of teachers' careful attention to grouping students or developing student abilities to choose their own groups wisely. "The way to get to productive collaboration is all about how you design and put the groups together," Wise said. A common practice by Rochester High School teachers is assigning groups for the 9th- and 10th-grade classes and then permitting greater student choice in upper grades. Rochester teachers are explicit when they describe what makes an effective group and, when they assign groups, they model for students how an effective group balances the skills and motivation of the members.

Productive collaboration is also a result of how teachers set up the roles within the groups. Teachers carefully define what the group is expected to produce, identify the associated tasks related to the product, and then help students divide tasks and assume individual roles in the group for producing the product. Rochester students must sign a group contract that identifies each student, his or her contact information, assigned role, self-identified strengths and areas of growth, and lists the project's goals and tasks that must be completed as a team as well as the team agreement. Teachers across these schools are continually working, as one teacher says, to "find the balance between holding onto the reins and letting the groups go." Another teacher said, "I have to keep reminding myself that I can't monitor every individual and group action... I have to give..."
space for the students to be productive collaborators."

**Facilitating access to experts**

Teachers constantly work to provide students with authentic experiences outside the classroom and the school. In this role, teachers are strategically identifying and networking with professionals in the community, including cultural, educational, or governmental [p.44] institutions. They leverage these relationships for student learning. "We're always looking for people—people connected to the school through parents, grandparents, board members, and professionals we know. You need to know who is around and always keep your eyes peeled for what people can contribute to our students," said Carrie Bakken, a teacher and codirector at Avalon School in St. Paul, Minn.

MC2 Stem High School in Cleveland, Ohio, has three separate campuses. Ninth graders attend classes at the Great Lakes Science Center; 10th graders report each day to the GE International Lighting Division's corporate campus. These sites provide exceptional opportunities for teachers to network with STEM professionals, engaging them as tutors and mentors, and arranging for students to work alongside them in their laboratories and offices. Juniors and seniors spend most of their time fulfilling internships with high-tech industrial partners and/or attending college classes.

Teachers depend not only scientific institutions to facilitate student learning through access to experts. Teachers from Casco Bay High School in Portland, Maine, leverage expertise from local businesses and nonprofit organizations to ground student learning in field experiences and to ensure students work with professionals, including scientists from the local university, musicians, writers, historians, and outdoor education experts. At King Middle School, also in Portland, students team up with
city officials and the Gulf of Maine Scientific Research Institute, a local nonprofit marine science center to brainstorm tactics to control invasive plants. The common thread is that teachers facilitate student connections with people and resources outside of school and integrate their experiences as part of learning.

**Facilitating inquiry and reflection**

Guided inquiry is the most typical facilitation strategy that these teachers use. Teachers use questioning in all aspects of their communication with students, particularly when they provide feedback on student work and engage students in reflection.

Avalon teacher Kevin Ward said he most commonly plays the role of questioner. "I am always asking to see where they are academically and personally," Ward said.

Instruction at these schools proceeds through a constant stream of questions from teachers, all designed to get students to reflect on their work and consider the choices they’ve made. Why did you choose this argument? How do you know this is right? What is your opinion, and what is it based upon? How did you come to your answer to the math problem? Is there a different way to solve the problem? How can you prove what you wrote? What did you predict or think was going to happen? How do you know one variable is more significant than another? What do you hope the reader takes away from your writing?

Careful questioning facilitates student acquisition and synthesis of knowledge and presses students to recognize that learning requires making thoughtful choices.

Teachers also construct formal opportunities for reflection, frequently assigning students to keep journals or post in online blogs, and through annual rituals requiring students to reflect on their academic performance and social growth before transitioning to
the next level. A vivid example of how teachers promote reflection is using student-led conferences, where students—rather than the teacher—lead the discussion with their parents about their schoolwork. Teachers facilitate this opportunity for students to own their learning through their efforts before the conference as they help students identify work samples and reflect on the connection between their effort and the products’ quality.

Students learn that reflection is a norm and value the reflective questions and conversations with teachers. A sophomore at Avalon said, "Every time I do a project, I learn more about what I want to do differently next time...You just learn to always be thinking about what you want to do next and how you can improve it." Students at Science Leadership Academy (SLA) in Philadelphia, Pa., feel similarly. A sophomore student said, "Teachers always ask, 'What could you have done better?' So, for every project you do, you know you better be ready at the end with that answer." Casco Bay High School biology teacher Ben Donaldson said, "It's a running joke that the students are professional reflectors."

Facilitating learning through technology

The teachers at the schools we profile embrace technology. As Rochester High biomedical science teacher Amy Blackburn said, "Students are able to get a lot more information than I can ever give them [p. 45] as a teacher...I want them to learn to go get it." No longer the single source of information, teachers are freed to guide students' learning, leveraging technology to help students access knowledge, manage their work, collaborate, communicate, and create and produce various products.

At SLA, Rochester High, Avalon, and other such schools, students have access to a robust learning management system; they immediately go to their laptops and log on when they come to class. Students..."
find all of the class resources for the projects and assignments on their learning management system and can access communication tools through Google Apps for Education, which gives them a suite of free communication and collaboration tools, including gmail, Google Docs, and Google Sites. A Rochester High student proudly declared, “I have come to expect that we can do everything on the computer. We can write papers, journals, do our research, collaborate, and organize and store our work. I can also access all of this all of the time from anywhere.”

Some of the teachers use the learning management system to facilitate discussion forums for students to post their work or collaborate with one another. But other teachers, like 10th-grade English teacher Larissa Pahmow at SLA, has students use wikispaces.com to leverage student desire for social networking. After reading a wide range of poems in class, teachers have students assume the role of both poet and critic or peer editor and provide a critique on wikispaces.

When beginning a new project, teachers guide students in recognizing what they’re trying to learn and then the best way to pursue their inquiry—an Internet search, library research, contact with an expert, or an interview with someone in the community. Technology helps teachers use valuable class time to work with student groups, concentrate on individuals who are struggling, and circulate around the room, asking questions and dealing with issues as they come up. “What I most like about our school now is how fluid the classroom is,” said Rochester High teacher Amy Blackburn. “Students are on the computers, they function in groups, and I am just guiding their work.”

**Conclusion**

The teachers at these schools are distinctive in the thought and creativity they put into finding ways...
to continually press students to deepen their learning. They are strategic in creating opportunities for students to become responsible learners developing their critical thinking, problem-solving, communication, and collaboration skills. In breaking with the traditional role of teacher, the staff at these schools gives us a picture of what the new model of teaching and teacher leadership looks like.

Strikingly, the teachers' approaches defy most of the current debate about the nature of teaching. While many argue that the teaching role has to change to promote efficiency, teachers in these schools take a different view. They often describe their task as "getting out of the way" or "standing in the background." They're able to do that because in their master role as learning strategist they have developed rich and engaging learning experiences that allow them to assume the role of a facilitator offering support for the content knowledge and sophisticated skills they want to develop in students.

Teachers at these schools have replaced the traditional sage-on-the-stage model that emphasizes rote learning with a flatter and more distributive organizational model. Schools have moved from teachers functioning in a traditional hierarchy to having them work as part of a community of professionals who collaboratively construct learning experiences for students. Teachers don't act as free agents in isolated classrooms but as responsible members of a professional community who share a common vision. Operating in this collegial manner, teachers use assessments diagnostically, share their experience of what works, and facilitate and customize successful learning strategies.

What the work of the teacher is NOT: The need to assert what the work of the teacher is
Appendix D: Emerging code

- Characteristics of new teaching
- Characteristics of called for change
- Characteristics of new teacher role
- Examples of new teaching
  - Alternative concepts of teaching
  - Alternative 'words for teachers'

1. Called for change in teacher role: characteristics, examples, word>
   - How do conditions enable learning to use tools in new ways?
   - Conditions under which teachers can learn to teach in new ways
2. Conditions under which change can occur: learning, school/institution
3. Barriers to change
   - Should the categories be the factors rather than enablers/constraints?
Appendix: Resisting the New World

4. Justification of change

- Characteristics of desired student learning
- Benefits of new ways of teaching
- Benefits to students of new ways of teaching

5. Benefits of change

6. Student perspectives

- Student perspective on new teaching
- Student perspective on technology use

6/13/16


Critique of current teaching practices

Characteristics of past teaching practices

Contrast of new + past teaching practices

Contrast with critique of past teaching practice

Assertion of change happening

Relationship between changes in society + changes in learning

Describing changes in society

Relationship between social + educational change

Connection? Could be integrated into (us) history? Change
Appendix E: Analytic memos

Memo - Data Collection
Wednesday, February 24, 2016

In the methodological models that I looked at, there was helpful language about how to narrow down to relevant documents. One mentioned clarifying between an article that mentioned the topic at hand, or an article that was fully about the topic at hand. I am trying to employ this distinction in going through the *Phi Delta Kappan* articles.

There are two things I have been thinking about. First, I want to hold on to the idea that what I am interested in is not just “educational technology”, but specifically the way that teachers are positioned in discourse about the relationship between educational technology and instruction, or instructional change. Perhaps in my next research meeting it would be worthwhile to return to the diagrams that I drew exploring this central relationship, or the structure of this central relationship. This means that I am not looking at technology that is about data tracking, management, or organization, at either the classroom or the school level (but, is that too stark a distinction? Is not student data tracking related to making instructional decisions? It seems different, though).

However, and this is connected to the distinction between being centrally about a topic and being only a mention of a topic, there is definitely something interesting going on in the articles about data and privacy. I’m not sure there is much to unpack, but many begin with an assertion both that this is the way the world is now, or that we all now that technology will improve teaching and learning, the trick is just to use it in a careful and responsible way.

I think this is something I am going to run up against in distinction between the issues that focus on instruction and those that focus on technology.
Monday, March 21, 2016
Memo: Preliminary read through of Phi Delta Kappan articles

I am reading through my initial list of Phi Delta Kappan articles and trying to identify whether there is a core set of articles worth further analysis. I am trying to identify discourses at work that could be potentially be drawn upon in conversations about teachers, technology, and instructional change.

In determining whether or not articles are relevant, I am focusing on classroom use/implications of technology, and articles that have technology as a primary, rather than secondary (or tertiary) focus.

I’m worried that there isn’t much there. In some ways, things are interesting in their absence. That is, it seems that some articles address the impact of technology on learning but without much attention to the actual teachers. Is it significant that teachers are not an especially big part of the conversation? Is that about the understanding of the path/central relationship, that teachers aren’t a part of that central relationship?

There do seem to be nods to the idea that technology is fundamentally changing the way schools operate, or the way that learning occurs. Yet there are also occurrences of the idea that just adding hardware and software alone doesn’t change things? Are these flipsides of the same idea? Something seems at stake (with both theoretical and practical implications) in the assertions that nothing really changes and that everything changes.

It seems possible that Phi Delta Kappan is not a site that is contributing to the dominant narrative of teacher resistance to technology/technological solutionism. It is relevant if these ideas are coming from other places. It is also relevant to an understanding of how discourse operates, of how particular ideas are more taken up at the school level, if other ideas operate more significantly. I think I am going to have to look at either/both of TED talks and NYT coverage. Even if it is less systematic, it will be relevant to note that different discourses seem more present.

I don’t think it is that I am making up that there is a thing there. Every working teacher with whom I speak says, yes, that is a thing. It more seems the work of figuring out where the thing is coming from, and where it isn’t coming from, what other ideas are out there that aren’t being taken up as much.
I am in the process of generating a preliminary code based on open coding of two articles.

In one article, Martinez & McGrath, “Technology alone won’t transform teacher to facilitator” (2014), I came upon the following passage (p.45) that I can’t make sense of.

*Strikingly, the teachers’ approaches defy most of the current debate about the nature of teaching. While many argue that the teaching role has to change to promote efficiency, teachers in these schools take a different view. They often describe their task as “getting out of the way” or “standing in the background.” They’re able to do that because in their master role as learning strategist they have developed rich and engaging learning experiences that allow them to assume the role of a facilitator offering support for the content knowledge and sophisticated skills they want to develop in students.*

What is going on here? There seems to be an assertion of differing viewpoints on the idea that the role of the teacher has to change. The authors are positioning themselves in opposition to another model of called-for change. This opposing model is characterized only by the phrase “promoting efficiency.” It isn’t entirely clear what that means. Some clues are given by what this opposing view is positioned against. The authors emphasize that, in their conception of new teaching, as exemplified by the teachers at the schools they have examined, teachers are working hard to not be in the foreground. Is the importance in moving away from a transmission model of education? Does the emphasis on “efficiency” mean that the alternative new conception of teaching (not the one the authors support) is about finding more efficient means to transmit information, rather than thinking about more of a changing role? It does seem as though the term “efficiency” indicates doing what you were already doing but better, of faster, or more, rather than a fundamental rethinking of the purpose of schooling.

I also don’t know what to do with the second part of the paragraph. I think the authors are trying to articulate why “getting out of the way” results in meaningful learning. They are calling upon the conceptions of “facilitator” and “learning strategist” that they’ve emphasized throughout the article in an attempt to offer a word for/way of thinking about the teacher that isn’t about standing up in front of the class and talking, that isn’t about transmitting information. All these pieces are tied up together: what is being asserted as a break from past practice, the words being used to describe teaching, what the new teaching looks liked. I think part of what’s going on in this paragraph is a need to justify that teachers are doing something valuable when they are ‘getting out of the way’. Is it about strategic planning? Is it about having a vision of what students need to know and be able to do?
In the Marc Prensky video interview that I analyzed for S-522, I named this as an interpretative dilemma that was being resolved. Because so much of the conception of new teaching was being asserted by saying what it was not (here’s the contrast with past practice), it created the need to assert what it was. And, because there was so much emphasis on moving away from teacher as transmitter of knowledge, as keeper of knowledge, as expert in relationship to students, as controlling the learning, there seemed a need to assert that the teacher was valuable, was important, but in a way that often rang somewhat hollow, it didn’t seem as integrated into the rest of the argument.
Research Question: How are teachers positioned in professional discourses about the relationship between technology and instructional change?


I began by doing line-by-line coding of each article, trying to name what was happening. I then read through the line-by-line notes and attempted to move up one level of abstraction, what was going on relationship to the research question. I wrote the emerging codes from that next level of abstraction on sticky notes and then tried to group them by conceptual categories. This resulted in the following organization (proposed codes in bold, original notes in regular font):

1. Called for change in teacher role
   a. Characteristics (“characteristics of new teaching”, “characteristics of called for change”, “characteristics of new teacher role”)
   b. Examples (“examples of new teaching”, “actions of new teacher role”)
   c. Words (“alternative words for teacher”)
2. Conditions under which change can occur
   a. Conditions under which teacher learning can occur (“how do conditions enable learning to use tools in new ways”, “conditions under which teachers can learn to teach in new ways”)
   b. Conditions under which new teacher actions can occur (“conditions under which teacher role can change”, “conditions under which teachers can meaningfully use technology”)
   c. Conditions under which technology use will result in change
3. Barriers to change→ It will be important to pay attention to whether this needs to be distinct from the above code. In some sense, barriers is the negative assertion and conditions under which change can occur is the positive assertion of the same thing.
4. Justification of change (“need for change in teacher role”, “student needs prompting change”, “purpose of change”)→ Whereas the first code is about describing the change, text that falls under this code is more about asserting the reasons why the change is needed.
   a. Relationship (connection) between social and educational change (“assertion of change happening”, “relationship between changes in society and changes in learning”, “describing changes in society”)
5. Benefits of change (“benefits of desired student learning”, “benefits of new ways of teaching,” “benefits to students of new ways of teaching”, “benefits to learning of new ways of teaching”)
6. **Student perspectives** ("student perspectives on new teaching", "student perspectives on technology use") → The naming of this code isn’t conceptually integrated into the rest. There’s something going on in both articles where student voices are brought in to support particular kinds of change. Could this be integrated with benefits of change or justification of change? The student voices are being brought in to either describe how the change helps them or why it is necessary?

7. **Critique of past teaching practice** ("critique of current teaching practices", "characteristics of past teaching practices", "contrast of new and past teaching practices") → I’m not sure about naming this as critique. From the emergent codes grouped under this category, it seems as though sometimes what is emphasized is describing what the past looked like, asserting what was wrong with it, or less explicitly asserting what was wrong with it but contrasts with the called for change that imply what was wrong with it.

> Codes I’m not sure how to integrate → There’s a question here about how to communicate the role of technology in the coding scheme. In the articles I’ve read so far, it is a part of/piece of/central role in the broader changes to teaching
> • Group 1: “role of technology in change”, “causal relationship between technology and change”, “specifics of how technology will change learning”
> • Group 2: “descriptions of teaching and learning enabled by technology”
> • Group 3: “benefits of technology use, “necessity of technology use”, “reasons for technology use, “examples of technology use” → These all seem to fit under the broader categories above about the overall change, they are just technology specific.
Memo-Coding
Meeting
Wednesday, June 15, 2016

I met with Karen yesterday to discuss the preliminary coding that was emerging. Two big questions came up:

- How can the code be written/organized to reflect what categories it is important to have distinctions in?
- How can the code be written/organized to reflect the relationships between the coding categories?

A third, less big questions:

- Should barriers/conditions that enable instead be expressed as specific factors, and then have it noted under each factor that/the ways in which, it is hindering or supporting change?

My research question is written such that the primary relationship is between technology and instructional change, with implications for the positioning of teachers. The code that was emerging was focused largely on instructional change: what it looked like, conditions that enable and hinder, justification. One of the things I was struggling with was how to integrate the codes that emerged that were focused on technology. The code needs to be able to express different iterations of the relationship between technology and instructional change.

I noted that the vision of change being called for is mostly fairly similar, this is less a place where distinctions need to be expressed. But that, in and of itself, is interesting. I don’t want to close off the possibility that something might express a different idea of change. I am also interested in the fact that the vision of instructional change is presented as not open for debate.

Next steps:

- Try a few different structures of the code to see how different iterations might express those relationships.
- Try to code another article using the existing code to see what is clarified.
Memo-Coding
Wednesday, July 13, 2016
Emerging Code

Research Question: How are teachers positioned in professional discourses about the relationship between technology and instructional change?

Karen had asked me a very important question about how the code can be written and structured in such a way that allows one to see the relationships between (and substance/direction/causality of those relationships) different elements. I’m trying to figure out how to see that structure and those relationships better. As currently written, the concept of change is the dominant organizing principle. It has to be a problem that I have the technology-specific issues off to the side in a chunk. I need to be able to see the different facets of the way in which the relationship between technology and instructional change, and technology and teachers, is understood.

In the interests of trying to move forward, I decided to code two more articles. I selected two articles that my initial read-through had indicated had some richness and substance in their negotiation of the issues of interest. I selected Charles Kilfoye (2013), “A voice from the past calls for classroom technology” and Stacy Childress & Scott Benson (2014), “Personalized learning for every student every day”. I read through each article and engaged in a mixed process of open coding and seeing if elements of the previously developed code were relevant. If an element of the previously developed code matched, I wrote it down, but also whether there were details of its specific iteration (possible sub-themes/sub-codes) that were in evidence here. I also noted when there were things that did not fit within the previously established code, or seemed to trouble distinctions between things (such as the difference between “benefits of” and “justification of”, and the fact that what was previously called “change in teacher role” might also be “change in learning environment” or “change in nature of instruction”).

Below are notes on changes to the existing code prompted by the coding of these two articles. Ideas from Childress and Benson are in blue. Ideas from Kilfoye are in green. Totally new ideas are in red.

8. Called for change in teacher role ➔ Other dimensions are change in “learning environment” or change in “nature of instruction”. The framing as one as opposed to the other is interesting in and of itself, and change in learning environment or nature of instruction would seem to necessitate some kind of change in role of teacher, but whether or not that is emphasized says something about where the focus is, or what is assumed.
   a. Characteristics (“characteristics of new teaching”, “characteristics of called for change”, “characteristics of new teacher role”)
      i. holistic, “student-driven”, “personalization”, “tailored to student needs/interests”
   b. Examples (“examples of new teaching”, “actions of new teacher role”)
Appendix: Resisting the New World

9. **Conditions under which change can occur**

May be an additional distinction between conditions that are housed within individuals (i.e. “bold willingness”) and conditions that are housed at the school or district level.

i. scope of thinking, collaboration between administration and teachers, school-based discretion, professional development, “support”, partnership with external agencies

b. **Conditions under which teacher learning can occur** (“how do conditions enable learning to use tools in new ways”, “conditions under which teachers can learn to teach in new ways”)

c. **Conditions under which new teacher actions can occur** (“conditions under which teacher role can change”, “conditions under which teachers can meaningfully use technology”)

d. **Conditions under which technology use will result in change**

i. Presence of new tools do not necessarily lead to change, the specifics of the tools themselves (i.e., social media)

ii. connection between technology integration and educational vision

iii. connection between integration of technological tools and pedagogical shifts

10. **Barriers to change**

Policy/infrastructure as categories of barriers

a. Fear/preoccupation with control

b. Internet filters/restrictions (school level, government/district level)

11. **Justification of change** (“need for change in teacher role”, “student needs prompting change”, “purpose of change”) Is this the same as motivation by the actors involved for change? Childress & Benson describe the staff getting together and choosing to pursue personalization because of goals they wanted to accomplish with students.

a. **Student needs**

i. College readiness

ii. Career/workplace readiness

iii. Practicality/budget-->

*There's some interesting slippage that happens with an early acknowledgement of practicality and budget constraints as motivating the impetus to investigate/invest in blended learning, but then the justification becoming that it is what is best for students*

iv. Students already using technology outside of school

b. **Relationship (connection) between social and educational change** (“assertion of change happening”, “relationship between changes in society and changes in learning”, “describing changes in society”)

i. Technology has changed society and schools have to catch up (in the context of assertion that the purpose of school is prepare students for life)
12. **Benefits of change** ("benefits of desired student learning", "benefits of new ways of teaching," "benefits to students of new ways of teaching", "benefits to learning of new ways of teaching") → Something either as part of this category or a distinct category around the evidence that is given for the benefits of change (look back in discourse analysis for what this is called, the authority to speak on something, what is taken as authority). Possible categories are: performance data, research, anecdotal.
   a. **[for students] student performance, motivation/engagement, ownership/empowerment, connection with others**
   b. **[for teachers, but also by impact for students] differentiation, more strategic distribution of teacher time/attention**

13. **Student perspectives** ("student perspectives on new teaching", "student perspectives on technology use") → In Childress & Benson but especially Kilfoye, there is a lot about asserting that students are already using technological tools outside of school, and they want in-school to be more like out-of-school. I’m not sure this clearly fits in with student perspectives. To be a student perspective, does it have to be a direct quote?
   a. Demand for in-school to more closely parallel out-of-school technology use

14. **Critique of [contrast with?] past teaching practice** ("critique of current teaching practices", "characteristics of past teaching practices", "contrast of new and past teaching practices") →
   a. **Teacher-led, whole group, standing at chalkboard**

Codes I’m not sure how to integrate → Is technology the change itself or is it something that enables the change or is it a potential way that the change can manifest?

- Group 1: “role of technology in change”, “causal relationship between technology and change”, “specifics of how technology will change learning”
  - Good use v. bad use (good use positioned as out-of-school use)
  - Relationship between teachers and technology
    - Teachers are “empowered by” technology (who is using who?)
- Group 2: “descriptions of teaching and learning enabled by technology”
- Group 3: “benefits of technology use, “necessity of technology use”, “reasons for technology use, “examples of technology use”
  - Benefits of technology use/Conditions that technology enables [what does it mean to call it one or the other] (Rather than just lumping this in the with the category of benefits of new instruction, something has to be understood about what is being asserted about the relationship between those two things. Is technology an essential part of that process, or a
potential way that it can manifest? Do the technological tools help you do the things you already knew you needed to do or is it the tools themselves that enable something not enabled otherwise?): immediate feedback, personalization, engagement, differentiation, motivation

<table>
<thead>
<tr>
<th>Purpose of schooling</th>
<th>(this should probably be integrated into something, possibly a kind of justification for both change and technology use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Preparation for life, part of why the named disconnect between in-school learning and out-of-school learning is seen as such a problem</td>
<td></td>
</tr>
<tr>
<td>• Technology is already part of life</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New codes needed</th>
</tr>
</thead>
</table>
| • Rich language-->
There are places where I’m noticing things about the specific of the language used that need more unpacking using methods of discourse analysis: positioning, rhetoric, DAM. For example, from Kilfoye, 2013, p. 55, “Digital literacy is a significant skill in the 21st-century workplace. Yet schools treat the technological world that awaits students as something dark and creepy, lurking beyond the boundaries of the school’s firewalls. Only rudimentary and controlled use of Internet technology seems to be on par with the mission of schools. This is why interactive white boards, nailed-down computer labs, and classroom clickers have become the most ubiquitous technology in classrooms, even though few, if any students will use such technologies once they join the adult workplace.” |
| • Raises questions
This raises questions that I’m not sure have to be resolved or understood for this particular project, but I think are worth noting. For example, from Childress & Benson, 2014, p. 35, “Students might then grab laptops from a shelf and log into a portal that features an individualized playlist showing exercises and concepts they have completed along with recommendations of what they should do next—a sort of combination of Facebook, Netflix, and iTunes.” The analogy to existing platforms doesn’t actually make any sense, but something is being accomplished by the analogy. |
| • I don’t know what this means
  • Kilfoye, p. 55 “According to a white paper from the Educational Technology Advisory Committee for the Massachusetts Department of Secondary and Elementary Education, the best way to protect |
Memo-Coding
The quest for an emerging code
Monday, July 25, 2016

*Research Question: How are teachers positioned in professional discourses about the relationship between technology and instructional change?*

In particular, I am trying to figure out the structure of the code so that it expresses the important relationships among, and distinctions within those categories, the themes of teachers, technology, and instructional change.

In continuing to sample from the full set of articles in the hopes of illuminating these distinctions, I decided that it made sense to go through two whole issues (or two issues where I had found multiple articles to be relevant): “New Styles of Instruction” from 2012 and “Literacy and Technology” from 2014. The presumption of a special issue is that the editorial staff has identified an area/concept/question in need of in-depth exploration. One can presume, particularly for a publication that presents itself not as representing one particular view but as speaking to the whole of a profession, that there would be an attempt to represent multiple viewpoints. That is, I hope that looking through a special issue would help give some clues to where stakes are being put in the ground, where facets of an issue or things at stake are being worked out.

As of writing today I have gone through the following articles from the issue on “New Styles of Instruction”: Bergmann & Sams, “Before you flip, consider this”; Fulton, “10 Reasons to flip”; Phillips & Popovic, “More than child’s play: Games have potential learning and assessment tools”, Richardson, “Harder than rocket science”. I was leaving Patterson and Carpenter & Pease until last because I have coded them and have more of a sense of what is there. I still need to go through Mehta & Fine, “Teaching differently...learning deeply” and Nolan et al., “Can you DIG/IT?”. Here's what is emerging so far:

1. Called for change
   a. Change in learning environment
      i. Characteristics
      ii. Examples
      iii. Words to describe
      iv. Relationship to technology use
      v. Description of teacher role
   b. Change in nature of instruction
      i. Characteristics
      ii. Examples
      iii. Words to describe
      iv. Relationship to technology use
      v. Description of teacher role

2. Contrast with past practices
3. Conditions under which change can occur [I am deciding that it is redundant to have both conditions under which change can occur and barriers to change.]
   a. Conditions under which teacher learning can occur [I don’t think having these four in a list is quite getting at it. There can be affective and material conditions housed within an institution, but not within an individual. Now I’ve changed it.]
      i. Individual
      ii. Institutional (policy/infrastructure)
         1. Material
         2. Affective/Intellectual
   b. Conditions under which new teacher actions can occur
      i. Individual
         1. Teachers being thoughtful/reflective
         2. Teachers being willing to make big changes
      ii. Institutional (policy/infrastructure)
         1. Material
            a. Presence of collaboration
            b. Presence of networks
         2. Affective/Intellectual
   c. Conditions under which technological tools will result in change [I am struggling with whether this should be placed as its own category or subsumed in the above two. In some sense, the issue of tool design only emerged in one article, and most others place the conditions under which the introduction of technology can actually result in change within the categories of individual and institutional conditions.]
      i. Design of the tool

4. Motivation for change [It seems important to name this as a separate category but one of the things that is interesting is the slippage between motivation and justification.]
   a. Practical/budgetary
   b. Student needs
   c. Wanting to work with students in a different way

5. Provenance of ideas for change [Should this be separate from motivation?]
   a. From teachers
   b. From research/academia
   c. From administration
   d. From society

6. Justification of change
   a. Justification of use of technology
      i. What students want
      ii. What students are already doing
      iii. College/career readiness
   b. Justification of different teaching
Appendix: Resisting the New World

i. Aligned with learning theory
ii. Student learning needs
iii. Student motivational needs
iv. Needs of society

7. Benefit of change
   a. Evidence given of benefit
      i. Anecdote
      ii. research
   b. Benefits to students
   c. Benefits to teachers
      i. Opportunities for differentiation
      ii. More strategic distribution of teacher time/attention

Things I still need to be able to express:

• The difference between the justification of use technology as a good in and of itself and the justification of use of technology through what it enables
• How to indicate how specific the discussion of the technological tool is ("technology" vs. "flipped classrooms" or "social media") and the implications of that specificity
• In talking about conditions/barriers to change, what is about change and what is about the technology itself
• How to indicate something about the relationship between teachers and technology, for example the idea that teachers are “empowered” by technology to do things that they have wanted to do.

Change, rather than technology, is still the organizing principle here. Is that bad? It seems like, of the three (teachers, technology, instructional change), change is most clearly the motivation. We have to change, SO that will have implications for how teachers teach (what their role is), and that change MUST/SHOULD/COULD involve use of technology.

What might it look like structured around technology? I don’t think this structure would allow me to get at what’s going on with change or teachers, in the way that those two can be brought into discussions of change. For all of these articles, some kind of change is needed, which might be either directly or indirectly about technology, with attendant implications for the role of the teacher.

1. Description of use of technology
2. Justification of use of technology
3. Benefits of use of technology
4. Conditions under which technology use can meaningfully result in instructional change
5. Barriers to meaningful technology use
Memo-Coding
Emerging Code
Tuesday, July 26, 2016

I am continuing to revise the code in light of ongoing sampling. These changes are after coding Mehta & Fine, 2012 “Teaching differently...learning deeply” and Nolan, Preston, & Finkelstein, 2012 “Can you DIG/It?”, both from the New Style of Instruction special issue.

Research Question: How are teachers positioned in professional discourses about the relationship between technology and instructional change?

Alternative wording of research question:
- What is the relative positioning of teachers and technology and their relationship to one another in calls for instructional change?
- How do calls for instructional change position teachers and technology and their relationship with one another?

8. Called for instructional change
   a. Characteristics
      i. E.g.: Project-based, student-centered
   b. Examples
   c. Role of technology
      i. E.g.: necessary component, enabler of instruction, specific tool
   d. Role of the teacher
      i. E.g.: Forming groups, designing projects, curating materials
   e. Alternative words for teacher/teaching
      i. E.g.: facilitator, guide

9. Contrast with past practices
   a. Teacher role
      i. E.g. away from lecturing/whole-group instruction
   b. Student role
      i. E.g. away from passive recipient of knowledge
   c. Relationship to knowledge
      i. E.g.: away from pre-determined set of ideas

10. Conditions under which change can occur
    a. Conditions under which new teacher learning can occur
       i. Individual
       ii. Institutional (policy/infrastructure)
          1. E.g.: ongoing training, support of long term growth
    b. Conditions under which new teacher actions can occur
       i. Individual
       1. E.g: Teachers being thoughtful/reflective, teachers being willing to make big changes, teachers having sufficient
content/pedagogical knowledge, lack of fear of losing control

ii. Institutional (policy/infrastructure)
   1. Material
      a. E.g.: structures for collaboration, presence of networks, absence of Internet restrictions and filters
   2. Affective/Intellectual
      a. E.g.: culture in support of change
      c. Conditions under which use of technological tools will result in change
         i. e.g.: Design of the tool, connection between tool and educational vision

11. Motivation for change
    a. E.g: Practical/budgetary, student needs, wanting to work with students in a different way

12. Provenance of ideas for change
    a. E.g.: from teachers, from research/academia, from administration, from society

13. Justification of change
    a. Justification of use of technology
       i. E.g.: what students want, what students are already doing, necessary for college/career readiness, fits with goals of instruction, needs of particular student population
    b. Justification of different teaching
       i. E.g.: aligned with learning theory, student learning needs, student motivational needs, human capital needs

14. Benefit of change
    a. Evidence given of benefit
       i. E.g.: anecdote, research
    b. Benefits to students
       i. E.g.: increased motivation, increased sense of ownership, increased performance on standardized measures, deepened conceptual understanding, digital literacy
    c. Benefits to teachers
       i. E.g.: opportunities for differentiation, more strategic distribution of teacher time/attention
    d. Benefit to society
Memo: Beginning software coding
Distinctions between codes
Monday, August 1, 2016

One issue that came up when I met with Karen last week was the possibility that some of the codes might end up being collapsed back together.

As I was working on typing up descriptions for each code in NVivo so as to start coding with the software, I found myself struggling with the distinctions between motivation for change, justification of change, and benefit of change. Provenance of ideas for change is in a way actually distinct, but I’m not sure it is big enough to be its own code, I think it will end up a sub-code under something else. Originally, motivation for change and justification for change were not distinct. I came up with the distinction when reading Fulton, 2012 describing a specific school district deciding to embrace flipped classrooms. In this article, the author and school/district personnel quoted emphasized that the district had originally made the decision for practical reasons, they didn’t have enough money to buy a whole pre-packaged curriculum and their students were struggling. After using the flipped classroom model, supported by a lot of collaboration, as a way to write their own math curriculum, they felt that this approach allowed them to better tailor instruction to the specific needs of their students. That is, even though the original decision was made for budgetary reasons, or for constraints, they realized that the instructional change had affordances for learning that they really liked for other reasons. This seemed the difference between motivation and justification. The motivation was practical, they didn’t have the money to buy a curriculum. But if this district were to justify to others why they should embrace a flipped classroom model (or if the author were to justify it to others), the justification would be about the benefits to student learning or the way in which teachers were more satisfied with their instructional choices.

And there is the trouble with distinguishing between justification of change and benefits of change. The presentation of particular benefits, and the evidence marshaled in that presentation, is serving to justify the change. Am I trying to get a distinction between what is necessary and what is good? Or am I trying to get a distinction that has to do with different levels of abstraction? The justification is more abstract and the benefit is more concrete? For example, a benefit of the new instruction might be that teachers are able to more strategically distribute their time and attention amongst students, and that this is both more satisfying to teachers and better for student learning. However, this wouldn’t have been the original motivation for the change (towards flipped-classrooms, or project-based learning, or blended instruction), which was more likely to be something about college and career readiness, or the demands of skills in the 21st-century workplace.

In both of these cases, what is perhaps most interesting is the slippage between categories, the backwards justification that wasn’t the original motivation, or the benefits that are distinct from the nominal justification. As I code, I will have to pay more attention to these categories and whether they should be in different conceptual relationships with one another.
1. Called for instructional change

Characteristics

Key words for categories on reading through examples that have been collected so far [at this point, there isn't enough density, and I don't feel certain enough of the categories, to try and break out sub codes]
- inquiry
- problem-based learning
- student leadership
- personalized learning (2)
- self-directed learning for students
- competency-based (2)
- integration of technology
- differentiated based on student need
- critical thinking
- deeper learning

Possible groupings:
- Differentiation/responsiveness to student need/personalization (but it actually really matters whether this is called personalization or differentiation)
- Deeper learning principles: critical thinking, inquiry, problem-based
- Self-directed: Does personalization actually fit with this? Is the difference between self-directed and personalization a relative emphasis on agency of teacher and student?

Role of technology---> I am noticing some things that I coded here that are really just examples. I think what I intended with this code was something about how the text understands the role that technology plays in the instructional change, it is essential, incidental, helpful, ect. Articulating the sub-codes will help me better convey this. Is there a question of whether we should use technology or is the only question how? This seems connected to the question of whether it is essential to the instructional change project, and essential for what reason.

- “capitalize on new technologies”
- “ought to incorporate online tutoring or virtual mentoring”
- “can capitalize on new technologies...freeing up time for all teachers to lead in new ways”
- “Teachers can promote rigor in a number of ways...Flipping, pioneered by high school chemistry teachers Jonathan Berman and Aaron Sams, has increased in
popularity with the availability of high-quality online lectures through sites such as Khan Academy and user-friendly software that allows teachers to produce their own lecture videos.”
- “Flipping is not the only instructional style that can enhance intellectual rigor”
- “They are aided by support staff and empowered by technology to better tailor their instruction.”
- “educators use technology to enhance”
- “The new model breaks down traditional school walls, allowing students to access digital content and lessons online so they can learn anytime, anywhere. For a generation that spends most of its time on mobile phones, this makes a lot of sense.”
- “The school’s goal is to move toward a blended, rigorous, and personalized curriculum”
- “It’s not the technology that will make a difference in how or what students learn. It’s how it is used.”
- “We have turned the corner from “Why do we need this?” to “How do we do this and what are the best policies?””
- “How do we fundamentally retrain teachers to create a new generation of engaging assignments that actually leverage the full power of the Internet and the power of the technology so students are learning to use the tools to think more deeply?”
- “which aspects of technology are likely to be motivating”
- “digital tools make it easier for learning to be social and for instruction to be differentiated”
- “teachers can differentiate with technology”
- “There is little question that technology has the potential to motivate. But to tap that potential, teachers must consider factors within the student and then implement technology based on the features it affords.”

Possible sub-codes
- One of many options
- Potential affordances
- Essential aspect
- To be capitalized upon

Role of the Teacher ➔ It seems there is absolutely clarity about what teachers won’t be doing, present here and also in the contrast with past practices. They won’t be lecturing or delivering whole group instruction, and they won’t be using traditional textbooks. It seems easier to describe this than what they will be doing. One of the things I keep wondering about is whether there is any kind of meaningful, substantive difference in the called for visions of instruction that are presented. And, are there actual differences that are getting masked behind words that serve as short-hand for concepts that are more complex and need unpacking? For example, everyone agrees that instruction should be “student-centered” and there should be more “critical thinking”.

- expanding role of the teacher into more leadership, connections beyond the classroom
Appendix: Resisting the New World

- working directly with groups and individuals (2)
- modifying/adjusting material to meet student need
- helping set topic and questions but allowing students to explore
- scaffold and set norms
- explaining concepts
- curate materials
- help students set goals
- provide feedback (2)
- providing support when needed

I think I’m seeing two slightly distinct categories here, but I will need more data before determining fully.

- Setting things up for students before letting them go (things around setting goals, offering explanations, curating material)
- Support/differentiation (working with groups and individuals, circulating and answering questions, adjusting material)

Berry & Hess on teachers moving more into leadership positions doesn’t fit in with this, but I think that one might be an anomaly.

2. Contrast with past practices

Role of the teacher

These are emerging, but again need more data to solidify:

- Away from lecture, whole-group, direct instruction [this does seem clear]
  - However, I have to think about whether it is okay to collapse lecture and whole-group together. There is a slightly differing emphasis in each. Away from lecture means away from direct instruction, teaching as knowledge transmission. But in away from whole-group the emphasis is more on the fact that the instruction was giving all students the same thing. It might have been less direct instruction, but everyone was doing the same thing at the same time. My only hesitation is that I think there is an assumption in the “away from whole-group” descriptions that is also about direct instruction.

- Away from letting students struggle on their own

- Away from only following others’ policies and initiatives
Monday, August 8, 2016

3. Conditions under which change can occur

*New teacher actions*→ I had an initial categorization here about whether the conditions that resulted in change were being housed in the individual, or at the institutional level. However, I think I was assuming to myself that individual meant teacher, where it can also mean administrator. I think policy/infrastructure might be a better word for institutional, and individual can break down into teacher or administrator, that is the conditions that enable change are being ascribed to teachers’ willingness to take risks, or administrators’ willingness to take risks. Should culture be something separate than either individual qualities or policy/infrastructure? Culture is something where it isn’t always clear what resulted in its creation, how it came to be, but we can identify salient things in the culture, like a permission to make mistakes.

In the process of coding, I also reintroduced a category of potential barriers as distinct from conditions that enable change, but currently housed as a sub-code within it. This seemed important in terms of being able to express the different ideas more clearly.

From uncategorized list (the first two seem like they are part of culture)
- permission to make mistakes
- permission to tinker over time
- networks of teachers

**Individual**
- Teacher qualities (not enough example yet to determine sub-categories)
  - Thoughtful/reflective (seems to mean willingness to tinker/iterate)
  - Willingness to rethink whole picture
- Administrator qualities (nothing here yet)

**Institutional**
- Uncategorized
  - Rethinking whole picture (culture?)
  - Accountability measures (should definitely be part of policy/infrastructure)
  - Support-access to experts
  - Incentives
- Affective
  - Support to tinker (related to permission to make mistakes)
- Material
  - Support
    - PD, resources, access to external partners
Appendix: Resisting the New World

- Incentives
- Structural change (some of Berry & Hess, 2013 is just asserting the need for kinds of structural change, but not saying specifically what that structural change would look like)
- Accountability measures aligned to learning goals
- Accountability measures with clear feedback mechanisms

There doesn’t seem quite enough density in any one place to be sure what the sub-codes should be. However, I think the distinction between individual qualities, explicit policy, infrastructure (which is maybe also resources), and culture makes sense.

New teacher learning → I seem to have placed a huge number of things here uncategorized, which means that the individual/institutional isn't working. I’m going to start with everything uncategorized, and then try to come up with new categories from there.

- time
- training
- professional development
- access to outside experts
- access to other teachers
- online networks
- Unconferences (a specific iteration of access to other teachers)

Something like (but still more density needed to confirm)
- Professional development
- Access to experts
- Access to other teachers

Potential barriers (of the 15 examples in here, 7 are from Carpenter & Pease, who mainly emphasize the problems created by accountability measures, they are ascribing to those accountability measures the pressure to teach in more knowledge transmission ways)

- high-stakes testing
- need for coverage (another instance in Colvin)
- students not used to taking on more responsibility, potentially resistant (two instances of this in Carpenter & Pease)
- preoccupation with order and control (currently, only one instance, from Ferguson 2014, but I think this comes up more in the articles about concerns with social media and other Internet use regulation)
- Lack of quality control on the Internet (maybe should go in tech-specific)
- Lack of recognition from administration/culture of validity of new methods (maybe this should go in cultural aspects that enable change)
Currently, the examples from Elden, 2012 speaking about teachers frustrations with past ways in which technology has been pushed on them are in this category. But interestingly, that is one of the articles that doesn’t particularly have a clear vision of instructional change. Elden is speaking more to the conditions under which teachers would be willing to adopt new technology, although there does seem to be an underlying assumption that would be for the best, if the technology was actually useful. I’m struggling with whether these instances should go in this category or under conditions under which technology will result in change.

7. Benefit of change

*Benefits to students* (of 36 references, 12 (1/3) are from Carpenter & Pease)
-I have to think more about which of these benefits is a self-evidence benefit and which have to be explained as a benefit through the benefit to something else.

-learn more (√√√√√√√)
-deeper learning (√√)
-individualized instruction, including differentiation (√√√√√√√√√) → This seems an example of something that might need to have the benefit explained in terms of the benefit to something else.
-actively engage in learning (√√√√√)
-increased engagement (√√)
-increased ownership of learning (√√√√)
-metacognition and self-reflection (√)
-increased motivation (√√√)
-increased lifelong learning
-improved self-concept
-support with struggles (√√)
-interpersonal connection
-offsetting loss of absenteeism

Possible categories:

-Learn more
-Deepen conceptual understanding
-Receive individualized/differentiated instruction
-Increased SMEFT
Mem-Coding
Unpacking sub-codes

Wednesday, August 10, 2016

I am currently in the process of coding all the articles using a coding software program. I began with the outline of a coding scheme I had developed, which was mainly organizational rather than substantive. That is, looking at the high-level codes didn’t tell you anything about the distinctions between different ways of understanding the relationships between teachers, technology, and instructional change, which is what I am trying to figure out.

After coding 10 articles, I went back and looked through the collected references to try and identify sub-themes, or groupings within the categories. I was able to figure out some categories but not others. There wasn’t enough density of references, or the references were all from the same text, or the distinctions between the groups weren’t clear enough.

This memo represents the next iteration of that process. I have now coded 20 articles (out of a total of 29). Here I am going to try and figure out more sub-themes within high level categories, and whether the high-level categories themselves need to change.

1. Called for instructional change

**Characteristics** → It is important to remember that what I am trying to figure out here is whether there is a consistent vision of ideal, or called for, instruction across the texts.

Possible groupings from 8.5.16 memo

i. Differentiation/responsiveness to student need/personalization (but it actually really matters whether this is called personalization or differentiation)

ii. Deeper learning principles: critical thinking, inquiry, problem-based

iii. Self-directed: Does personalization actually fit with this? Is the difference between self-directed and personalization a relative emphasis on agency of teacher and student?

Updated thinking → There are only references for 11 sources (out of a possible 20). I think there is some slippage here between categories, like putting things in “example”, rather than characteristic. But does that mean that some of those articles are talking about the role that technology plays (should play, could play) in instruction but without a clear vision of what that instruction is.

Key words → I think there is something going on here about these concepts being at different levels. Is authentic experience, or higher-order thinking, under the broader umbrella of deeper learning? Also, the characteristics of new instruction described by Nolan, Preston, and Finklestein are markedly different from that of any of the other
articles. They describe mastery-based learning, with an emphasis on reward systems. The instruction they describe is about accumulation of knowledge, rather than inquiry-based, open-ended, critical thinking, etc.
- authentic instruction
- computational thinking \rightarrow \text{problem solving, designing, understanding human behavior}
- personalized learning \rightarrow \text{in the context of using data in adaptability programs, adjusting based on student responses}
- deeper learning
- higher-order thinking
- communication
- collaboration
- authentic experiences
- real-world experiences
- guided inquiry
- reflection
- leverage technology
- project-based
- open-ended
- activity-based, active-learning
- blended
- mastery-based
- reward system

The instructional change described is characterized by being:
- Responsive to student need
  - Personalization is worth emphasizing within this
- Open-ended (includes project-based, inquiry-based, problem-solving)
  - I’m putting computational thinking in here, but it does seem somewhat distinct
- Authentic (connected to real-world experiences and needs)
- Competency-based

Should deeper-learning be its own separate category?

Things like promoting critical thinking and conceptual understanding seem more connected to the benefits of the instruction than what characterizes them.

Friday, August 12, 2016

*Role of the teacher* \rightarrow What am I trying to get at here? This is different from the characteristics of the instruction, because saying that instruction should be “authentic” doesn’t actually tell you anything about what the teacher themselves is doing. I am interested in what is being described about the teacher and what they are doing in the instruction. I don’t anticipate the categories being similar to what
came up for role of technology, where the distinctions were about how essential the technology was to the project of the instruction. Something that I noticed in analyzing the Marc Prensky interview was that there seemed to be this dilemma about asserting how the new instruction involved the teacher taking a back seat, but still needing to show how they were important. There is definitely consensus on needing to move away from the model of teacher as lecturer, teacher as in front of the classroom.

Previous thinking (from first 10)

- Setting things up for students before letting them go (things around setting goals, offering explanations, curating material)
- Support/differentiation (working with groups and individuals, circulating and answering questions, adjusting material)
- Increased leadership

Key words from second set of articles (note that out of 42 total references, 15 come from Martinez & McGrath)

| -establishing rules for appropriate use | • Designing learning experiences includes things about setting expectations, setting up groups |
| -talking to students about what they might encounter on the internet | • Support includes differentiation, scaffolding, support |
| -establishing expectations for work and participation (√√√) | • Facilitation questioning, circulating, feedback, listening |
| -work together in professional communities | • Leadership |
| -act as facilitator (√√√) | |
| -setting up conversations | |
| -establishing groups (√√√) | |
| -designing open-ended projects/learning experiences (√√√√√√) | |
| -circulating the room (√) | |
| -scaffolding (√) | |
| -providing support (√√√) | |
| -networking with broader community (√) | |
| -questioning (√√) | |
| -providing feedback (√) | |
| -listening | |
In some sense, I don’t actually feel as though these subcategories are getting at what is interesting here. But I think that is why the two levels of analysis are needed. On the surface, it seems like there is agreement about a vision of instruction that is more learner-centered and constructivist, in the interests of increased student learning and motivation, aided by technology, with the teacher acting to help plan what students will do and support them in doing it. But there are more subtle differences in the language used that convey different ideas of how that actually plays out, or what it looks like.

The vision of instruction in Journell, Ayers, & Beeson, along with Nolan, Preston, & Finklestein seems different. It is less dependent on constructivist principles in describing the use of twitter and digital technologies in learning.

Monday, August 15, 2016

Conditions under which change can occur

Conditions under which technology will lead to change

I see this category as texts that engage with the idea that the introduction of instructional technology leads to (or enables) the desired changes in teaching and learning. This is distinct from the other change categories in that it is about the technology specifically rather than the other parts of change, or change in general. Part of what’s interesting here is that this is being engaged with at all. The very presence of this category is a counter-argument to the idea that the presence of instructional technology will, by itself, lead to change. Although I’m not sure that any of these articles themselves are actually saying this, but some of the language refers to other things that are saying that (at least in theory)

I might also need to think about whether there is a difference between conditions under which technology will lead to increased learning (which is what the Conradi article is mostly about), and conditions under which technology leads to teaching in different ways, which is more what Martinez and McGrath are engaging with. Then, Elden is a third category, the conditions under which teachers would be open to actually making use of new technologies. Then there is the issue of conditions that are housed in the technology itself and conditions that are housed within the people or surrounding conditions. Kafai & Burke talk a lot about what the broader social culture is around programming, identifying elements of that culture, such as DIY and openness, that can support more meaningful in-school uses.

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Preliminary Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>-validation of online reading</td>
<td>-In conjunction with rethinking what schools should do/how students learn/what students learn</td>
</tr>
<tr>
<td>-support with knowing how to use it</td>
<td>-In conjunction with pedagogical shift</td>
</tr>
<tr>
<td>-sensitivity to students’ feelings about cooption</td>
<td>-In conjunction with thinking about what actually motivates students</td>
</tr>
<tr>
<td>-user-friendly</td>
<td>-Modeling/teaching students how to</td>
</tr>
<tr>
<td>-don’t embarrass teachers in front of students</td>
<td></td>
</tr>
</tbody>
</table>
-don’t take away from other instructional priorities
-creating own resources
Conditions housed in the technology
-too anonymous to support connection
-Twitter: not always productive, potential for inappropriateness, holding accountable for response, need guidelines and clear expectations for use
-computational thinking, in context of more systemic rethinking
-helped by DIY programming culture outside of schools
-connected to authentic goals
-support from online community around programming tools, clear audience
-culture of openness
-barrier: use of technology to replicate existing structures and practices
-barrier: limitations on use
-being developmentally appropriate
-allowing for experimentation
-access
-infrastructure
-good professional development
-funding of tools
-funding of human resources
-barrier: restrictions on use
-need to rethink teacher roles
-students have to learn how to use them
-don’t assume it is motivating
-thinking through appropriateness of tools to different subject areas/content
-used as part of broader instructional repertoire
-“careful planning and informed implementation”

actually use tools

-conditions under which technology *can* support innovation → access, infrastructure, PD, rethinking of pedagogy, match between tool and content, informed by knowledge of how students learn, teaching students how to use it, appeals to teachers

I have renamed this category as “conditions under which technology can enable change”. That name, in and of itself, implies that the examples that fall within this category are within particular ideas of the relationship between technology and change. That is, everything here would agree with the idea that simply the presence of technological tools does not lead to instructional change.
Within “rethinking of pedagogy” there are some distinctions to be made between rethinking how students learn, how teachers teach, and what schools should do. But it may be that these are more finely-grained distinctions that would come out more in analysis.

**New teacher actions**

From previous thinking:

- Individual qualities (could be within teachers or administrators)
- Explicit policy
- Infrastructure (distinct from policy in that policy is the official declaration of what can/should be done, and the infrastructure is what is in place to support it, it includes what I was previously thinking of as material resources, or school structures (like PLC time))
- Culture

From 10 additional articles, do those four categories seem to fit or are there other ideas? They do, although the bulk of examples are from the first 10. Within infrastructure, there seems to be a distinction between teacher generated infrastructure (like networks to support communicating with other professionals), and school/district-generated infrastructure, like adequate bandwidth. I wonder if teacher-generated infrastructure is more about networks or connections as the conditions that enable new actions.

**New teacher learning** ➔ I have been going back and forth on whether this should be a separate category or a sub-category of new teacher actions. I was originally trying to get at something about how teacher would even be exposed to new ideas in the first place, which is also kind of what provenance of ideas for change is about. I don’t think the distinction between new teacher learning and new teacher actions is really clear. In looking through the first four examples, they are also coded in new teacher actions. I’ve decided to collapse this under new teacher actions, creating a new sub-category called “learning environments”. I also notice that a significant chunk of the examples concerned with teacher learning come from Ferriter & Provenzano on the use of social media for teacher learning and Hull, Scott, & Higgs on helping teacher learn about using technology in the classroom. The fact that there is such a concentration within a few sources does suggest that this isn’t its own overarching category, but a subset of focus within the conditions that enable new teacher actions.

**Potential barriers** ➔ This is still possibly redundant to conditions that enable change. However, it seems interesting where different authors are placing the emphasis around what is getting in the way of the change that they want to see.

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Instances (after first)</th>
<th>Possible categories</th>
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<tbody>
<tr>
<td>Accountability pressures</td>
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<td>-accountability pressures</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-------------------------</td>
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</tr>
<tr>
<td>Student resistance</td>
<td>1</td>
<td>-restrictions on access</td>
</tr>
<tr>
<td>Teachers desire to save</td>
<td></td>
<td>-changing culture</td>
</tr>
<tr>
<td>students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overload of technology</td>
<td></td>
<td></td>
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<tr>
<td>Failed past promises of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of tech infrastructure</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Inaccurate information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Need to gain legitimacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture of resistance to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restrictions on Internet</td>
<td>1,1</td>
<td></td>
</tr>
<tr>
<td>access</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Memo-Coding
Organizing Subcodes
Tuesday, August 16, 2016

**Justification of change**

*Justification of different teaching*

<table>
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<tr>
<th>Keywords</th>
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<tbody>
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<td>21st century learning</td>
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<td>• Preparation for work</td>
</tr>
<tr>
<td>Work and life success</td>
<td>1, 1, 1, 1, 1, 1</td>
<td>• Needs of specific population</td>
</tr>
<tr>
<td>Needs of global economy</td>
<td>1</td>
<td>• Better alignment with learning theory</td>
</tr>
<tr>
<td>College and career ready</td>
<td></td>
<td>• Society has changed, learning must change</td>
</tr>
<tr>
<td>New demands of school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk of dropping out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Better alignment with learning theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What students want</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech changing society, so schools have to change</td>
<td>1,</td>
<td></td>
</tr>
<tr>
<td>Students aren’t using tech in creative ways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To learn the work of professionals</td>
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<td></td>
</tr>
</tbody>
</table>

I think there is a broader and a more narrow conception of preparation for work and life. Mehta & Fine explicitly position themselves against “to prepare students for a hypothetical future”, asserting that the kind of teaching and learning they describe is characterized by giving students meaningful work in the present. They evoke John Dewey to discuss the significance of this perspective, as does Kilfoye, although his emphasis is on Dewey as authority for need for authentic learning, aligned with world of work outside of school, rather than against an idea of what Dewey would call “instrumental preparation”.

In some sense, I think what’s interesting here is anything that is different from the narrow “preparation for work”, “needs of the global economy” or “college-and-career readiness” ideas. Those terms seem thrown in, as necessary justification, but not as what the author is actually really interested in.
**Justification of use of technology**

<table>
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<tbody>
<tr>
<td>Anywhere, anytime learning</td>
<td>1</td>
<td>• What students are already doing</td>
</tr>
<tr>
<td>What students are already doing</td>
<td>1, 1, 1, 1</td>
<td>• What students want</td>
</tr>
<tr>
<td>Getting beyond information acquisition</td>
<td>1,</td>
<td>• How the world is now</td>
</tr>
<tr>
<td>What students want</td>
<td>1, 1, 1</td>
<td>• Will improve learning</td>
</tr>
<tr>
<td>Energize and inspire</td>
<td></td>
<td>• Increasing access to learning</td>
</tr>
<tr>
<td>Will help learning (this is what the benefit category is about)</td>
<td>1,1</td>
<td></td>
</tr>
<tr>
<td>What the world is doing (much of this is Kilfoye)</td>
<td>1,1,1, 1,1, 1, 1, 1</td>
<td></td>
</tr>
</tbody>
</table>

**Benefits to change**

*Benefits to students*

Previous thinking
- Learn more (1, 1, 1, 1)
- Deepen conceptual understanding (1, 1, 1, 1, 1, 1)
- Receive individualized/differentiated instruction (1, 1, 1, 1, 1)
- Increased SMEFT (1, 1, 1, 1, 1, 1)

<table>
<thead>
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<th>Keywords</th>
<th>Instances (after first)</th>
<th>Possible Categories</th>
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<tbody>
<tr>
<td>Creative confidence</td>
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<td>In addition to previous 4</td>
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<td>Problem-solving</td>
<td>1</td>
<td>• College &amp; career ready</td>
</tr>
<tr>
<td>Enabling communication</td>
<td>1, 1, 1, 1, 1</td>
<td>• Communication</td>
</tr>
<tr>
<td>Exposing to broader world</td>
<td></td>
<td>• Collaboration</td>
</tr>
<tr>
<td>Engage in meaningful work</td>
<td></td>
<td>• Meta-cognition</td>
</tr>
<tr>
<td>Critical-thinking</td>
<td>1,1</td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td>1,1, 1</td>
<td>I think problem-solving, critical-thinking, and meta-cognition can all go together. What is a word for that? Non-content skills? That also includes communication and collaboration</td>
</tr>
<tr>
<td>Develop metacognition</td>
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<td></td>
</tr>
<tr>
<td>Prepared for college</td>
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<td></td>
</tr>
<tr>
<td>Sit with ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build relationships with teachers</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Increased access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared for work</td>
<td>1, 1</td>
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### Benefits to teachers

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<tr>
<th>Keywords</th>
<th>Instances (after first)</th>
<th>Possible Categories</th>
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<tbody>
<tr>
<td>Allowing teachers to work effectively</td>
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<td>Target instruction to needs</td>
</tr>
<tr>
<td>Teach more differentiate</td>
<td>1, 1, 1, 1</td>
<td>Use time differently</td>
</tr>
<tr>
<td>Using time more effectively</td>
<td>1, 1</td>
<td>Collaborate</td>
</tr>
<tr>
<td>Collaborate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Know more about students' understanding</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Minimize unnecessary work</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>More face-to-face time with students</td>
<td></td>
<td></td>
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</tbody>
</table>

### Evidence given of benefit

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Instances (after first)</th>
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<td>Teacher testimonial</td>
<td>1, 1</td>
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</tr>
<tr>
<td>Student anecdote</td>
<td>1, 1</td>
<td>Student voice</td>
</tr>
<tr>
<td>Parent survey</td>
<td></td>
<td>Classroom anecdote</td>
</tr>
<tr>
<td>Student achievement</td>
<td>1, 1</td>
<td>Student achievement</td>
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<tr>
<td>Student voice</td>
<td>1, 1, 1, 1</td>
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<tr>
<td>Student survey</td>
<td>1</td>
<td></td>
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<tr>
<td>Classroom anecdote</td>
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<tr>
<td>Other writers</td>
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