

A Systematic Review of Qualitative, Classroom-based Digital
Literacies Research 2006-2016

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Abstract

This research synthesis examines digital literacies instructional practices in 75 qualitative studies of digital literacies teaching and learning in K-12 classrooms from 2006-2016. Analyses suggest that effective digital literacies instruction begins with a process of integrative design that positions students as consumers, creators, communicators, collaborators, and agents in control of their own learning and identity construction. Informed by calls for educational research focused on the dynamic interactions of teachers and students in diverse contexts of schooling (Bryk, 2015; Gutiérrez & Penuel, 2014), this research synthesis provides a much-needed, practically relevant baseline of qualitative data to inform digital literacies instructional choices in K-12 classrooms.

Purpose and Research Questions

The Internet and the devices we use to access it are this generation's defining technologies (Leu, Kinzer, Coiro, Castek & Henry, 2013). Literacies today include processes for making and communicating meaning with and from print-based texts, but also with Internet texts that, in addition to featuring hyperlinks, are often interactive, socially constructed, dynamic, and multimodal (Afflerbach & Cho, 2009; Cho & Afflerbach, 2015; Coiro & Dobler, 2007; Hartman, Morsink & Zheng, 2010; Kress, 2003; Street, 1995). For teachers, this expanded definition of literacy--one that includes the digital--has significant implications for the learning experiences they design for students.

Curriculum documents such as the Common Core State Standards for Literacies in History/Social Studies, Science and the Technical Subjects (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) emphasize the importance of reading, writing and communicating through diverse digital and printed texts. Anchor standards expect students to evaluate and synthesize Internet texts; to use technology, including the Internet, to produce and publish writing and to collaborate with others; to make strategic use of digital media and visual displays to express ideas. However, evidence suggests that these advanced academic literacies are difficult to learn.

Many children and teens struggle to evaluate information sources and to construct synthesized understandings from diverse Internet texts (Braasch, Bråten, Strømsø, Anmarkrud, & Ferguson, 2013; Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012). A recent survey of fourth and fifth-grade students in the US revealed that children prefer to use the Internet over reading a book or watching TV, but also find it more difficult than these other activities (Hutchison, Woodward & Colwell, 2016). Justifiably then, when it comes to choosing teaching practices that support digital literacies learning, teachers have many questions about what works (Colwell, Hunt-Barron & Reinking, 2013; Greenhow, Robelia & Hughes, 2009).

One way to inform pedagogical decision making is to look retrospectively and across classroom-based studies of digital literacies learning and teaching to identify promising practices. This is the goal of the current study.

Our analyses are driven by two questions: (a) What can we learn from classroom-based research on digital literacies that can inform teaching practices? (b) What gaps does this synthesis reveal in terms of current conceptualizations of digital literacies teaching?

Theoretical Framework

As a systematic review of literature, we assume that by looking across studies and analyzing themes and trends, we will gain insights into classroom-based digital literacies research, as conceived and operationalized in the decade from 2006-2016 (Schofield, 2002; Thomas & Harden, 2008; Saini & Shlonsky, 2012). These assumptions are informed by Shanahan (2004) who writes that “by pooling the results of a collection of investigations, we can draw more reliable conclusions, resolve discrepancies and contradictions, and become more fully cognizant of the contexts that influence the phenomena of interest” (p. 209). Moreover, Shanahan notes that research synthesis is “fundamental to the idea of applying research to issues of practice and policy” (p. 209).

Our choice to synthesize classroom-based digital literacies research is informed by recent debates that emphasize relevance to practice as a central criterion for rigor in educational research (Gutiérrez & Penuel, 2014; Bryk, 2015). By selecting digital literacies studies that essentialize the understanding of sustained, dynamic interactions between teachers and students in diverse contexts of schooling, we assume that our analyses will offer a relevant point of departure for classroom teachers seeking recommendations for how and what to teach and for researchers most interested in data that reflect situated instructional practices.

Conceptions of digital literacies are informed by complementary theoretical frames that define the dispositions, skills, strategies and practices that children must learn to be fully literate, participatory citizens in the 21st century (Jenkins, Ito & boyd, 2015). The studies we have synthesized leverage theories of Multiliteracies (New London Group, 1996), Multimodality (Kress, 2003), Web Literacies (Mozilla.org, 2016) and New Literacies (Leu, Kinzer, Coiro, Castek & Henry, 2013) to frame all of the skills, strategies, practices and dispositions required to create, consume and to communicate ideas using diverse digital technologies, applications and modes (Author, 2012). We have chosen the term *digital literacies* to refer to these competencies. It is meant to be an inclusive term, reflective of the complementary theoretical perspectives that have framed the corpus of studies included for analysis.

Methods

This study synthesizes and categorizes digital literacies instructional practices in a set of 75 classroom-based studies published in journals of the Literacy Research Association, the International Literacy Association, the National Council of Teachers of English and the American Educational Research Association between 2006 and 2016. As prominent literacies and educational research organizations that teachers trust for rigorous, peer-reviewed studies on digital literacies teaching and learning, our sampling methods purposefully targeted high quality and influential digital literacies research of relevance to practice. Inspired by calls from Gutiérrez

and Penuel (2014) and Bryk (2015) for educational research that essentializes understandings of the dynamic interactions between teachers and students in diverse contexts of schooling, we designed inclusion criteria accordingly.

All studies in this review were (a) published in the journals of prominent literacy and educational research organizations in the last decade; (b) conducted in K-12 classroom contexts; (c) involved K-12 students and/or their in-service teachers as the focus of the inquiry; (d) used case study, teacher action research, observational and/or ethnographic methods to collect data and construct findings; and (e) involved *digital* literacies learning and instruction. Plus, all of these studies report evidence of learning benefit to students, making them an important corpus for understanding what works in classroom instruction of digital literacies.

To access the most recent decade of studies, we used the EBSCOHost database to search the archives of nine journals. Boolean search terms included the words *digital literacy*, *new literacies*, *multiliteracies*, or *multimodal* in articles published between 2006 and 2016. This resulted in a corpus of 427 articles.

Using the abstracts, descriptions of research methods and findings for each study, we eliminated those that did not include digital tools as part of instruction, studies conducted with pre-service teacher candidates, studies conducted in out-of-school contexts, or that pulled students out of their regular classroom context. We also eliminated articles that reported teachers' perceptions but did not describe the qualitative methods used to collect and analyze data.

We also excluded studies that relied primarily on quantitative methods of analysis from this synthesis for two reasons. First, given our interest in synthesizing, for teachers, the kinds of sustained teaching activities that seem most promising for helping students to create, communicate and consume digital content, qualitative data are most likely to inform our questions. As noted by Miles, Huberman and Saldaña (2014), qualitative data focus on “naturally occurring, ordinary events in natural settings, so that we have a strong handle on what ‘real life’ is like” (p. 11). They are also typically collected over “a sustained period” which makes them “powerful for studying any process” (p. 11). For us, the sustained situatedness of our data set mattered. Ultimately, 75 studies met our inclusion criteria.

The number of articles included in the synthesis, by journal, is summarized in Table 1. The full set of articles is provided in Appendix A.

Categorization of Studies

We categorized the studies using three *a priori* codes informed by complementary theoretical perspectives of literacies (Spires, Bartlett, Garry & Quick, 2012; Leu et al., 2013; New London Group, 1996; Mozilla.org, 2016): *Consuming Digital Content*, *Creating Digital Content* and *Communicating with digital tools-Participating in digital spaces*. This three-part coding structure allowed us to identify constellations of studies designed to support particular aspects of digital literacies instruction and learning in K-12 classrooms, and to further synthesize their descriptions of learning activities.

Studies coded as *Consume* posed research questions focused primarily on reading activities, comprehension and critical evaluation strategies, constructing understandings of topics through engagement with digital texts; consuming information via video, apps, games.

Studies coded as *Create* posed questions focused primarily on student writing or creation of multimodal products that represent some understanding of a topic, of self, of culture; these activities usually require reading and communicating, but the focus of the inquiry is on the use of a creative project to teach digital literacies.

Studies coded as *Communicate-Participate* focused primarily on the ways students think about their communications, collaborations, and participation in digital and classroom spaces as part of their digital literacies activities. These studies often discuss the importance of sociocultural dispositions and awarenesses as fundamental to digital literacies teaching and learning.

Coding progressed through four phases. Using research questions and abstracts, the articles were first sorted by top-level code (consume, create, communicate-participate). Second, we selected a random set of 10 studies and compared the application of codes to determine inter-rater reliability. We disagreed on two of the articles (80% agreement), but then negotiated and solidified definitions for these top-level codes. Third, all codes were checked for alignment with these agreed-upon definitions. Once categorized this way, all of the studies were again analyzed to identify sub-themes in (a) the processes of teaching and learning described in these studies, (b) the products of learning, and (c) the ways student stance, or positionality, is described in the digital literacies classroom.

Results

Top-level analyses

Using the research questions and the findings of each of these studies to apply initial codes, we found that 20 focused primarily on consumption, that 33 studies documented the processes and outcomes of classroom projects that required learners to create a product using digital tools and texts (e.g., videos, websites, digital stories), and that 21 studies focused primarily on communicating and participating in digital spaces. One study (Buckley-Marudas, 2016) presented an integrated pedagogical approach to digital literacies instruction that we could not categorize as privileging any of our three top-level codes. We therefore categorized it as “integrative.” Interestingly, this article seems to have operationalized a central tension in our analyses of the other studies -- that even when research questions and teaching interventions were designed to primarily explore and engage particular digital literacies (e.g., reading or writing or remixing multimodal texts) those targeted competencies often seemed inextricable from, or dependent on, others. Assignments that emphasized creation, for example, required students to curate information using a range of reading and critical evaluation skills, and to communicate for a particular audience.

Brown's (2013) study of the impact of a graphic novel study on student learning is an example of this inextricability. We coded this study as "create" because the students wrote stories and published them digitally. However, the students also read many graphic novels as part of the unit of study. Evidence suggested that immersive reading experiences and mini lessons served to scaffold comprehension of the graphic stories and that the publishing of digital stories caused several students to newly identify as writers. Consumption and creation were therefore integrated elements of this learning experience. Similarly Bogard and McMackin's (2012) study focused on how to blend "time-honoured literacy customs with new literacies". The authors documented how third-graders immersed themselves in the writing process to create digital stories. We coded this study as "create" because writing was the focus of inquiry. However, findings suggested that an essential part of students' writing process involved communication for an authentic audience. The authors recommend creating storyboards and iMovies, to share these with authentic audiences, and to use nondigital and digital resources to continually give the space and support for students to *communicate* critically, aesthetically, lovingly and agentively (p. 322; cf. Hull, 2003, p. 230).

This central tension in the application of our *a priori* coding scheme led us to question the extent to which traditional literacies silos (e.g., reading, writing, listening and speaking) actually align with the ways that digital literacies have been conceptualized and taught in classrooms. Using methods of constant comparison (Glaser & Strauss, 1967) our next phase of analysis focused on the construction of sub-themes through analysis of the teaching and learning processes described in this corpus of studies, the products of learning activities, and the ways that students are positioned in these studies. These thematic analyses were designed to inform both research questions.

Process Themes

Our analyses of instructional approaches (processes) are summarized here for studies in each of the three top-level categories. Table 2 provides an overview of the frequencies for each of the process codes among studies in the three top-level categories.

Consume. For *Consume* studies, teaching and learning processes seemed to coalesce around four central themes: (a) Critical Analysis, (b) Collaboration, (c) Gradual Release/Scaffolding, and (d) Layering of Integrated Meaning-Making Activities.

Critical analysis occurred through annotation (Larson, 2009; Pape, 2015), through critical discussion of meaning (Ajayi, 2015; Barone, 2014; Choudhry, 2012; Groenke, 2011; Nichols, 2012; Turner & Hicks, 2015) and through recontextualization, rewriting or remixing meanings (Ajayi, 2015; Rowsell, 2009). For example, in Ajayi's (2015) study, Nigerian girls critiqued the portrayal of girls and girls' experiences and then rewrote their identities using audio, images and their own language to present their own answers. Critical, here, connotes analysis, evaluation of texts, and also the deconstruction of power relationships in texts (cf. Lewis, Enciso & Moje, 2007; Street, 1995).

Collaboration activities included paired explorations of digital texts (Ipkeze & Boyd, 2007) and discussions focused on negotiation of meaning (Bruce, 2015).

Learning experiences that integrated scaffolds or a gradual release of responsibility included modeled reading and the design of a series of progressively more independent learning experiences for learners (Boche, 2015, Barone, 2008).

Layering of multimodal meaning construction was evident in most of these studies. For example, Turner and Hicks (2015) describe multiple processes that comprise connected reading - making contact with Internet texts by receiving, searching, surfing or stumbling upon texts; engaging with Internet texts by deciding, curating, reading and sharing; evaluating the value in texts by critiquing, using digital tools, and choosing to manage distractions. Bailey (2010) described how students read multimodal texts such as film, comic strips, music and photography during research and constructed syntheses of multimodal information. Rowsell and Burke (2009) describe how two middle-school literacy learners construct meaning from digital texts by leveraging multiple systems of meaning: the visual, spatial, the linguistic, the material.

Create. The teaching and learning themes constructed from this group of 33 studies include (a) multimodal bricolage, (b) layering meaning, (c) collaboration, (d) performance, (e) engagement with identity and culture, and (f) researching to create.

We chose the term multimodal bricolage to connote the set of creative, design-based, compositional activities described in all 33 of these studies. Activities included multimodal remixing (e.g., Burwell, 2013; Honeyford, 2014; Lewis, 2011; Lange, 2015; Malley, 2009), multimodal authoring and composing (e.g., Bogard, 2012; Chisolm, 2014; Danzak, 2011; Dunkerly-Bean, 2014; Handsfield, 2009; Hill, 2014; Hurst, 2015; Kist, 2007; Love, 2014; Ostenson, 2011; Ranker, 2007, 2008, 2010) and collaborative design of multimodal products (e.g., Husbye, 2012; White, 2015). Common to all of these practices is *bricolage* (Lévi-Strauss, 1962; Perrenoud, 1983) a creative, iterative process of making and design that includes the blending, weaving, repurposing, reimagining, remixing, or reusing of materials that are available in the creative environment. Whether the materials are digital images, words, stories, narrative structures, video, voices, identities, cultural representations or narratives, students in these studies made new products and new representations of their ideas through many processes of multimodal creation.

As in several *Consume* studies, students' process of bricolage included the layering meaning with multiple modes and through multiple processes of composition. For example, Curwood and Cowell (2011) describe a process of deconstruction and reconstruction as teachers helped students to identify visual and audio elements of multimodal poems, and to understand their individual and interwoven contributions to the meanings in messages. They recommend a process of questioning that enables a layered, iterative process of meaning construction with multimodal poetry. In their study, students became multimodal composers when they came to understand "how the presence, absence, or co-occurrence of specific modes allowed them to better share their experiences, beliefs and thoughts" (p.114). Dunkerly-Bean, Bean & Alnajjar (2014) describe an iterative cycle of design as instructional process as well. Students in their

study created diverse multimodal projects to address human rights issues by writing and performing screenplays and creating movies. They explored multiple ways of expressing and acting on local and global social justice issues through layered, multimodal composition processes.

Collaboration was a purposeful part of several composition and design processes in this set of studies. In Hepple's study (2014) students critically discussed the storyboarding, writing, design and production of claymation movies. In White's (2015) study, students used reciprocal teaching to help one another build deeper understandings of online informational texts that they then shared through screencasts (White, 2015). In a study by Shelby-Caffey (2014) students wrote collaboratively and engaged in iterative cycles of feedback to create digital stories.

Performance was also identified as an instructional practice in four *Create* studies. For example, in Costello's (2012) study, "the lines between art, drama, literary criticism and personal expression were blurred and the result was a powerful multimodal learning experience in which students were positioned as thoughtful, reflective producers of media" (pp. 55-56). For the very young children in Husbye's (2012) study of developmentally appropriate ways to develop digital literacies skills, imaginative play was the foundation for the production of films. In her study, children were able to perform literate identities by telling multimodal stories during their creative, performative play.

Twelve studies included instruction that allowed students to engage with representations of their cultures and identities. This approach to digital literacies instruction In Honeyford's (2014) study, immigrant youth created photo essays that allowed them to "represent their diasporic identities as the merging of multiple places, times and spaces with multiple perspectives" (p. 196) Similarly, in Danzak's study (2011) English language learners created digital comics that explored issues of family, culture and identity. Love (2014) found that when urban youth in Georgia were invited to leverage their knowledge of hip-hop, and to use that knowledge as a cultural frame for personal explorations of violence, stereotyping and prejudice, they created diverse, multimodal literacy products that allowed them to develop digital literacies skills, and a deeper sense of agency.

Finally six studies centralized research and synthesis of information as part of students' multimodal processes of bricolage. For example, Ranker's studies of students' constructions of digital videos through inquiry-based information gathering on topics related to school subjects (2007, 2008, 2015) show that inquiry to create multimodal video representations of understandings can be effective methods of digital literacies instruction. He found that by providing multiple modes, media, and technologies through which students can explore their topics, a more comprehensive – and perhaps more engaging – understanding of the research process and of the subject matter can emerge (2015). Spires, Hervey, Morris & Stelpflug (2012) used a similar approach. Internet research, synthesized through digital video production seems to support understanding of topics, but also the development of multimodal literacies.

Communicate. The teaching and learning processes in these studies all focus on composition, so that learning here is taken to occur through composition. Importantly, however,

the focus for these studies was the social, participatory context for composition. We therefore constructed themes based on the range of participatory activities described in these studies. Themes include (a) peer collaboration, (b) privileging relationship building through multiple channels and with multiple tools, (c) identity engagement, (d) encouraging open, participatory mindsets and practices.

Peer collaboration included the collaborative creation and editing of wikis (Andes, 2011), of game-based quests (Kingsley, 2015), of multimodal stories (Lentners, 2013; Rish, 2011), and videos (Ranker, 2015). Collaborative negotiations and discussions seemed to facilitate development of digital literacies skills as students created a range of communicative products.

Importantly, in this set of studies, collaborations often focused on community building, and on the development of a culture or community of engaged participation in the classroom through digital composition and communication. For example, students in de la Piedra's (2010) study, leveraged their common bilingualism (Spanish-English) to develop friendships, to maintain cultural connections between home and school, and to explain school work to one another using multiple channels (e.g., email, facebook, text messages). In Rowsell, Saudelli, Scott & Bishop's (2013) study, the integration of iPads flattened hierarchies. Students and teachers became co-learners in a community of practice focused on exchange of ideas and critical thinking about digital texts.

Identity engagement was a significant theme in these studies. Six studies engaged processes of creation and communication focused on representations of self, identity or culture. For example, Wilson, Chavez & Anders (2012) explored how English Language Learners use multiple forms of representation to express identities they valued in ways that make use of their communicative strengths. They found that podcasts allowed students to explore and represent their identities in relation to family members, places, interests, activities, popular culture or life events. In Rust's (2015) study, students leveraged humor and wit, allusions to popular culture and patterns of gossip discourse to discuss characters in plays and books, and to represent themselves on a social networking site for class. The social media context for these discussions seemed to invite particular out-of-school vernacular literacies that can be leveraged to critically analyze how students represent themselves online.

Finally, open, participatory mindset was a central instructional theme in Callahan & King's (2011) study who explored how traditional power and participation patterns are challenged by the enactment of techno-literacies in the classroom. They found that mindset remix is essential. An openness to the transformational possibilities of technologies is important, as is a willingness to redistribute power in the classroom. Teachers and students must be open to democratized participation, and open to the distribution of knowledge and expertise. In Rowsell et al.'s (2013) study too openness to co-learning and participation was fundamental.

Products

To further understand conceptualizations of digital literacies learning in classrooms, we synthesized the reported products of the digital literacies learning activities in these 75 studies.

Bold is used to indicate products that appeared in more than one top-level category of study. For example, digital stories were created by students in Bruce's (2015) study (Consume) and also in studies by Chisolm & Trent (2014) and Shelby-Caffey, Ubeda & Jenkins (2014) (Create). Likewise, Blogs were featured products in Create (Handsfield, 2009) and Communicate studies (Ranker, 2015).

● **Consume.** Products of the studies focused on consumption of digital texts were sometimes reported as digital objects (e.g., multimodal word lists or curated collections of information) but often we could only describe the products of *Consume* studies as student understandings, or dispositions developed through the activities.

- Multimodal word lists (Abrams, 2014)
- Multimodal representations of self that reject or challenge textbook (Ajayi, 2015)
- Curated collection of multimodal information (Bailey, 2010)
- Reading routines and values that include exploration of multiple, diverse texts (Barone, 2014)
- Recursive lessons that scaffold Internet search, evaluation and notetaking (Barone, 2008)
- **Digital stories (Bruce, 2015)**
- Student understandings
 - Of multimodal texts and multimodal meaning construction (Boche, 2015; Rowsell & Burke)
 - Of critical thinking and analysis (Choudhury, 2012; Nichols, 2012)
 - Of semiotics (Rowsell & Burke, 2009)
 - Of the design interface and its impact on meaning construction (Rowsell & Burke, 2009)
- Reading strategies
 - Prediction and inferencing (Groenke, 2011)
 - Critical analysis (Ipkeze & Boyd, 2007)
 - Reflection on understanding (Ipkeze & Boyd, 2007)
 - Sequencing (Huchison, 2012)
 - Cause and effect (Huchison, 2012)
 - Collaboration and feedback (Wolsey, 2015)
- Technology skills
 - Navigation and use of iPad to draw, manipulate, read, write and represent (Huchison, 2012)
 - Annotation and navigation and use of eBooks (Larson 2009; Larson 2010)
- Student engagement with multimodal texts (Garcia, 2012)

Create. Students in each of the studies in this group created digital products or projects. These are listed below. Together, they provide a snapshot of the ways that teachers have operationalized digital literacies learning in classrooms. (only first authors and year have been given to save space)

- Storyboards (Bogard, 2012; Love, 2014)
- Screenplay (Dunkerly-Bean, 2014;)
- Digital movie or video (Bogard, 2012; Costello, 2012; Dunkerly-Bean, 2014; Lange, 2015; Love, 2014; Ranker, 2007, 2008, 2010; Spires, 2012; Turner, 2011; Young, 2012;)
- Claymation video (Hepple, 2014)
- **Digital story (Chisolm, 2014; Danzak, 2011; Shelby-Caffey, 2014)**
- Digital Literary Arts Journal (Broderick, 2014)
- Graphic Novel (Brown, 2013)
- Digital Media Remix Projects (Burwell, 2013; Malley, 2009; Ostenson, 2011)
- Multimodal Identity Texts (Love, 2014)
- **Multimodal Poetry (Curwood, 2011; Blog (Handsfield, 2009)**
- Digital Comics (Handsfield, 2009;)
- Interdisciplinary, project-based multimodal projects driven by student interest (Dalton, 2014; Hill, 2014; Tan, 2010;)
- Photo Essays (Honeyford, 2014;)
- **Podcast (Hurst, 2015; Smythe, 2010)**
- Play-based media literacies curriculum (Husbye, 2012)
- Movie Poster (Kist, 2007;)
- Screencasts (White, 2015)
- Website (Spence, 2009)
- Photovoice research project (Zenkov, 2015)

Communicate. The products of studies categorized as *Communicate* are notable for their open, social, audience-focused orientations. Although some of these products also appear in studies categorized as Create and/or Consume, the research questions in these studies focused especially on the participatory aspects of digital literacies learning. The sharing of multimodal poems was emphasized in the Callahan (2011) whereas the creation of the multimodal poems was emphasized in the Curwood & Cowell (2011) study.

- **Blog**
- Wiki
- **Open Digital Annotations of Texts**
- Facebook profiles
- Tweets/Twitter Stream
- **Multimodal poems**
- Collaborative game-based quests
- Online discussion board posts
- Voicethread critiques
- Community of Practice
- **Podcasts**

Stance

As we analyzed the learning processes, it became clear that the range of student stances emphasized and encouraged in these studies was a significant design feature of digital literacies teaching and learning. Several scholars have explored the importance of reader stances and epistemology as predictors of meaning construction with print and digital texts, including graphic novels (e.g., Barzilai & Zohar, 2012; Hartman, 1995; Jiménez & Meyer, 2016; Serafini, 2015). As creators of digital texts, and as communicators in digital spaces, students' stance in relation to the task, to the context and to community seemed like a feature of these learning experiences that may have contributed to their impact on learning.

In this corpus of 75 studies, students were encouraged by teachers to assume a range of stances that explicitly positioned them as agents in control of their own learning and identity construction, as collaborators, as analysts, as bricoleurs, and as culturally engaged communicators. Usually, students assumed multiple stances in these studies – as bricoleurs and analysts, for example. Or, as agents in control of their own learning and as culturally engaged communicators. Together, this range of student stances demonstrates that in this set of 75 studies, effective digital literacies instruction encourages students to assume multiple positions. In digital literacies learning activities, students construct understandings of self and also others. To do so, they engage skills, but also mindsets of openness, agency and participation.

Consume. We identified four stances in the set of Consume studies: (a) students as critical analysts, (b) students as bricoleurs, (c) students as agents in control of their learning and identities, and (d) students as collaborators.

By *students as critical analysts*, we mean that students were encouraged, by teachers to assume a critical position in relation to the texts they were reading or finding. Students were encouraged to actively question or deconstruct representations of themselves, as in the Ajayi (2015) study or to uncover layers of meaning by actively questioning texts, and messages in multimodal media (e.g., Barone, 2014; Choudhury, 2012). By *students as bricoleur* we mean that students were encouraged to be creators, composers, writers, multimodal remixers. By *students as agents in control of their learning and identities*, we mean that they were encouraged to own their process of learning, to make decisions about their work, to develop their own questions, and to leverage their own experiences as central to their meaning making processes. By *students as collaborators*, we mean that students were encouraged to co-construct meaning, to work together to understand texts.

Create. In all of these studies, students assumed stances as creators, composers, writers, designers. Iteration and revision were often cited as essential to these processes. We applied the single theme *students as bricoleurs* to connote the many iterative processes of creation in which they engaged, over time. Other stance themes among these studies include: students as

collaborators, students as agents in control of their own identity and learning, students as culturally engaged, and students as critical analysts.

Communicate. Students in these studies assumed stances as agents, as researchers, as bricoleurs, as culturally engaged participatory citizens, and as community builders. Community building implies collaboration, but it differs from the collaboration themes identified among the consume and create studies because of the active focus on the construction of a community of practice.

Synthesis of themes

What can we learn from this corpus of classroom-based research on digital literacies that can inform teaching practices? To synthesize findings, we looked for themes that cut across the three top-level categories for process, product and stance.

In terms of process, collaboration was a common cross-cutting theme. Several studies emphasized the importance of students working together to consume information, to create multimodal products, and to design participation in digital spaces. Sharing, negotiating, discussing, co-authoring -- these seem... An emphasis on layered meaning construction was also common across categories. Whether through activities focused on reading, writing, or sharing ideas with a broader community, these studies conceptualized digital literacies learning as...

Practices that work

The way that digital literacies learning has been conceptualized in this set of studies spanning the ten-year period 2006-2016 suggests that the emergence of complex digital literacies competencies in K-12 classrooms seems likely when students engage in creative, multimodal digital projects that require them to curate information from diverse, printed and digital texts and communicate understanding, for diverse audiences, using diverse digital tools and platforms.

The products of learning take many forms, but we have distilled four central principles from these studies that can inform digital literacies teaching practices.

1. Effective digital literacies classroom practices are layered, dynamic and recursive, just like the processes of multimodal design, composition and bricolage that are central to digital literacies learning.
2. Effective digital literacies classroom practices position students as agents in control of their own learning. Student ownership, agency, and choice are fundamental.
3. Effective digital literacies classroom practices invite expression, critique and remixing of representations of culture and identity.
4. Effective digital literacies classroom practices privilege collaboration and essentialize an open, community building mindset in physical and digital participatory spaces.

Gaps

In terms of gaps, we noticed that only two studies met inclusion criteria from the four educational and literacy researcher-oriented journals (JLR, RRQ, AERJ and EJ). The findings synthesized here have therefore been almost exclusively published in journals designed for teachers. This stands to reason; we sought to synthesize qualitative accounts of digital literacies instruction and the complexities therein -- precisely the kinds of studies of greatest use and value to the audiences of teacher-oriented journals. And yet, the stark divide raises questions about how studies of dynamic and complex interactions between students and teachers have been received by researcher-focused journals. Given calls for studies that are more relevant to practice, we wonder if future research in this field will be more inclined to embrace these complexities.

Although remix and representations of culture and identity were integrated elements of several studies, none of these studies explicitly focused on engagement with indigenous identities, indigenous cultures and ways of thinking. Digital literacies instruction in classrooms where indigenous children are present will need to shift and include culturally responsive practices that access their funds of knowledge.

Technologies, too, are evolving. This set of studies did not include physical and digital maker technologies (e.g., 3D printing), augmented reality or virtual reality applications. We anticipate that future conceptions of digital literacies instruction will increasingly include these and other emerging technologies. We cannot yet anticipate how these technologies will shift conceptions of digital literacies instruction in classrooms. However, we assert that the four central principles distilled from this analysis will still apply.

We also found that computational thinking and coding as digital literacies were not taken up in this corpus of studies. We expect that there will be a turn toward instruction that integrates computational thinking as part of digital and physical making activities.

Discussion

During the decade of 2006-2016, and based on our analyses of these 75 studies, teachers and researchers have generally (re)conceptualized digital literacies instruction as integrated, iterative, dynamic systems-based processes that place students at the centre of their own learning, that emphasize collaboration, and that promote engagement with meaningful questions of identity, and culture through processes and products of multimodal design, remix, composition, making: in short, bricolage. Based on our analysis, we assert that one way for teachers to plan their digital literacies instruction is to think of a double helix with four base pairs: students' conceptualizations of self, students' conceptualizations of others, students' skills and students' mindsets. Planning for combinations and interactions of these four base pairs, over time, and through activities that emphasize consuming digital texts, creating digital texts and communicating with and for others in digital participatory spaces will promote the expression of the learned traits they wish to see in their students. The complex sugar that, in genetic material, forms the string of the double helix (deoxyribose) can be thought of as connected teaching methods that interact with the base pairs but that also bind to one another.

For example, in one study by Spires, Hervey, Morris & Stelpflug (2012) students used a project-based inquiry (PBI) model to gather and analyze information from various web sources and printed texts on topics of personal interest. They synthesized information and communicated their understandings through digital videos. Teachers created a space for exploration, collaboration and invited outside experts to provide feedback to students on their learning. They also evaluated their own work and offered feedback to peers. In this one project, we see the interaction of all four base pairs. (a) Self: students' conceptualizations of self as agents in their own learning, with their own interests and ability to assess their progress (b) Others: students collaborated with peers, considered their audience, and integrated expert feedback into their work, (c) Skills: students engaged online research, critical analysis, synthesis skills; they created digital videos by engaging multimodal design and composition skills, (d) Mindset: As part of a collaborative, creative community of learning, students were encouraged to adopt an open, participatory mindset; to share, to give, to support others. Using this same PBI model, Spires, Himes, and Wang (2016) describe how they applied the process in a cross-cultural context in which students from the US and China collaborated across time, space, and cultures to create co-designed digital products.

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Table 1
Summary of initial vs. included studies by journal title

Organization	ILA			LRA	NCTE			AERA		Total
	RT	JAAL	RRQ	JLR	LA	EJ	VFM	AERJ	ER	
Initial	64	176	26	19	52	48	33	3	6	427
Included	19	29	0	2	3	17	5	0	0	75

ILA: International Literacy Association; RT: Reading Teacher; JAAL: Journal of Adolescent and Adult Literacy; RRQ: Reading Research Quarterly; LRA: Literacy Research Association; NCTE: National Council of Teachers of English; LA: Language Arts; EJ: English Journal; VFM: Voices From the Middle; AERA: American Educational Research Association; AERJ: American Educational Research Journal; ER: Educational Researcher

Table 2. Frequencies of process themes by top-level category.

Consume (n = 20)	Create (n = 33)	Communicate-Participate (n = 21)
Critical Analysis (11)	Collaboration (7)	Building relationships and community (8)
Scaffolding-Gradual Release of Responsibility (2)	Identity Engagement (12)	Open/Participatory Mindsets and Practices (5)
Collaboration (3)	Multimodal Bricolage (33)	Collaboration (14)
Multimodal Layering of Meaning (11)	Performance (4)	Identity Engagement (6)
	Researching (6)	
	Revision and Iteration (7)	

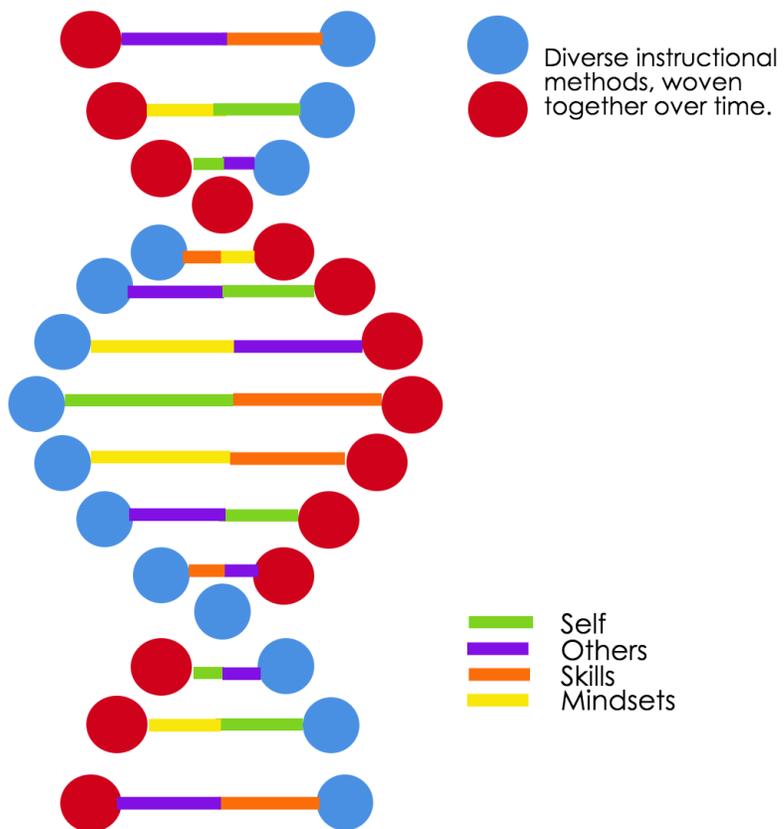


Figure 1. Helix model representation of digital literacies instructional practices.

Appendix A
List of studies included in synthesis

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