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Emergently Digital in Grade Two: Another case of "3.6 Minutes Per Day*?*"

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Abstract

This case study examines the presence of digital tools and the inclusion of digital activities in a grade two classroom for one unit of study on the countries of the world. The researcher sought to: identify the range of web literacy activities and digital skills; describe the ways in which the teacher and students balanced analog and digital texts; and, present the features of the tools and texts used in literacy instruction in the classroom. Data were collected across six hours of classroom observation time spanning three days of instruction. Field notes, photographic stills, and audio-recorded and transcribed teacher interviews served as data sources for the study. 100 randomly selected entries in the field notes and the remaining data from the stills and interviews were coded using a constant comparative method for a range of variables related to the users, tools, texts, modes of meaning in the texts, curricular places, and web and digital skills and competencies. Results indicate 1) there were limited opportunities for children to participate in web literacies, despite the many opportunities to write/compose and read/consume digital media; 2) there is a balance between printed and analog text, and students move fluidly between the paper and the screen; 3) more modes of meaning are utilized in reading/consuming texts than in writing/composing them.

Keywords*:* technology, digital tools, web literacy, emergent literacy

Children come into class as the morning bell rings. They unpack their bags. Many place their own devices on the teacher's table to be signed on to the network—a task the teacher has to manually manage for every device children bring from home, every day. They begin their day with the language arts block. During this time the class is routinely engaged in The Daily 5 (Boushey & Moser, 2014). A blend of digital and analog text types are present in the room. Miss Littlefield is conducting fluency checks with a small group of children at the guided reading table. Children here are reading a pictureless PDF of a grade-level text on one device and Miss Littlefield is recording running records through an app called Timed Reading (K12 Inc., 2013). After the fluency checks, the group rehearses for a readers' theatre performance, with scripts printed on paper.

Two children engaged in "listen to reading" choose Tumblebooks (KidsClick!, 2000), an online picturebook library, and one other student grabs Miss Littlefield's iPod to listen to e-book applications. The two children who have selected Tumblebooks struggle to get started: they untangle their headphones, and discuss with one another how to get the pop-out window right-sized for their screens. They call me over for help; the images are "cut off." While we are reloading the window, the student on the iPod asks me to help her update an application she would like to listen to—a fairy tale e-book app. Four children have selected "read to someone" and are focusing on self-selected narrative text in paperback chapter books. Two other students have selected "read to self" and are engaged reading digital or analog texts for their ongoing writing projects—a report on a country of the world. When six students come back from out of the classroom special education or ELL services, they begin to "work on writing" with assistance from the paraprofessional. They are summarizing the digital and analog texts they've read for their country reports. A few other children are engaged in "word work" with word parts to sort words and practice in identifying patterns within words.

After the Daily 5, Miss Littlefield gathers the class for a whole-group mini lesson on taking notes from a digital resource—one piece of her unit on nonfiction writing that was inspired by Cummins' work on nonfiction text (2013). Miss Littlefield uses the Culturegrams (Proquest, 2014) and Kidsinfobits (Gale,

2014) database websites as part of her demonstration. She focuses specifically on reviewing how to login to the databases, and how to search for entries within each database about a specific country of the world. In addition she briefly reviews how to extract key ideas related to the goals of the writing task, and how to understand whether the images contained on the websites could be used in the presentations the students are preparing. Miss Littlefield reminds the class that there is a "listen" function on PebbleGo (PebbleGo, 2014) *and on Culturegrams if the children should need an assist with decoding the text. She then prompts the children to continue working on their projects. Students pick up their writing research projects and some begin to engage in their work as Miss Littlefield had modeled in her demonstration; they are successfully taking notes, citing sources, and/or creating their presentation visuals in Google Slides, while other children struggle to engage until a peer, paraprofessional, or teacher comes to help.*

Throughout the time I spent engaged in the case study of Miss Littlefield's grade two classroom I present in this paper, I observed a diverse range of tools and resources throughout the various goal-oriented activities occurring in the literacy block. Such tools and resources mirror many of those that are present in general early learning contexts (Blackwell, Wartella, Lauricella, & Robb, 2015).

Manderino and Wickens (2014) argue that in some contexts, notably those that engage with older students, these tools and resources have allowed disciplinary literacy practices to shift from individual to collaborative, from text-centric to multimodal, and from disconnected to networked. The wider range of tools and materials for the conduct of literacy practices, like those in the web-based digital interactive space, allow an observer to view a parallel set of [digital] skills and [web] literacies in action.

Web Literacy, Digital Skills, and Learning Standards

Belshaw's work on web literacies (2011), the work of those in the connected learning movement (Ito, Gutierrez, Livingstone, Penuel, et al., 2013), and those who study new literacies (e.g., Leu, Kinzer, Coiro, & Cammack, 2004; New London Group, 1996), have put forward the idea that multimodal, mobile and connected literacies are something special in and of themselves, beyond the more traditional forms of literacy that are exchanged with analog tools. In digital spaces and places, students work toward mastery

of "21st century skills" as they participate, write, and read the web and the world around them. Accordingly, the *"...technology is critically important because it literally has redefined what it means to be literate these days"* (Teale, as quoted in Turner, 2018).

Mozilla, the company behind the Firefox web platform, offers a Web Literacy interactive map that serves as a "framework for entry-level web literacy & 21st century skills" (n.d., see Figure 1). The web literacy framework suggests that web literate persons read, participate, and write in digital forms to problem solve, communicate, create, and collaborate. These forms of web literacies extend beyond interpretation and composition of written text and integrate multiple modes of meaning—including visual and aural modes. The activities presented around the outside of the web literacy map (i.e., remix; revise; compose; code; design; share; contribute; open practice; protect; connect; search; navigate; synthesize; evaluate) facilitate a range of embedded competencies (i.e., skills), which likely emerge as do most other literacy skills: that is to say they develop and emerge over time. Such development likely hinges on multiple experiences with a given activity that involve someone who is more expert in the skill scaffolding a novice as their practice matures.

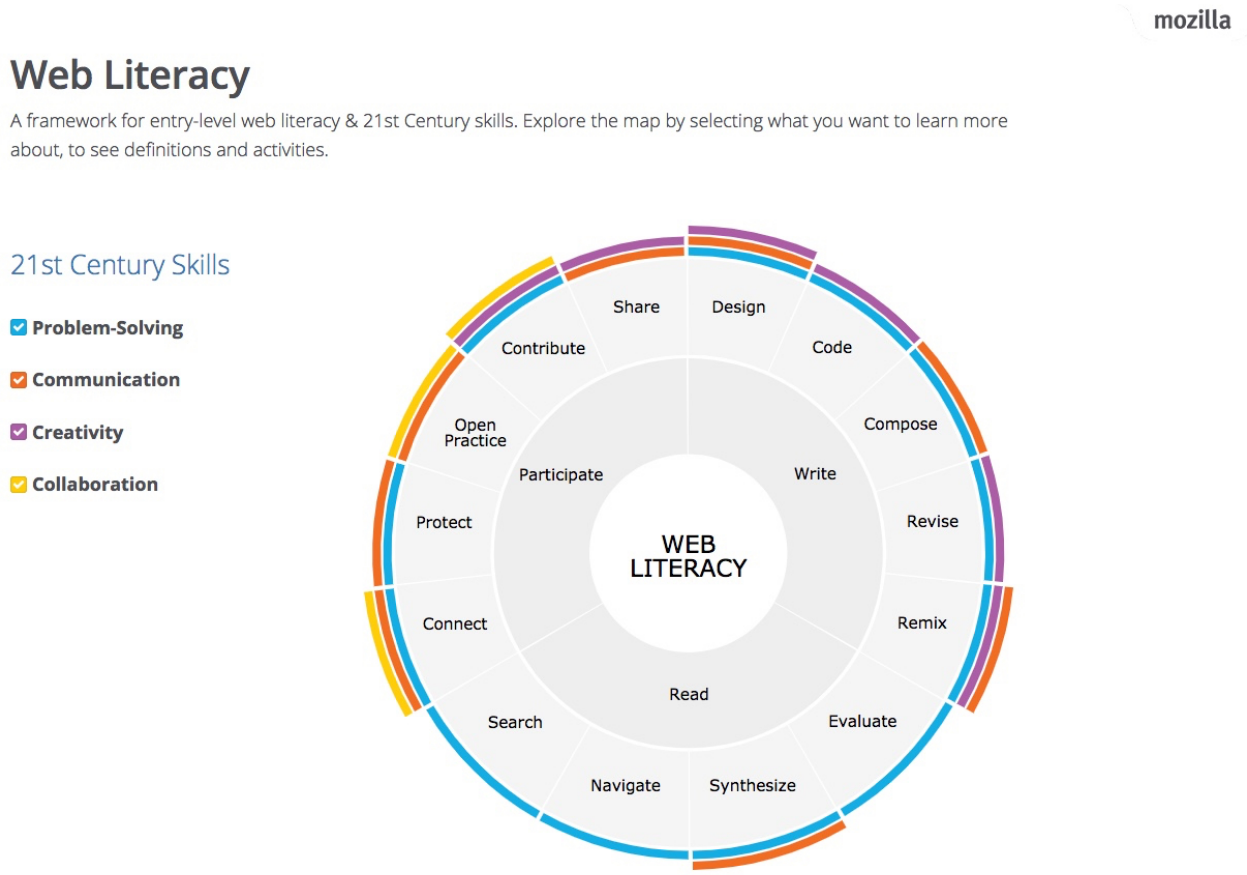

Figure 1. Web Literacy Map (Mozilla, n.d.)

(available interactive tool at https://learning.mozilla.org/en-US/web-literacy)

As an example, the "compose" activity engages problem solving and communication skill sets and is defined as "building, organizing, and sharing digital content that is accessible and approachable." Composition contains the following embedded skills:

- Curating digital content and organizing it into a system for building and sharing.
- Organizing information, digital content, and hyperlinks to add to a webpage or online space.
- Embedding multimedia, hyperlinks, and digital content on a web page.
- Creating web resources in ways appropriate to the medium/genre.
- Setting up and controlling a space to publish on the web.

- Using appropriate permissions and licenses.

While these web composition skills are very discrete and specific, the presentation of digital composition in the Common Core State Standards [CCSS] relies far less on specifying discrete skills and resorts to a more generalized statement:

> *To be ready for college, workforce training, and life in a technological society, students need the ability to gather, comprehend, evaluate, synthesize, and report on information and ideas, to conduct original research in order to answer questions or solve problems, and to analyze and create a high volume and extensive range of print and nonprint texts in media forms old and new. The need to conduct research and to produce and consume media is embedded into every aspect of today's curriculum. In like fashion, research and media skills and understandings are embedded throughout the Standards rather than treated in a separate section* (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p.4).

Table 1 presents a list the CCSS anchor standards and corresponding grade two standards that contain any explicit reference to digital text or media tools. I have utilized bolded italic font to draw attention to the key terms ***digital, media,*** and ***technology***. In addition I have utilized bolded font to draw attention to the key terms around multimodal meaning making: **visual, images, illustrations, orally** and **audio**. By comparing the presence or absence of key terms from anchor to grade two standards, it is clear that there is not a one-to-one match in the appearance of the key words from anchor to grade level standards: e.g., grade two standard CCSS.ELA-Literacy.W.2.8 contains ***digital***, but the anchor standard CCSS.ELA-Literacy.CCRA.W.8 does not specify ***digital***, whereas the multimodal key words always appear in both the anchor and the grade level CCSS whether they are addressing reading, writing, speaking and listening, or language.

Table 1. Common Core State Standards guiding children's use of digital technologies in the classroom: College and Career Readiness Anchor and Grade 2 Standards (***Bolded italic*** emphasis added to key terms: ***digital, media, technology***; **Bolded** emphasis added to **visual, images, illustrations** and **oral, audio**.)

Domain		Anchor Standard		Grade 2 Standard
Writing	CCSS.ELA-Literacy.CCRA.W.6	Use ***technology***, including the Internet, to produce and publish writing and to interact and collaborate with others.	CCSS.ELA-Literacy.W.2.6	With guidance and support from adults, use a variety of ***digital*** tools to produce and publish writing, including in collaboration with peers.
Writing	CCSS.ELA-Literacy.CCRA.W.8	Gather relevant information from multiple print and ***digital*** sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.	CCSS.ELA-Literacy.W.2.8	Recall information from experiences or gather information from provided sources to answer a question.
Reading	CCSS.ELA-Literacy.CCRA.R.7	Integrate and evaluate content presented in diverse ***media*** and formats, including **visually** and quantitatively, as well as in words.	CCSS.ELA-Literacy.RL.2.7	Use information gained from the **illustrations** and words in a print or ***digital*** text to demonstrate understanding of its characters, setting, or plot.
Reading	CCSS.ELA-Literacy.CCRA.R.7	Integrate and evaluate content presented in diverse ***media*** and formats, including **visually** and quantitatively, as well as in words.	CCSS.ELA-Literacy.RI.2.7	Explain how specific **images** (e.g., a diagram showing how a machine works) contribute to and clarify a text.
Speaking & Listening	CCSS.ELA-Literacy.CCRA.SL.2	Integrate and evaluate information presented in diverse ***media*** and formats, including **visually**, quantitatively, and **orally**.	CCSS.ELA-Literacy.SL.2.2	Recount or describe key ideas or details from a text read aloud or information presented **orally** or through other ***media*.**
Speaking & Listening	CCSS.ELA-Literacy.CCRA.SL.5	Make strategic use of ***digital media*** and **visual** displays of data to express information and enhance understanding of presentations.	CCSS.ELA-Literacy.SL.2.5	Create **audio** recordings of stories or poems; add drawings or other **visual** displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.
Language	CCSS.ELA-Literacy.CCRA.L.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.	CCSS.ELA-Literacy.L.2.4.e	Use glossaries and beginning dictionaries, both print and ***digital***, to determine or clarify the meaning of words and phrases.

The cohesion between the multimodal components of digital and media literacy in the CCSS speaks to the prominence of multiple modes of meaning-making when digital tools are included. The web literacy framework also integrates the centrality of the visual and audio modes of meaning-making, with key terms *multimedia, visual, audio* appearing in the following selected web literacy activities and skills (there are many additional examples of multimodal meaning in the web literacy framework):

- Compose - Embedding multimedia, hyperlinks, and digital content on a web page.
- Read - Recognizing the common visual cues in various web services.
- Revise - Incrementally adding or removing individual components (i.e., text, audio, image, video) in digital work.
- Revise - Incrementally repositioning individual components (i.e., text, audio, image, video) while revising digital work.

Miss Littlefield utilized the CCSS for planning for reading and writing with digital tools. It was arguably clear that she should integrate opportunities for her students to make meaning from and with multiple modes while using digital tools and resources for literate activity. For the purposes of this case study Google Slides was considered an "online space" even though it was a protected environment that was managed by the teacher and administered by the school district and the content was never published openly on the web.

Developing Emergent Digital Web Literacies

Developmental and sociocultural theories of learning support my research work. Accordingly, I am one who is interested in how individuals, from birth through age eight, begin to become literate in their worlds: how the social experiences and tools utilized in the conduct of literate acts shape a child's literacy development. In my work the theory of emergent literacy (Teale & Sulzby, 1986; Teale, Hoffman, Whittingham, & Paciga, 2018) offers insights into what literacy research and instruction ought to attend to. If we want digitally literate citizens who can nimbly navigate the various parts of the networked web, then the early social interactions children have with and around these digital and

interactive tools are important. The tools themselves are important, as well, because they often define the range of possible interactions, understandings, and outcomes for children's literate thought and action. After all, the CCSS identify that the end goal is to have students who:

> *..use technology and digital media strategically and capably…to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn using technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and mediums and can select and use those best suited to their communication goals (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p.7).*

Given the essentiality of the visual and audio modes presented in the digital standards of the CCSS (see Table 1), an arts and media approach to early education could help build those enduring understandings in young children. In a media literacy approach, children "don't automatically learn what they need to know about technology from their environment...Verbal play-by-play [from teachers through modeling] introduces key vocabulary and helps children see tablets and computers as tools that offer more than games or videos…[and] provides opportunities to engage children in the practice of asking relevant questions" (Rogow, 2015, p. 95). Moreover, teacher modeling functions as a mechanism to help children identify strategies for finding answers to their authentic inquiry. Teachers who enact a media literacy approach also provide children carefully scaffolded opportunities to create media with digital tools: stories and reports that use images, sounds and words for communication and persuasion. When we "pair the use of technology with decision-making opportunities and conversation" (Rogow, 2015, p. 98), even 5-year-olds can demonstrate media literate outcomes.

Kress (2000) suggested, too, that technologies are changing how we communicate in a connected world: "the written language is coming under new, intense strains...computing devices will make available new routes to making speech visible, not handled by the hand and the pen, or by the hand on the

keyboard...writing will become much more affected by visual considerations…[making] the visual lexicon of a five-year old girl...commonplace" (pp.7-8). In other words, the sorts of graphic languages utilized by young children (Edwards, Gandini, & Forman, 1998), which often utilize images, audio, and embodied action to convey their meanings, are found more frequently in the texts composed and exchanged through digital means, but there is little utilization of these digital means of communication in early school contexts (Blackwell, et al., 2015; Hutchison & Reinking, 2011).

All of this is to say that I believe web literacies and digital skills also develop emergently in our young children, and that we, as a field, have much work to do understanding how these skills and literacies develop across the early childhood age span. Also important is developing a wider knowledge base about how teachers and parents can thoughtfully foster these ways of thinking and doing in a digital world in developmentally appropriate (Bredekamp, 1987) ways.

Duke's (2000) groundbreaking study of informational text in the primary grades was, for me in my graduate studies, one of those pieces of research that struck a chord. I think, perhaps, it is because I sort of have been blessed to see the historical and political effects of that study on the lives of children everywhere. Duke's study put forward the notion that young children need more than 3.6 minutes per day of nonfiction, disciplinary texts to do and learn the disciplinary literacy. This was accomplished by documenting the absence of these analog texts/tools in first grade classrooms. Digital tools span across disciplines, and integrate visual, interactive, and audio features that are otherwise not present in print-based texts. Given this, I wonder whether children might also need academic experiences with digital tools to engage in discipline-specific digitally literate practice? In addition, how do digitally-mediated activities look, feel, and sound in the early years…in schools that are perceived by experts to be doing technology well? What are the cohesive themes that tie the research and practice surrounding the use of these tools and objects for digital children in schools? Does any of this matter?

I was curious to learn more about the action in classrooms in the nexus of digital and literacy within a period of child development in which many children are transitioning from beginning readers to

fluent readers. I wanted to better understand some of the realities of bringing in digital experiences to a primary grade classroom, and I wanted to learn from someone who others perceived to know technology well (a similar approach was taken by Nikolopoulou and colleagues (2014) in their investigation of educational software use in Greek kindergartens). We know from Hutchison and Woodard's work with the TPACK framework (2014) that teachers need the technological pedagogical content knowledge to do this work well in any grade. So, I engaged in a case study to try to further understand some of these things I had been thinking about. I specifically was interested in exploring the following:

- What web literacy activities and digital skills are observable in a primary grade classroom with a teacher who experts perceive to be technology savvy and a digital leader?
- How do the teacher and her students balance analog and digital in the classroom?
- What are the features of the tools and texts used in literacy instruction in a tech-forward school and classroom?

Method

An exploratory descriptive case study methodology (Yin, 2003) was used to examine the classroom-based digitally-oriented activities, actions, and tools of a 2nd grade teacher, identified as "high-tech " by a professor in her reading specialist Master's program. I observed her and her students at the end of the school year. The school was in a suburban elementary (K-5) public school within 50 miles of a major city in the Midwest. Approximately 37% of the student population was low income and 39% of the student population was white. Participants consented to participate in the research. All names are pseudonyms.

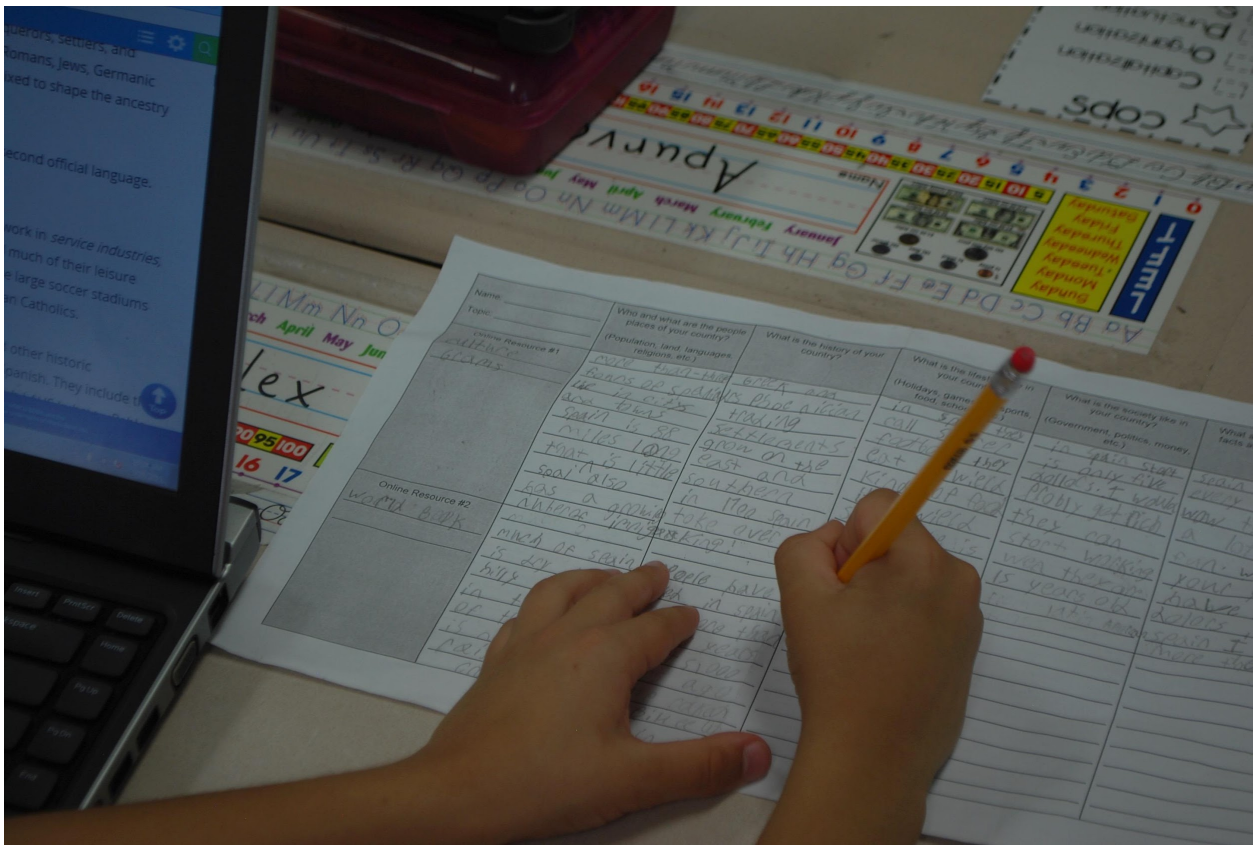

Figure 2. Note taking sheet utilized in unit of study

Miss Littlefield's class was engaged in a nonfiction unit of study that required students to read and write on the web. Instruction and activity throughout the three observation periods centered on an English Language Arts/Social Studies research project of a specific country. The students utilized a range of digital tools and resources in their work: they read multiple digital and printed resources about an assigned country of the world, took notes about key ideas from each source with appropriate citation or attribution, synthesized notes across sources using a note-taking worksheet (Figure 2), and presented synthesis in the form of a Google Slides presentation. Miss Littlefield provided the class with a presentation template/shell with topic headings aligned to the questions on the note-taking worksheet, guidelines for the amount of text to appear on each slide, and required that students include three images in their presentation visuals. At the end of the unit, students presented their findings to their peers and the

students' work was printed as a book and displayed on a board in the classroom. A paper copy was sent home to parents.

Data were collected over three two-hour observation periods near the end of the school year. Field note triangulation was achieved through follow-up interviews with the teacher and still photograph data. A mounted camera was set bird's eye view in the room to capture a still snapshot of the room every two minutes. These bird's eye view snapshots were utilized to garner a sense of how frequently two focal students who did choose to engage in the Bring Your Own Device [BYOD] program utilized these devices as well as to help determine the overall time spent per focal child on any devices for literacy activity.

Throughout the observations, I moved through the classroom environment and stopped to engage students perceived to be challenged or particularly successful by asking: "What are you trying to do? What steps did you take? How can you find out what to do to help you solve your problem?" and "What did you just do? Why? How?" I utilized field notes and camera stills snapped from a handheld camera I carried with me to document what students were doing on their individual screens and the ways in which the students worked with the materials/tools in their classroom environment. I used shorthand codes for device and text types and presentation notes in the margins of my field notes each time I observed a new child. To maximize the data I collected, I used a vibrating timer in my pocket to cue me every two minutes to a new child. I moved unsystematically through the room.

Audio-recorded interviews with the classroom teacher followed the 2nd and 3rd observations, and were transcribed and utilized to triangulate findings from the other data sources. Member checking occurred six months after the observation to validate trends emerging from the data set. Following data collection and transcription, the interview transcripts and field notes were coded using constant comparative methods (Corbin & Strauss, 2008) and an activity theory frame (Leontyev, 1981)—attending to the tools, subjects, objects, rules, community, and division of labor related to digitally-oriented activities. Table 2 presents the parent and child nodes of code that emerged from the data set.

Table 2. Parent- and child-nodes coded in data set

Parent-node	**Child-nodes**
User	student; teacher; interventionist/specialist; other
Tool/Device type	none/analog; laptop; teacher computer; iPad; BYOD [insert device type]
Text type	printed/paper text; digital text – web; digital text – mobile app
Digital text presentation mode	visual still; visual animated; written text; narrated text; audio/sound accompaniment; combination [add descriptive notes]
Composition method	paper/pencil; copy/paste; voice text; type labored; type fluently
Search method	search & find keyword; scroll; site map or index; no search
Curricular place	Daily 5; Guided Reading; ELA Block; Writing Block
Web literacy activity	remix; revise; compose; code; design; share; contribute; open practice; protect; connect; search; navigate; synthesize; evaluate
Digital skills/competencies	see Chung, Gill, and O'Byrne (n.d.)

Analysis and Results

This section presents the analysis and results for each of the three research questions. Field notes contained 160 different entries about the children in Miss Littlefield's classroom. One hundred of the entries were randomly selected for analysis for this study. In general, and unless otherwise specified, frequency counts of the number of instances of each parent- and child-node code were utilized to describe the relationships existing among variables.

Web literacy activities and digital skills

To address the first research question, *"what web literacy activities and digital skills are observable in a primary grade classroom with a teacher who experts perceive to be technology savvy and a digital leader?",* I culled the curricular place and web literacy activity variables from the data. I found

that the majority of the activity around digital text fell in the read and write portions of the Mozilla Web Literacy framework. In other words, second grade students in this classroom, for this particular unit of study, had multiple opportunities for specific, albeit narrowly defined, reading and writing activities on the web, but there were no opportunities to build their emergent understandings of *how* or *why* to participate in any of the web literacies on the connected web because these were not modeled and children were not asked to participate in any such activity. Table 3 presents the frequency of codes for each activity type.

Table 3. Frequencies of web literacy activities observed

Read		Write		Participate	
Activity	*Frequency*	*Activity*	*Frequency*	*Activity*	*Frequency*
Search	6	Design	0	Share	0
Navigate	7	Code	0	Contribute	0
Synthesize	20	Compose	42	Open Practice	0
Evaluate	0	Revise	28	Protect	0
		Remix	0	Connect	0

From Table 3 it is obvious that there were a few focused web literacy activities and the same statement could be made about the digital skills housed within each activity. Specifically, the following skills web literacy skills/competencies were the observed and coded in the data set:

- Read-Search
    - Using and revising keywords to make web searches to find information more effectively.
    - Detecting information in a website using the internal search engine.
- Read-Navigate
    - Accessing the web using the common features of a web service.

- Read-Synthesize
    - Coalescing information shared on one webpage to make meaning.
    - Incorporating information shared across two pages on one website to make meaning.
    - Combining information shared across pages on two or more websites to make meaning.
- Write-Compose
    - Organizing information, digital content, and hyperlinks to add to a webpage or online space.
    - Embedding multimedia, hyperlinks, and digital content on a web page.
- Write-Revise
    - Incrementally adding or removing individual components (i.e., text, audio, image, video) in digital work.
    - Incrementally repositioning individual components (i.e., text, audio, image, video) while revising digital work.

No additional competencies identified by Chung and colleagues (n.d.) were observed. It is important to note that the majority of children demonstrated novice-level skill in each of the above competencies, with the exception of a) the more complex synthesis competencies, b) the embedding competency of the compose activity, and c) the repositioning competency in the revise activities. Fewer students were successful in their attempts to demonstrate their ability in these three areas, and just two students of six observed were able to successfully embed an image on their slides unassisted. Repositioning components (text and image) occurred several times, but was accidental in every case except one. When repositioning was accidental students were observed with hands on heads in concern, often asking "what happened?" My interpretation was that the student would grab the text box on the slide and move it unintentionally across the slide template because text box positions were not locked in place.

With respect to searching I found that most children scrolled through the web page to find what they needed. When a student was unsuccessful in his or her scroll and scan, they frequently abandoned

the search on that web resource and opened another one to repeat the process. One student utilized the control plus find function to search for a keyword within a web page.

Balancing analog and digital tools

The second research question asked, "*how do the teacher and her students balance analog and digital tools in the classroom?* " The photos from the camera stills provided 180 images for review. Digital tools and texts were utilized by second grade students as part of the following curricular places in the ELA block: Daily 5 - listen to reading; guided reading; writing mini lesson; writing research; and writing composition.

Across the entire ELA block, fifty percent of the camera stills (54 images) were examined for two focal children who were identified by red dots they wore on their shoulders throughout the observations. Zoom was used to code for the tool/device type child-node based on the materials the children had on their desks and in their hands in each image. This analysis revealed approximately 36% of the images (n=19) coded across the three observations indicated that a focal child had a device for independent work, oftentimes utilized alongside printed/analog tools and materials such as books, pencils, and papers as visible in Figure 2. All of the children's note-taking for this unit was done with paper and pencil and then children transferred notes onto Google Slides. Observations indicated and interviews with the teacher confirmed that children's typing was slow and laborious, yet field note observations revealed zero students utilizing alternate modes for composition despite at least two being aware of the possibility to use voice text.

An additional 6% of the images (n=3) contained a whole-group screen. 88% of the images showed focal children with devices on loan from the Library/Media Center [LMC]. Only 22% of the images with screens showed the child with a BYOD, despite the BYOD school wide initiative. In other words, the majority of the focal children's time was spent with printed/analog tools for the observation periods, rather than with screens provided by the school, or with screens the children brought to school from home. This finding, that printed materials remain the predominant materials used for instruction,

was not a surprising one: it adheres to the discussion around screen time in school and home contexts (see, e.g., Straker, Zabatiero, Danby, Thorpe, & Edwards, 2018; Paciga, Quest, & Lisy, 2018), which purport that children's interactions with screens ought to be limited. Given the result that there was more independent use of technology tools than there were modeled or co-created experiences, these results stray from the recommendations that screen time for children up to eight years of age is best when mediated by an adult.

Tools and text types

Parent nodes for 1) tool/device type and 2) text type were utilized to answer the third research question, which asked, "*what are the features of the tools and texts used in literacy instruction in a tech-forward school and classroom?"* Analysis revealed that children accessed and utilized printed texts for reading and writing more frequently than digital texts. Moreover, these trends varied as a function of whether children were primarily reading or writing: there were more opportunities for children to engage in writing activities on a laptop compared to tablets, and there was more reading activity on tablet device types.

There were several options for device type available to the children in the classroom. The LMC at the school had both laptops and iPads the teacher or children could check out. In addition, the children could bring devices from home for use, or could utilize the teacher's iPod or desktop computer. Analysis for the second research question determined that focal children minimally utilized the device they brought from home and interviews with the teacher confirmed this. Miss Littlefield reported, "They spend so much time getting their own devices to connect. They won't let it go. Finally I'm just like, 'it's time to use a school device!'" Because of this, LMC iPads were more commonly used for consuming text during the Daily 5 or for writing research. A few students traded in the LMC iPads for LMC laptops when it came time to compose. There was one students composing with an LMC iPad and no student utilized a home device for composition. These trends could be potentially related to the accessibility of the keyboard on a laptop, or could, perhaps relate to the biased notion that tablets are not tools for writing

(i.e., see Rideout's survey items (2017), which do not mention any form of writing, specifically). Table 4 compares the frequency of device types observed, as indicated by field note child-nodes.

Table 4. Frequency of tool/device types utilized during the English Language Arts block observations

	LMC-Laptop	LMC-iPad	BYOD-iPad	BYOD-Kindle	T-Computer	T-iPod
Reading	23	31	14	26	0	6
Writing	92	8	0	0	0	0

All three text types (i.e., printed/paper, digital-web, and digital-app) were observed in reading, whereas only two of the three text types (i.e., printed/paper and digital-web) were observed in writing, with printed/paper texts being the most commonly observed text type across the reading and writing domains. Table 5 compares the text types observed.

Table 5. Frequency counts of text types appearing in field notes

	Printed/paper	Digital – web based	Digital – mobile application
Reading	51	43	6
Writing	72	28	0

These text types are important to consider while addressing the research question because the digital domains include broader definitions of what counts as "text": these include hyperlinked content, audio components, video components, and searchable content. Mobile applications are installed via download onto tablets, and can be utilized free of an internet connection, whereas web-based digital content requires the device to be connected to the internet to engage in the activity. Both digital forms of text type, web-based and mobile applications, afford students opportunities to easily "uproot a text from one context and transport it into another context, thereby re-contextualizing the meaning of that text" (Beach & O'Brien, 2005, p.50). Such opportunities are minimal, or require significantly more effort in

printed/paper contexts, and are generally only applicable to the printed words, rather than the visual content/images in the paper contexts.

When I examined the modes presented in the digital texts I found that children read/consumed a wider range of modes when reading text than when creating/composing text. To arrive at this conclusion, each text described in field notes was described as containing one or more of one or more visual presentation mode (i.e., visual still; visual animated) and one or more mode for presenting the printed text on screen (i.e., written text only; narrated (i.e., audio) text; audio/sound accompaniment to written text). When multiple audio or visual components were present in a digital text at the moment of observation, these were coded as combination. This is to say that the sum of visual still plus visual animated plus combination adds to 100%. Because the number of digital texts observed in field notes varied across reading and writing, I utilized a percentage (instead of a frequency count) to allow for more equitable comparison. This percentage was calculated based on the number of instances presentation modes appeared in field notes codes divide by the total number field notes codes for presentation modes in reading or writing. These results are presented in Table 6.

Table 6. Comparison of presentation modes observed in texts

	Visual still	Visual animated	Written text	Narrated text	Audio/sound accompany	Combination
Reading	67	24	76	24	5	9
Writing	100	0	100	0	0	0

Table 6 reveals that there are fewer modes of meaning making called upon in writing/composing than in reading and writing.

When Miss Littlefield and I had met to discuss her plans for the unit, I had anticipated seeing the students integrating digital assets such as sound files with national anthems and videos of culturally authentic food preparation into their compositions about their assigned country of study. So, while the

students did hear the anthems, could download the MP3 file from the CultureGrams website (Proquest, 2014), and did see food being prepared in the digital encyclopedia entries they read in their research process, no child integrated such components into their writing. Miss Littlefield did model in a whole group demonstration how to integrate and give attribution for copied/pasted still visual images into the Google Slides, but had not yet demonstrated how to integrate other visual or audio content, the ways that children engaged in the note-taking process (see Figure 2) did not afford students opportunity to think about how the ways in which these other forms of conveying meaning might contribute to their compositions.

Discussion

As the framing for the CCSS rightly point out, we need the arts to make sense of the range of media we read and write in digital word. So much of the media we consume/read in the world contains modes of meaning making that go beyond the printed world. As we write in the digital world GIFs, emojis, bitmojis, vines, snaps, infograms, instagrams, and vlogs allow authors to make meaning in ways that rely more significantly, if not wholly, on visual images and/or audio. This study shines a spotlight on the ways in which these modes of meaning play out in one second English Language Arts classroom with a teacher who is considered to be technology savvy.

The data collected demonstrate clearly at least three key findings. First, a limited range of the web literacy activities appeared in the observation contexts: there were limited opportunities for children in the focal classroom to engage in the participate domain of the web literacies map, despite the many opportunities to write/compose and read/consume digital media. Second, screen-driven activity does not dominate in this technology-friendly classroom—there is a balance between printed and analog text and evidence suggests that students move fluidly between the paper and the screen. Third, more modes of meaning are utilized in reading/consuming texts than in writing/composing them.

While this study is limited by its exploratory nature and small sample size, it is quite feasible that attending to the texts and tools and web literacy practices is important enough to warrant the field's

attention. Similar advances have been made by Edwards and Bird (2015) in their efforts to harness the power of popular media and digital tools in children's play. I believe the idea of emergent web or digital literacy is a real phenomenon, and that the range of activities, tools, and experiences we provide children will determine the extent to which these skills emerge and develop in children, and the timing of such emergence.

It is entirely possible that the timing of the observation at the end of the school year and the disciplinary practices (i.e., reading, social studies, and writing) for the unit of study constrained what was observed during the six hours I spent in the classroom, but my interviews with the teacher suggested this was not the case. According to Miss Littlefield, she had never thought to engage students in the participate portion of the web literacy framework. She could have done this by sharing drafts of the presentation slides and soliciting feedback from peers, or by sharing the final product with a larger authentic audience. Or, she could have expanded the research process or form of the final product to allow for more creative or collaborative means of demonstrating understanding of the history, key people, key landmarks, and traditions of the countries of the world the children studied. Examples of such expansion of process include email or video chat exchanges with a primary source. Examples of such expansion of form might include an annotated Google Earth map, a tourism commercial, an interview with a local child from the country studied, an interactive game in which students tour a digital replica of a key event in the country of study, or a diorama with a video tour in which all of the information is presented.

Miss Littlefield recognized these ideas as valid and of value to her in planning of future units of study, but also pointed out that she had previously not been exposed to the web literacies framework and so was only beginning to think about participating and remixing and coding as part of her responsibilities as a second grade teacher. Arguably, despite being identified as a technology-savvy teacher by professors in her Master's program, there was still additional room for growth in her Technological Pedagogical and Content Knowledge [TPACK] (Mishra & Koehler, 2006), so that her application of technology could

redefine or modify literacy practices, rather than simply substitute or augment them (Puentedura, 2006). Miss Littlefiled's broader than most, but narrower than Mozilla's definitions of reading and writing constrained the range of web literacy activities and resulted in students' experiencing a limited range of opportunities to practice digital skills.

If fewer opportunities across all portions of the web literacies frame—like those with zeros in Table 3 such as design, code, evaluate, participate, contribute, connect, and share—are provided in children's early years, the children *could* have under-developed or later emerging dispositions for and interest in these web literate, 21st century ways of thinking and doing. In this case study, collaboration and creativity were largely omitted from the activities I observed. It is probable that students' foundational vocabularies and skills could prohibit their abilities to navigate through complex digital text and activities that rely on modes beyond printed words with visual stills as accompaniment, such as those created by Miss Littlefield's students using Google Slides in this case study. Work in the field of emergent literacy point toward validating these hypotheses (e.g., Paciga, 2015; Paciga, Lisy, & Teale 2013; Plowman, 2012; Wohlwend, 2015), but further work is needed to validate the observational framework employed here, and to develop professional development to nudge educators to critically examine the ways in which the types of tools, subjects, objects, rules, community, and division of labor (Leontyev, 1981) surrounding the digital activities in classrooms.

With Jessica Hoffman and Bill Teale I have written about how the Common Core State Standards use language like "begins in grade 2" and about the apparent disconnect between anchor standards and the early childhood breakdown of those standards (Paciga, Hoffman, & Teale, 2015; Hoffman, Paciga & Teale, 2014). We have argued, "upping their daily participation in collaborative experiences with teachers and peers around complex literacy tasks that are better aligned to later grade level and anchor standards, e.g., modeling and discussion through think-alouds and guiding questions in interactive read-alouds of complex texts and shared writing activities" is essential. Here I'll add that it is especially essential to model complex web literacy skills with texts that adequately reflect the range of media utilized in the

world if we are to have adolescents who "use technology and digital media strategically and capably" (NGA & CCSO, 2010, p. 7).

It is important to remember that students require much collaborative practice with complex literacies in early childhood before they will be able to demonstrate proficiency in such skills independently in later grades. In addition to upping participation around complex literacy tasks that are carried out with analog tools, I argue that we also need to up children's literacy experiences in which children and their teachers examine and create digital texts for authentic, discipline-specific activity that includes multiple modes for conveying meaning. Leu, Forzani, Timbrell, and Maykel (2015) have commented that the CCSS under-specify learning goals with respect to the internet and online activities. Miss Littlefield got there in spite of the underdetermined nature of the standards presented in Table 1, but largely missed opportunities for participating in web literacy as well as composing with the visual and audio modes of conveying meaning.

Recently, Dintersmith and Behr contributed a feature to the *Pittsburgh Post* that highlighted learning in schools that participate in the Remake Learning (2015) initiative: "In Western Pennsylvania, teachers, librarians, curators and others are showing parents the way, equipping kids to thrive with a mix of high-tech tools and low-tech mindsets — along with plenty of art, science, activism and problem-solving. From the urban core to the rural farms, they're remaking learning for the modern world: students film documentaries about changing neighborhoods, engineer real solutions to community problems and code software for their peers. They collaborate, communicate and think critically while making the world a better place than they found it." For me, several questions remain: if our projects, activities, and media inputs and outputs we have in our technology-oriented early childhood classrooms fall short of the kinds of activities Dintersmith and Behr describe, will we accomplish the goal of having web literate students? Will we have another case of Duke's "3.6 Minutes Per Day" (2000) with digital texts? Will web literacies emerge? Additional research that a) documents the range of early experiences children have with web

literacies and digital skills and b) connects experiences to later demonstrations of strategic and capable use of technologies to create, problem solve, communicate, and collaborate is needed.

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