Beach, R., Boggs, G., Castek, J., Damico, J., Pano, A., Spellman, R., & Wilson, N. (2020). Fostering preservice and in-service ELA teachers' digital practices for addressing climate change. *Contemporary Issues in Technology and Teacher Education, 20*(1), 4-36.

Fostering Preservice and In-Service ELA Teachers' Digital Practices for Addressing Climate Change

Richard Beach
University of Minnesota

George Boggs
Florida State University

Jill Castek
University of Arizona

James Damico
Indiana University

Alexandra Panos
University of South Florida

Renee Spellman
University of Arizona

Nance Wilson
Courtland State University

This report presents research on preservice (PST) and in-service teachers acquiring digital practices for addressing climate change related to knowing how to employ digital practices for studying visual representations of climate change and engaging students in critiquing online information about climate change. Study 1 examined PSTs understanding of climate change through participation in visiting a laboratory involving scientific study of ecological systems to interact with scientists, collect digital artifacts, and create a virtual field trip using these artifacts for instructional purposes. Study 2 involved PSTs and in-service teachers responding critically to the NASA Climate Change website, identifying digital literacies their sixth-grade students would need to employ in responding to this website and designing activities to foster critical response to the website. Some PSTs focused on issues of bias and ideological assumptions, while other PSTs focused on comprehension strategy instruction. Study 3 examined PSTs critiques of the reliability of two web sources containing conflicting claims and evidence about climate change based on analysis of screenshots of each source, a digital literacy web-based tool for critical analysis of the sources, and whole group class discussion. PSTs assumed the need to consider both perspectives on the validity of climate change claims.

When a changing world called for scribes thousands of years ago, language education as a formal academic subject was born. The world needed scribes; the authors gave them scribes. In the information age, people carry computers in their pockets; the world begged for citizens who could navigate, comprehend, critically analyze, and work with new technologies. Computers were brought into schools along with digital literacy instruction. With a continued push for transformation in schools, changes need to be made to preservice teacher education.

This call for change is not new and comes from research that encourages teacher educators to "focus on the specific teaching practices and curricular components that foster changes in the beliefs and attitudes of preservice teachers" (Castro, 2010, p. 207). At the heart of changing these beliefs is a need to focus on digital critical literacy. When taking a pedagogical stance focused on critical literacy, preservice teachers (PSTs) are encouraged to question the messages and knowledge they receive from texts, actively challenge inequities, and become change agents (Shor, 2009).

Learning to be critically literate requires preservice teachers to take on difficult issues with an eye toward teaching their future students. In this report, we focused on teaching digital critical literacy around issues of climate change to illustrate how transformation can be made in preservice teacher education while addressing an issue that impacts everyone.

Framing literacy teaching and learning through political, sociological, historical, and economic perspectives fosters an analysis of how digital texts are shaped by certain perspectives and ideological beliefs (Lankshear & McLaren, 1993). This critical framing points to the need for teachers to help their students think beyond the text (Jones & Clarke, 2007).

The goal of critical digital literacy is to raise students' responsiveness toward societal problems in their world so they may learn to ask why things are the way they are and who profits the most. They may then make informed actions for the benefit of themselves and others. As teacher educators, we argue that the tenets of digital critical literacy are essential in teacher preparation courses, particularly in terms of how digital texts frame climate change.

Providing ELA Teachers With Training in Teaching About Climate Change

While climate change is typically addressed in science classes consistent with a primary focus of the *Next Generation Science Standards* (NGSS Lead States, 2013), there is an increased interest in also addressing climate change in English language arts (ELA) classrooms. In 2019, members of the National Council of Teachers of English passed a resolution supporting the need to include instruction on climate change in ELA classrooms (National Council of Teachers of English, 2019; http://goo.gl/2zYnFe)

ELA teachers play an important role in providing instruction based on addressing ethical issues associated with the need to address climate change as portrayed in literature and the media, resulting in changes in students' knowledge and attitudes (Beach, Share, & Webb, 2017; Goodbody & Johns-Putra, 2018).

Preservice and in-service teachers benefit from learning how to employ digital tools and data for engaging their students in teaching about climate change, by for example, helping students employ visual representations and creating texts portraying climate change effects (Beach & Smith, 2019). Using Web-Based Inquiry in Science (WISE; see http://wise.berkeley.edu), middle-school students' knowledge of climate change was enhanced through access to visual representations of climate change (Varma & Linn, 2012). Moreover, the implementation of the online EarthLabs curriculum (http://serc.carleton.edu/eslabs) increased students' knowledge of climate change effects (McNeal et al., 2014), and use of the Google Earth Time-lapse tool (http://www.earthengine.google.com/timelapse) bolstered students' knowledge of glaciers melting over the past three decades (Boss, 2019).

For studying issues of environmental justice, teachers have instructed students to employ digital mapping tools such as CMap Tools (http://cmap.ihmc.us/download), the EPA's mapping tool, EJScreen (http://www.epa.gov/ejscreen), or the National Institutes of Health's TOXMAP (http://toxmap.nlm.nih.gov/toxmap) to acquire data about local emissions from fossil fuel plants located in their neighborhoods and communities.

Students studying the heat levels of roads in their areas found that heat levels within their city were higher than for the suburbs, given the heat from buildings and increased traffic (see http://jeremyscotthoffman.com/throwing-shade; Yale Climate Connections, 2019). In the Connect to the World We Live in Project (http://tinyw.in/TjIz), students used local examples (http://tinyw.in/KfCC) and Environmental Case Studies (http://tinyw.in/zChg) to address ecojustice, (see Great Lakes Environmental Justice; http://tinyw.in/7ZSW).

Through sustained efforts at representing climate change visually, students achieved more positive audience responses because they learned how to include digital images portraying local climate change effects (Newell, Dale & Winter,

2016; O'Neill, Boykoff, Niemeyer, & Day, 2013). For example, students created videos to portray issues of social justice and sustainability (Toohey et al., 2015). Students in the Climate Education in an Age of Media (CAM) project (http://tinyw.in/wGTA) created short public service announcement videos (http://tinyw.in/Jdb0) designed to raise audience awareness about climate change (Rooney-Varga, Allende Brisk, Adams, Shuldman, & Rath, 2014).

In the face of the effects of climate change on the Earth, teacher educators need to prepare ELA preservice teachers (PSTs) and in-service teachers to employ digital practices. They can then foster their students' digital critical literacies, equipping them with the skills to act on the knowledge they generate to address climate change. Providing teachers with training on teaching climate change enhances their students' knowledge of and willingness to act on climate change.

Analysis of the Stanford University's Global Climate Change: Professional Development for K–12 Teachers project (https://earth.stanford.edu/climate-change-ed) over a 2-year period found that teachers' students had significant gains in knowledge of and attitudes about climate change over time (Holthuis et al., 2014). (See https://tinyurl.com/u5n4j5o). Analysis of three-year CYCLES: Teachers Discovering Climate Change From a Native Perspective project found shifts in teachers' attitudes due to their experience in the project, particularly for teachers who initially identified as skeptical (Liu, Roehrig, Bhattacharya, & Varma, 2015). This training is particularly important, given that PSTs who receive training are more likely to address ethical issues associated with climate change effects on students (Hestness, McGinnis, Riedinger, & Marbach-Ad, 2011).

Adopting Critical Digital Literacies for Teaching About Climate Change

Teachers and their students are often more likely to acquire information about climate change effects through viewing and interacting with online digital media images (Beach & Smith, 2019; Newell et al., 2016; O'Neill et al., 2013). Thus, research is needed on the ways PSTs and in-service teachers develop activities to help their students to respond critically to online media images. Teachers need well-designed, impactful instruction that will result in changes in learners' attitudes about the need to take action.

Unfortunately, popular media often does not provide adequate coverage of climate change (Painter et al., 2016). In 2018, only 6% of Sunday television talk shows included discussion of climate change (Cooper & Hymas, 2019). Even when the media portrays extreme weather events, fires, droughts, flooding, and so forth, audiences may not connect these events with climate change (Atkin, 2018).

Popular media may also frame the issue of whether climate change is caused by humans as "debatable" related to the need for "balanced reporting," despite the fact that scientists agree that climate change is caused by human actions (Nisbet & Scheufele, 2009). In addition, media coverage of climate change may not include scientists' perspectives on climate change. An analysis of 100 publications on uses of online communication about climate change found that scientists play a relatively limited role in online interactions (Schafer, 2012).

Even when people acquire information about climate change through the media, they may not use that information to take action. A survey of 1,205 Danish participants found that, while they accessed and decoded information about

climate change from a range of different media platforms (TV/radio 36.4, newspapers/magazines 17.1, websites 13.9, face to face 8.9, social media 7.1, email/texting 2.8, other 1.3; p. 443), they often did not recode this information and adopt critical stances necessary to take action on climate change. These survey results suggest the need for additional research on how people go beyond acquiring information about climate change toward developing defining strategies for taking action to address climate change (Jensen, 2017).

Adopting a critical stance about online information and interpreting representations of climate change entail the ability to go beyond information about climate change effects. For example, a news report about the effects of sea rise on a local community suggests that readers perceive climate change as shaped by larger ecological, energy, economics, transportation, media, agriculture, health care, schooling, politics, and housing systems (Roychoudhury et al., 2017).

Readers must use digital media to frame climate change in ways that are consistent with their own agendas (Jacobson et al., 2017; Lezak & Thibodeau, 2017). However, online information about climate change that comes through mainstream/social media is itself a system shaped by economic systems associated with the fossil fuel industry to portray or filter information to offset critiques of that industry or to frame human causation of climate change as "debatable" (Hymas, 2018; Kalhoefer, 2017).

Instruction in Critical Digital Literacies for Teaching About Climate Change

The need to help students adopt a critical digital media stance on information about climate change suggests the need to help PSTs and in-service teachers engage in "systems thinking" to analyze how digital media shapes representations of climate change (Lezak & Thibodeau, 2017). Skilled PST and in-service teachers must be taught to generate learning activities that foster their students' adoption of critical thinking, so that the next generation of students can skillfully analyze and critique these representations and portrayals of climate change.

Given that teacher education methods courses do not often include instruction on teaching about climate change (Drewes, Henderson, & Mouza, 2018; Leal Filho & Pace, 2016; Varela-Losada, Arias-Correa, & Vega-Marcote, 2018), ELA methods courses need to be reformed. This report recommends an increased focus on critical digital literacy practices for engaging pupils in understanding climate change. We suggest drawing from approaches that employ connected learning (Garcia, 2014; Ito et al., 2013), which is associated with engaging students in collaborative activities that build on students' needs or interests (Mirra, 2019).

An analysis of ELA PSTs enrolled in a New and Multimodal Literacies course found that in their observations of classroom instruction they often observed only limited uses of digital practices, with little evidence of connected learning, for example, teachers' use of online worksheets. They also recognized the limits of the often hyperbolic magical perspective on instructional technology to adopt a more pragmatic approach based on connecting learning with "the rich, overlapping ecologies of students' lives and fosters personal and social transformation" (Mirra, 2019, p. 287). In developing their units, the ELA PSTs therefore recognized the need to employ "connecting teaching" (p. 287) through drawing on students' needs and interests, for example, a unit based on use of Storium as an online storytelling

community in which students assumed the role of players collaboratively creating stories.

Use of connected teaching also includes strategies to help their students filter online texts about climate change for bias, agenda, and author's purpose to uncover and learn new interpretations so they can discuss how the sociopolitical implications of the text (Lankshear & McLaren, 1993), so students then create their own digital texts portraying climate change actions.

In creating a series of videos on climate change (http://tinyw.in/OyFu, http://tinyw.in/Bcek, and http://tinyw.in/Dv2B; French & Campbell, 2019), PSTs adopted a critical stance by including video clips from their original media contexts and combining them with other clips in a critique the original intended meaning of those clips. For example, PSTs portrayed statements by climate denialists juxtaposed with portrayals of empirical evidence for climate change effects.

Moreover, ELA methods instructors need to draw on transdisciplinary perspectives associated with larger social and cultural values, such as those included in social sciences, humanities, and the arts instruction (Kidman & Casinader, 2019; Klenk & Meehan, 2015; Monroe, Plate, Oxarart, Bowers, & Chaves, 2017; Varela-Losada et al., 2018). An analysis of PSTs participation in a transdisciplinary program that combined the humanities/arts with history, geography, and environmental studies through the use of visual arts, performing arts, and media studies resulted in PSTs noting their moral obligation to include sustainability in their instruction (Wright, 2012).

Research on Acquiring Critical Digital Practices for Teaching About Climate Change

This report includes three research studies that examined instruction in methods courses to help PSTs and in-service teacher acquire and implement critical digital practices through the use of visual communication and multimodal production, accessing and critiquing information, and collaborative interactions related to understanding and creating texts for addressing climate change (Boyd, 2014; Pangrazio, 2019; Smith, 2019).

We argue that PSTs and in-service teachers will benefit from instruction on accessing and employing visualization tools for understanding, responding to, and portraying representations of environmental phenomena related to climate change, which is the focus of Study 1. Evidence for this assertion draws from several studies (see Napawan, Simposon, & Snyder, 2017; Spence, Poortinga, Pidgeon, & Lorenzoni, 2010) that found when students access digital visual representations of climate change effects, they may experience a "psychological distance" from portrayal of these effects if those effects are not evident in their own regions or lives. Moreover, students may perceive representations of these effects associated with droughts, floods, sea rise, and fires simply as *visual spectacle* that they are not directly experiencing, which may limit the extent to which they are willing to take action to promote the need for change (Ghosh, 2016).

This study recommends teachers have students create their own digital visual portrayals of climate change effects related to droughts, flooding, sea rise, and fires so that they recognize and share examples of *local, actual* effects with audiences in ways that go beyond visual spectacle. Similarly, while PSTs and in-service teachers may readily access online information about climate change effects, they also need

to both adopt a critical stance on that information and generate activities that foster their students' adoption of critical stances, which is the focus of Studies 2 and 3.

Study 1

Moving from Awareness to Understanding: Building PSTs Knowledge About Climate Change Through Digital Storytelling

by Jill Castek and Renee Spellman

Participants in this project included future ELA PSTs and future teachers from other disciplines, who came together in a course focused on literacy, leadership, and learning. The instructional sequence described here was designed to expand PSTs' understanding about climate change through a four-step process:

1. Participating in a guided tour at Biosphere 2 (B2), a world-renowned living laboratory for studying the Earth's biomes.
2. Interacting with and interviewing Earth systems scientists at B2.
3. Collecting digital artifacts — audio, video, and 360 immersive interactions with scientists — during their visit.
4. Compiling digital artifacts into a virtual field trip as a resource to inform others.

By taking a field trip to Biosphere 2 (B2), and creating digital stories drawing from the field trip experience, PSTs engaged in authentic science and critical digital literacy practices that took them outside the classroom to deepen their knowledge about the nature and practice of science as well as their knowledge of climate change. In combination, these experiences challenged PSTs' thinking of what it means to be an ELA teacher in a digital world.

A growing body of research indicates that for many people, the majority of their science learning takes place outside of school, at home (e.g., watching science documentaries and visiting science websites) or in informal settings such as science centers and museums (Falk & Dierking, 2010; Falk & Needham, 2013). Because science knowledge is informally acquired, teacher educators need to better understand the ways that PSTs make meaning from what they see and experience. Thus, this project was focused on (a) designing a first-hand, participatory field trip experience to expand PSTs learning about climate change and (b) instructing PSTs to redesign the digital artifacts they collected during the field trip into immersive digital learning materials that could be used with their own future students.

B2 is a 3.14-acre glass-enclosed research and education center for teaching about Earth, its living systems, and its place in the universe. The facility is located in Oracle, Arizona, and is known as the world's largest experiment in Earth and environmental science (http://biosphere2.org). B2 attracts about 100,000 visitors per year and offers significant opportunities for informal science learning. Up to two dozen interpretive specialists provide tours for the public amidst the many active research projects. On site, scientists generate valuable information about Earth's resources, their use, and sustainability on an ever-changing planet.

Through guided and self-exploration while on a day-long field trip, participating PSTs interacted with B2 scientists to examine Earth's ecosystems, including the

rainforest, ocean, and desert biomes, as well as the Landscape Evolution Observatory (see https://tinyurl.com/qlaqaur). In the process of interacting with Earth scientists (see for example, Rainforest1 https://tinyurl.com/vh8xgxe), PSTs discussed relevant topics about climate change, asked questions, brought in their own relevant life experiences to interpret the experience, and discussed implications for future teaching.

Participation in a range of meaning-making activities provided the context for PSTs to extend and expand their emerging understandings as they moved from awareness toward understanding about the complex factors involved in climate change. In the process, they drew conclusions about how human and environmental impacts shape climate change in ways that were personally memorable and lasting. In addition, they reflected on what it means to be an ELA teacher in a digital world and acquired critical literacy knowledge and digital skills and practices they could build on in their future classrooms.

Compiling Artifacts Into a Virtual Field Trip

The PSTs captured their emerging understanding through creating videos as resources for their future students. In the process of recording interactions with scientists, capturing images, and taking videos, PSTs engaged in various meaning making activities that were eventually compiled into a digital field trip using Google Tour Builder (https://tourbuilder.withgoogle.com/). In the process, they learned valuable digital literacies, such as ways to collect and compile video, audio, and still photos taken with 360 cameras.

Encouraging PSTs to collect artifacts during their B2 visit was a way to offer them an experience outside the classroom to expand their experiences and increase their engagement with climate change. All the while, they honed their critical visual literacies as they explored how to represent their emerging understanding digitally. Ultimately, the digital field trip and virtual tour of B2 was shared as part of a global exchange project that took place between teachers and students in Greece and researchers in the US, providing PSTs with valuable experience working with digital media production.

Building on their B2 visit, PSTs collaboratively compiled the media they collected and located online into digital field trip (see Figure 1 and completed project Biosphere 2 Field Trip at https://goo.gl/SN7mzk). Ultimately, the PSTs walked away with a teaching resource in the form of an immersive video that could be expanded, adapted, or remixed as a climate change teaching resource in their future classrooms. The sections that follow discuss each component of the project, anchoring them to relevant theories, rationales, and instructional resources.

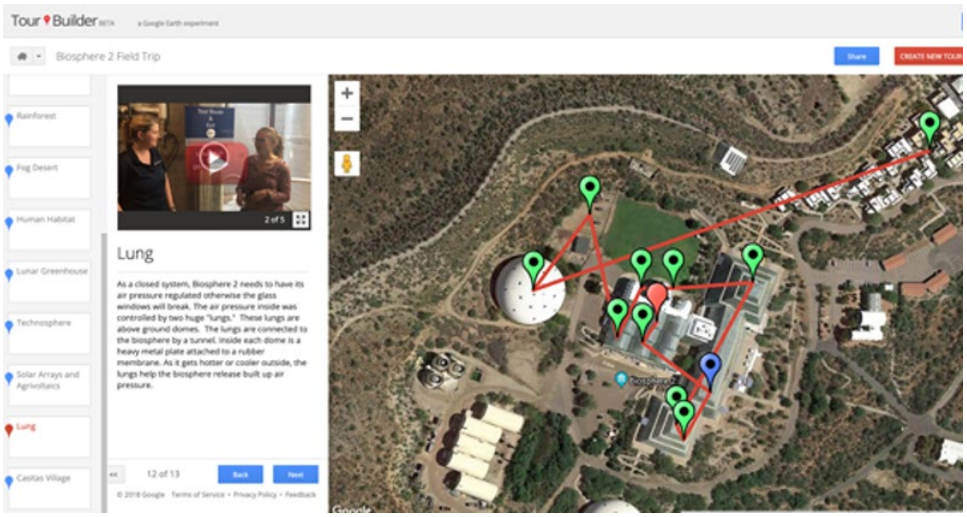

Figure 1. *PSTs compiled Biosphere 2 Virtual Field Trip (see https://goo.gl/SN7mzk). PST & scientists' interviews about the lung (see https://tinyurl.com/wmoeyk5)*

Collecting digital artifacts. Many PSTs are a part of a digital generation who readily use digital technologies to tell their stories in social media, texts, chats, and other digital forms. By expanding PSTs' experiences with telling their own stories and encouraging them to create climate change stories, they are drawing in their prior experience with digital media while expanding their exposure to instructional innovative design.

Digital storytelling encourages individuals to adopt their own focus and angle on the material, rather than adopting the ones given to them (Sadik, 2008; Smith & Shen, 2017). As a result, learner-created digital stories hold the potential to deepen learning (National Research Council, 2012), as individuals share personal experiences and make connections using multiple modes (audio, visual, text annotations and descriptions, videos, drawings, etc.), work that capitalizes on human's need to tell stories to make sense of experiences (Bruner, 1996).

The use of technologies built on PSTs engagement with digital information gathering, picture taking, and social networking that provided a context to extend viewing and responding to content beyond the confines of formal class time. In the process, they were encouraged to create meaning from experiences to reflect and share what they learned from those experiences.

PSTs made sense of their emerging understanding through enacting spontaneous dialogue summarizing what they had learned for their future students (see growing food on Mars https://tinyurl.com/wx6eeh3). In the process of planning, recording, and interacting across several takes, the rehearsal of the dialogue solidified their understanding of important insights. PSTs' enacted dialogue explored all the considerations of Farming on Mars – a sustainable practice for securing food resources on a changing planet. (See two of their practice trials where PSTs refined their scripts and their understanding across consecutive practices takes: initial Take 1: https://tinyurl.com/s4wp230, and final Take 2: https://tinyurl.com/r4vb2nk).

Across these iterations, the PSTs coached and provided feedback to each other. Across these several takes, the rehearsals helped them solidify their understanding and articulate their ideas. They were then able to put their understanding into words designed to inform an audience, which they anticipated being their future students.

The process of digital media creation is an inherent tool for responsive approaches to meaning-making that can be constructed through the PSTs' own focus and framing to build background knowledge and experience. When drawing on PSTs' experience with technology to communicate ideas, they may also acquire a sense of agency and use it to contribute to a shared knowledge base.

Digital media creation promotes the curation and coordination of digital artifacts that can be personalized, formatted, and shared to tell others about an experience, in the case of this project, creating a virtual tour of Biosphere 2 (Sadik, 2008; Smith & Shen, 2017). In the process, the media maker experiences a number of benefits, such as enhanced engagement, critical thinking, and learning outcomes (Yang & Wu, 2012). In addition, the act of digital storytelling deepens individuals' connections to the content they interact with and provides the vehicle for viewers to explore a deeper connection to the content.

Digital storytelling supports PSTs' learning. In this project, each small group of PSTs took artifacts of their learning at Biosphere 2 and created different forms of representation. Learners were challenged to use 180-and-360-degree cameras to archive their learning in the round.

The act of creating and compiling digital artifacts designed to inform others encouraged identity development, engagement in learning, and connections between themselves and the world. As a result, the practice can have a significant impact on their motivation to learn and on overall academic achievement. The use of new technologies encouraged PSTs to pose questions and seek resources to find answers while developing personal understandings that led to the co-construction of new knowledge (International Literacy Association & National Council of Teachers of English, 2017).

PSTs shifted from awareness to understanding. Analysis of this project found that PSTs participated in a process that supported their acquisition of information about climate change to generate their digital storytelling texts to inform audiences about climate change. In addition, the opportunity to collect and archive artifacts of their understanding encouraged informed media choices to convey explanations of factors shaping climate change.

The creation of the virtual field trip provided framing on digital visual literacies related to virtual enactment of climate change effects. This project points to the need to create opportunities for PSTs to deepen their own knowledge in ways that triggered a lasting interest related to teaching about climate change.

Study 2

PSTs Development of Critical Responses to Digital Texts Representing Climate Change

by George Boggs and Nance Wilson

PSTs' and in-service teachers' engagement in climate change education depends on their understanding critical digital literacy practices underlying critical response to digital texts portraying climate change information (Damico & Panos, 2016). This study examined how PSTs and in-service teachers enrolled in a digital literacy class identified literacy practices necessary for students to learn from the NASA Climate Change website (https://climate.nasa.gov).

This project was embedded within an online graduate digital literacy course, whose objectives were to help students understand the theory, research, and practices for the acquisition of digital literacy skills and strategies. The central question of this study asked, "What effect does the understanding of critical digital literacy have on teacher candidate's capacity to make sense of the literacy practices underlying contemporary communication and arguments about climate?"

In this course, we highlighted climate change for several reasons of relevance to the current project: First, we viewed climate change texts as offering excellent examples of digital literacy challenges in a posttruth era, characterized by tribalization of ideologically saturated information sources with corresponding information literacy practices (boyd, 2017). Second, we consider the natural world and Earth's systems to be among the most enduring reasons to learn to read well. Third, we were sincerely curious about how preservice and practicing teachers would approach climate change texts given sharp divisions politically and culturally about climate issues. The project occurred in two phases as part of design-based research, in which we identified promising possibilities based on early research that we incorporated in the following semester.

Methodology

Design-based research seeks to assure that educational research leads to improved practice, therefore increasing the impact on educational practices. This study meets the characteristics of design-based research because it was situated in an on-line course on digital literacy within a real educational context. It focused on the design of the course (the intervention) to build critical digital literacy around climate change; it involved multiple interactions; and it involved a partnership between a researcher and a practitioner (Anderson & Shattuck, 2012).

The NASA website was chosen because of its complexity. For instance, the launching page of the website requires an understanding that the launch or home page has slides that give previews of information presented on the website along with the functions of the menu and the data about the climate that is presented at the bottom of the home page. The website allows users to learn about places to navigate through scroll-overs and a careful examination of the homepage shows that the scrollbar can move below what is presented in the window on the home page.

In short, students in the course need to understand how to navigate the page, given that utilizing the research and data on the website requires an integration of digital

literacy skills and strategies. Like Hutchinson and Colwell (2015), we use "digital literacies to explain and describe the skills, strategies, and dispositions that students and teachers develop and use when learning skills with digital technology" (p. 2), practices that include critically evaluating, navigating, and creating texts. In both phases of the project, candidates examined the NASA website on two occasions. The first was following reading and learning about the theories behind New Literacies (see appendix for Study 2 resources).

The second assignment was provided to students after they learned about multiple digital tools along with strategies that support digital learning in the classroom (see appendix).

For both phases of the study the two key assignments remained unchanged. However, in Phase 2, there was a more conscious focus on digital critical literacy before and after the initial assignment (see appendix). These changes were implemented to determine if the students were able to look at the NASA website through a critical eye rather than working to teaching the website didactically.

Participants. The participants in this study were graduate students obtaining their master's degree in literacy education from a small Northeastern University. There were a total of 19 participants in both phases, nine of whom were preservice teachers and 10 of whom were in-service teachers. In both phases six of the 19 participants were taking the course during the first semester of the program; the other 13 had previous coursework in which they were asked to read and complete a variety of assignments regarding critical literacy. Phase 1 had 10 participants (six in-service, four preservice). Phase 2 had nine participants (four in-service, five preservice).

Code book. The data analysis explored how teachers made sense of the literacy practices underlying contemporary communication and arguments about climate change: namely, their comprehension of those arguments, their awareness of the multimodal communicative practices used to convey climate information, and their sense of the relative importance of communicative modes. The codebook was created through an iterative process during Phase 1 of the study when data analysis was ongoing, using constant comparative techniques (Corbin & Strauss, 2014) applying content analysis (Miles, Huberman & Saldana, 2013). This analysis led to the emergence of themes. The final code book is found in the appendix.

During Phase 2, the data were reviewed using the initial code book. Through a recursive practice it was determined that all of the codes were still appropriate, but that a code of critical metacognition needed to be added to the second part of the code book focused upon teaching.

Findings

The findings indicate that the literacy teacher candidates preferred constructions of literacy goals confined to comprehension and successful management of the focal texts' streams of information. Many did not address implementing critical digital literacy as a feature when planning instruction around the NASA Climate Change website. A few provided brief statements here and there that suggested their awareness that students can and should think about the messages beyond merely seeking to comprehend them.

Some students in the course directly addressed the ideological nature of online, multimodal climate change texts, interweaving discussions of page navigation with efforts to point to the ideological or identity work that may be taking place as their pupils comprehend information from the site. Some striking differences may be seen in students' discussion of metacognition, where many framed metacognition as a psychological dynamic that affords control over a reader's comprehension, while others treated metacognition as the space in which critical consciousness allows the reader to make sense of a text while also responding to its biases, and so forth.

Phase 1. In Phase 1 of the study, the candidates presented digital literacy practices that focused on helping pupils with basic literal comprehension. The data indicated that the candidates divorced the content and context from their reading, even though they often mentioned the importance of context, that is, mentioning that climate change was a controversial issue without addressing teaching students how to approach controversial issues.

The digital literacy strategies tended not to focus on the content and did not ask students to extract meaning from the NASA Climate Change website, given that their focus was on teaching generic strategies. Interestingly, candidates talked about hexadic (Hartman, Morsink, & Zheng, 2010) notion of reading but presented practices that were more didactic. Throughout the responses, candidates were more apt to talk about surface issues than the substantive one.

The findings of Phase 1 led us to conclude the following:

- When teacher educators try to use academic practices to teach candidates, they may or may not be integrating new ideas with existing schema. They may just be answering questions to complete assignments.
- The awareness of self is less prominent than the awareness of digital tools.
- Literacy is about using strategies to *extract* information successfully.

Phase 2. In phase 2 of the study, the candidates recognized that knowledge has social, ideological, and power implications. Their recognition of these implications occurred only toward the end of the semester during the description of instruction for sixth graders, when the candidates connected literacy to active thinking and beliefs. Although they still tended to be agnostic about the beliefs themselves, they were not agnostic about the existence of belief as a factor. The candidates now recognized how multimodal texts increased the challenge of teaching critical digital literacy by adding additional sources of information that may cause overload; hence the need for strategies, such as annotations of texts, to manage the information.

Some candidates, on the other hand, perceived development of knowledge as difficult, given how they were associating that knowledge with specific messages and claims with specific implications that readers must make decisions about — discard, join, follow, defend, critique, and so forth.

Candidates' often diffident or hands-off treatment of politically divisive material contained in the focal website parallels Darner's (2019) concerns that science denial represents a significant obstacle to the project of public education in general. We see important implications for literacy education as a complementary project aligned with Darner's, yet our research adds gravity to the problem, pointing as it does to teachers' reluctance to tackle thorny matters.

Overall, in Phase 2, the additional readings influenced candidates to recognize that their pupils are making sense of their world: Whether they have strong opinions about climate change or not, they are capable of having beliefs, and they can interact with others who have strong opinions.

Conclusion

The first two phases of this study indicated that preparing PSTs and in-service teachers to support students' engagement with digital texts portraying climate change information goes beyond instruction in strategies useful for extracting meaning from a variety of digital texts. The contemporary media landscape and serious matters such as climate change call for discussions of the assumptions driving standards for literacy education instruction.

We agree that explicit and in-depth practice with digital critical literacy in conjunction with instruction in digital literacy skills and strategies is necessary. Yet, we worry that deficit thinking about presumably low-ability readers may justify approaches to literacy education that shortchange critical literacy at a time when critical literacy is most needed and most likely to impact the lives of children of color and those of lower socioeconomic status (Zeichner, 2015).

The changes that occurred between Phases 1 and 2 indicate that explicit instruction in critical digital literacy *does* have an effect on candidates' recognition of climate change as a controversial topic that needs additional literacy skills and strategies. However, that was not enough. From the data collected in these studies it is evident that teacher educators must talk openly about the need to address controversial topics head on and prepare teacher candidates with the tools they need to teach students to be critical digital readers.

Study 3

Teaching PSTs Critical Response to Digital Texts

by James Damico and Alexandra Panos

The third study involved an analysis of the ways PSTs evaluate the reliability of varied web sources about climate change. The context for this inquiry was an undergraduate content literacy course comprised of students aspiring to be middle school or secondary level teachers in English, mathematics, science, social studies, art, or physical education/health.

In this course, students completed a 2½-hour climate change activity that employs digital literacy tools as one essential component of their work (Damico & Panos, 2016; 2018). Some students participated in follow-up paired think-aloud interviews, with a primary goal of better understanding how they dialogue across their different perspectives about anthropogenic climate change (Damico, Panos & Baildon, 2018).

This work was framed in terms of literacy and English language arts with an overarching question: What does it mean to read for reliability when it comes to a diverse array of digital texts about climate change? Climate change was framed as a complex, multifaceted, and inherently interdisciplinary topic, which makes central the roles and responsibilities of ELA educators to engage climate change with their own students as well as to take a lead to engage collaboratively with their

colleagues across school subject matter areas. To date more than 150 undergraduate students have completed this climate change activity, and 10 of these students have participated in in-depth follow-up interviews.

The following sections provide clear descriptions of the classroom activity and the follow-up paired think-aloud interviews and present some of the core findings.

Teacher Education Classroom Activity

This study took place for several years (2015-2018) in different sections of an undergraduate content literacy course with a focus on using web-based or digital literacy tools to engage complex, complicated, or controversial topics. The students primarily held the academic status of juniors, with one or two semesters of coursework remaining before their student teaching placements. All majoring in middle level/secondary level teacher education, the students represented content areas of mathematics, science, social studies, art, physical education/health, and English.

At the beginning of the session students were told they would be evaluating the reliability of different web sources about the politically divisive topic of climate change. They were not informed that this topic is not divisive in the climate change scientific research community. Students were told that the overarching purpose of the activity was for them to explore to what extent the web sources were reliable to help them determine what, if anything, should be done to address the sociopolitical issue of climate change.

They were also told there were two main learning goals for them to (a) better understand their own thinking when it comes to discerning the reliability of online information about a complex topic; and (b) understand and appreciate similarities and differences among their peers' approaches to evaluating the reliability of diverse web sources. They were also informed that persuading or convincing them to appraise the web sources in a particular way was not the goal of this activity.

The classroom activity included three phases, or time intervals (T1, T2, T3), in which the students evaluated the reliability of four online sources about climate.

Phase 1: Climate change beliefs and initial evaluations of online sources. In T1, students first completed a survey about their climate change beliefs, which was part of the Six Americas Project led by the Yale Project on Climate Change and the George Mason University Center for Climate Change Communication (Leiserowitz, Maibach, Roser-Renouf, & Smith, 2010). The survey places participants on a continuum of climate change beliefs: Alarmed, Concerned, Cautious, Disengaged, Doubtful, Dismissive.

People with Alarmed profiles, for example, believe climate change is happening due to human activity, that it poses a serious threat to the planet, and they are actively engaged in addressing it. Those with a Dismissive profile believe climate change is not happening or is not human-caused, and they are often involved in arguing that it is a hoax (Roser-Renouf, Stenhouse, Rolfe-Redding, Maibach, & Leiserowitz, 2015). Of note, students did not discuss the results of the survey with each other. The goal was for them to explore and examine the four sources without comparing diversity among profiles.

After completing the survey, students used a scale (*highly reliable*, *somewhat reliable*, *somewhat unreliable*, *unreliable*) to independently read and evaluate the reliability of computer screenshots of four online sources with diverse views about climate change (Damico & Panos, 2016):

- A web page from the oil company, British Petroleum (BP) (http://tinyw.in/n302).
- A news report from the Christian Science Monitor (http://tinyw.in/Qdsi).
- A web page from a leading human-caused climate change denial organization, the Nongovernmental International Panel on Climate Change (NIPCC; http://climatechangereconsidered.org).
- The homepage of the leading climate science organization, the Intergovernmental Panel on Climate Change (IPCC; www.ipcc.ch).

Students were prompted to explain their reasoning in writing for each of their evaluations and to identify from the four sources the most and least reliable.

Phase 2: Supporting critical literacy practices with scaffolded questions.With T2, students were provided full Internet access to more closely read and evaluate each of the four sources (to allow for investigating hyperlinks, etc.). They used a web-based critical reading tool to respond to a set of six questions for each source:

- Who created the source?
- Why was it created?
- What claims are made?
- Are claims well-supported? Explain.
- Are there biases or points of view?

To what extent is this source reliable? (highly reliable, somewhat reliable, somewhat unreliable, unreliable).

These questions reflected a critical digital literacy framework where readers are guided to examine how texts work (Luke & Freebody, 1990) with an emphasis on examining authorship, bias, claims, and evidence associated with critical responses to online information.

The students were also prompted to return to their evaluations at T1 and to identify and explain if there were any changes to their initial evaluations. For example, after using the digital literacy tool, would this more focused consideration of each source lead students to deem each source more or less reliable? They were also again prompted to document which of the four sources they deemed to be the most and least reliable. As with T1, students worked independently throughout T2.

Phase 3: Whole class deliberation. In T3, students had the opportunity to participate in whole class discussion about the reliability of each source where they could persuade their peers to modify their evaluations of each of the four web sources. They were then prompted to independently document if they wanted to modify their own evaluations of any of the four sources based on the group discussion (Damico & Panos, 2016).

Classroom Activity Conclusions

Activity supporting evaluating reliability with the scientific consensus. In terms of overarching results of this project, students (n = 153) became more critical or read *with* the scientific consensus around human-caused climate change, as they moved through the process. Specifically, they were able to decipher and decode the one *denialist*-oriented source in the set of four sources (the NIPCC source). Figure 2 illustrates these findings. At T2, the students' evaluations of highly reliable (HR) and somewhat reliable (SR) declined while their evaluations of somewhat unreliable (SU) and unreliable (U) increased.

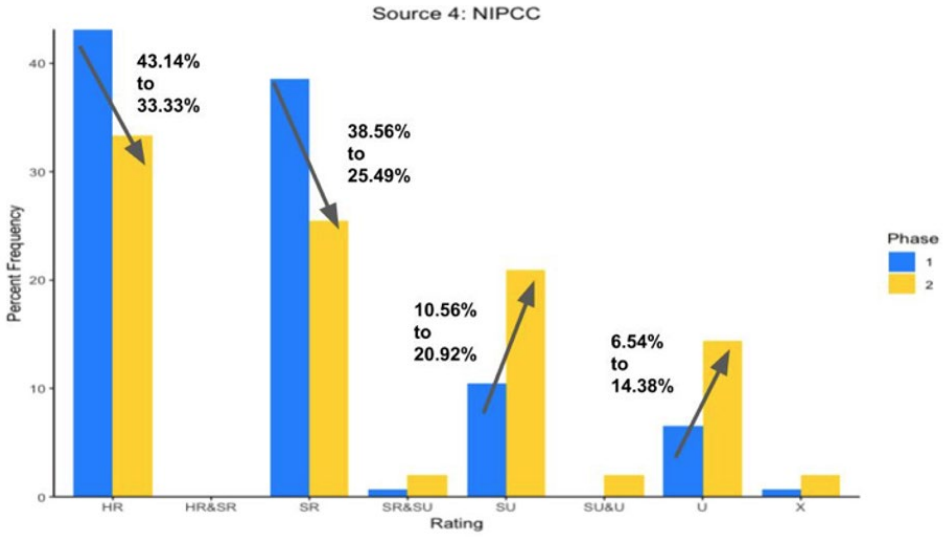

Figure 2. *NIPCC source T1 & T2 evaluations of reliability.*

After the whole group discussion at T3, which included structured deliberation and dialogue with peers, the largest shift (see Figure 3) with 44% (n = 67) of students noting this source was *less reliable* occurred.

The instructional model embedded in this research design offers one way to guide future teachers to become more aware and more strategic when evaluating the reliability of a diverse array of digital texts about climate change. The model entails identifying one's own beliefs about the topic, working independently with sources to better understand how they each individually process the information, and deliberating ideas with others, in this case through a whole group discussion (Parker, 2006).

This approach led a majority of the students to a more robust understanding about the reliability of the NIPCC source, which posited an extreme minority view in terms of the science and reflected the biases of the sponsoring organizations. Because website evaluation, like interpretation of any kind, is tied to individuals' idiosyncratic knowledge, experiences, and beliefs, it is critical to create more opportunities for students and educators to become more cognizant of their own reliability criteria by guiding them to make explicit the factors that shape their evaluations consistent with a critical digital media perspective.

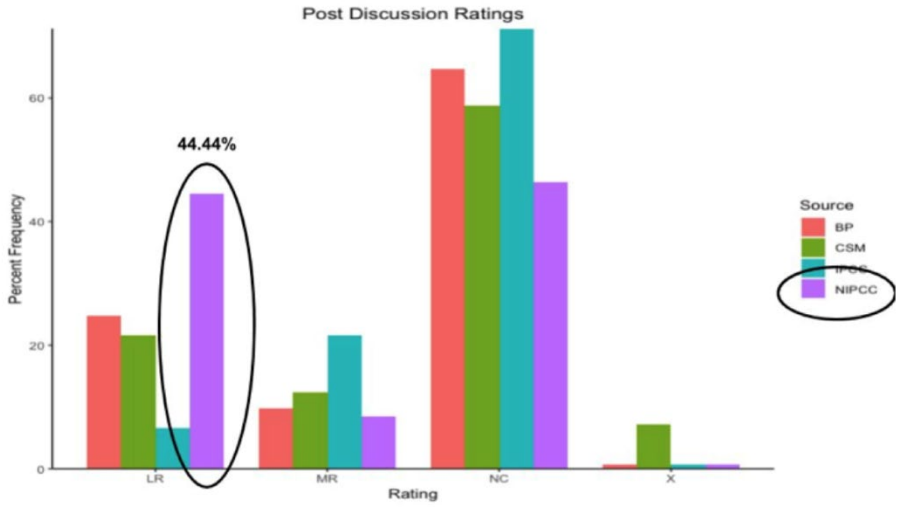

Figure 3. *Students analysis of the reliability to different sources.*

Challenges for PSTs with critical literacy practices. While the students came to the most clarity in examining authorship and bias with the NIPCC source, they encountered more challenges with the other sources, in particular the *Christian Monitor* news source (CSM). This finding can be attributed in large part to the complexity of this news story, which reads in large part like a click-bait, blog post.

Students experienced challenges in differentiating between facts and opinions across all sources and, more broadly, what counted as quality evidence (Damico & Panos, 2016). For example, with the NIPCC source the sheer amount of information became proxy for evidence, with students commenting or writing, "It seems to have a lot of reliable sources," or, "It provides so many sources and voices on the issue, allows for the reader to form their own opinion." In contrast, several students made a clear distinction between a large quantity of informational sources and evidence (e.g., "I am unsure if this source is reliable because I have not read the reports by the 50 scientists"; "It has evidence but I didn't evaluate it"). However, these students were in the minority.

Another key finding was the number of students who deemed two sources with polarizing views about human-caused climate change (NIPCC and IPCC) as *both* reliable. One reason was that students cited the need to include "second opinions" or "both sides" on the issue of climate change, in addition to each of these sources citing numerous reports and scientific studies.

Paired Think-Aloud Interviews

After completing the classroom activity and given the impact of the third phase when students deliberated their evaluations as a whole group, students had the opportunity to further explore the possibilities of dialogue across difference about climate change sources. Students were identified from different content area backgrounds and with different results from their climate change profile surveys from the Six Americas Project (Leiserowitz et al., 2010). Five paired interviews were conducted, and three were selected for closer analysis (Damico, Panos & Baildon, 2018; see Figure 4).

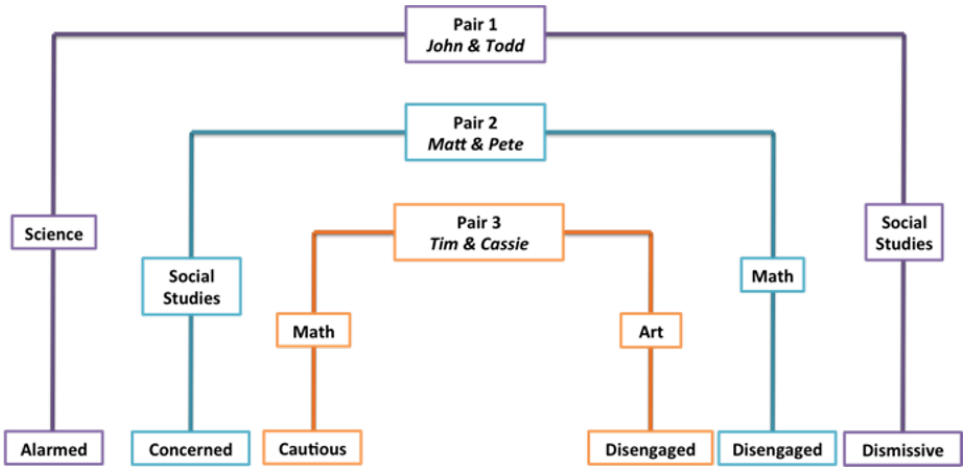

Figure 4. *Students stances on their concern about the challenge of climate change.*

The task for these paired think-aloud interviews was to jointly view and evaluate two web-based videos about climate change and to discuss whether each source was reliable for deciding what, if anything, needed to be done about climate change. The first YouTube video was called "Global Warming: Glaciers (2006)" (http://tinyw.in/ogWa) and was produced by the Competitive Enterprise Institute, which advocates "advancing the principles of limited government, free enterprise, and individual liberty."

This 1-minute video is a denialist or dismissive text because it contains fake experts, logical fallacies, impossible expectations, cherry picking, or conspiracy theories (Washington & Cook, 2011). The second video, titled "What is fossil fuel divestment and why does it matter?" (http://tinyw.in/Jbxn) was produced by the newspaper, *The Guardian*, as part of its "Keep It in the Ground" initiative in 2015. The 2 minute, 40-second video offers an alarmed perspective with a policy proposal (divestment) to deal with climate change as a social and economic issue.

A key framework with this project involved application of ecolinguistics analysis and the particular concept, "stories-we-live-by," which are narratives in the "minds of multiple individuals across a culture" that are "not immediately recognizable as stories, and need to be exposed, subjected to critical analysis, and [possibly] resisted" (Stibbe, 2015, p. 5). Stibbe, as an eco-linguist, identified stories in terms of whether or not they affirm, cultivate, or nurture life-sustaining relationships among humans, non-humans, and the physical environment. The analysis for this project, however, focused on reliability based on the ways people determine whether or not information sources are trustworthy and reliable and to what extent larger cognitive or conceptual frames are part of their sense-making (Damico, Baildon & Panos, 2018).

Paired Think Aloud Interview Conclusions

Cross disciplinary conversations need a theory of the political. These interviews provided opportunities for PSTs from varying disciplines to talk across differences. Using agonism (Mouffe, 2013), a lens to understand political engagement and the perspective that political conversations benefit from confronting difference and seeking productive action, findings indicated that

students took a range of approaches to confront critical digital literacy practices of textual critique and reader reflexivity (Damico, Panos & Baildon, 2018).

Specifically, such a confrontation promoted both entrenched and supportive conversations about the nature of evidence and premises of truth. In addition, students creatively engaged their own reflexive sense of social locations (including their roles as content teachers, students, and connected to particular geographies) to engage in discussion (Damico & Panos, 2018).

PSTs appeal to reliability stories that detract from scientific consensus.Using a lens of ecolinguistics (Stibbe, 2015), the second set of findings pointed to the complexities of students' orientations to reliability and identified three "reliability stories-we-live-by" in the paired interview data (Damico, Baildon & Panos, 2018). Specifically, students continually oriented to reliability through three stories, or discourses, that guided their interaction with climate change text. The first was the need to have the "other side" represented within a source. The second was continually pointing to a need for or desire to include *more* information or evidence to support an argument. And finally, the third was framing reliability as also connected to reasoning through one's own identity, social location, or perspective.

Taken together and individually, these stories of reliability framed what was possible in interacting with a source about climate change and how to determine what, if anything, to do about it as a sociopolitical challenge. These stories detracted from the scientific consensus and yet they are stories that are pervasive in schools, news media, and society.

Summary and Implications

Given the challenge of PSTs and in-service teachers teaching about climate change as a "wicked problem"(Lehtonen, Salonen, Cantell & Riuttanen, 2018; Sun & Yang, 2016), these three studies underscore the importance of providing ELA PSTs and in-service teachers with a range of digital critical literacy practices to engage their students in creating and responding to digital texts about climate change. Through active participation in responding to and creating digital texts in the courses described in this report, PSTs and in-service teachers were provided tangible examples of what it means to be an ELA teacher in a digital world.

Critical Digital Practices for Responding to and Creating Digital Texts

PSTs' creation of digital storytelling in Study 1 demonstrated the value of PSTs having first-hand experiences in which they could engage with and learn from practicing scientists. In the process, they created texts and they were able to explore, examine, and create resources that could be used, adapted, or remixed for use with their future students. The knowledge gained included understanding how to employ techniques for interpreting images and enact storylines that encourage personalizing and visualizing climate change content (e.g., growing food sustainably under harsh conditions).

Further, PST were encouraged to examine and represent climate change effects from different Earth systems perspectives. In the process, they were challenged to design, create, and package their artifacts as they came to know how digital texts work (Luke & Freebody, 1990). Using digital images that portray climate change

effects requires the ability to critique the degree to which those images are used as visual spectacle (Ghosh, 2016). PSTs learned ways to use visuals in ways that do not distance audiences (Napawan et al., 2017; Spence et al., 2010) but instead to engage audiences to achieve knowledge acquisition and uptake (Newell et al., 2016; O'Neill et al., 2013).

Through PSTs' participation in the B2 field trip, they were provided valuable opportunities to engage with scientists and acquire scientific knowledge in context of observing and examining ecosystems. In the process of designing their own virtual field trip, they acquired knowledge of how images and artifacts serves to portray ecological, institutional, and economic systems shaping climate change (Klenk & Meehan, 2015; Lehtonen et al., 2018). These experiences in the B2 space then led them to capture and use digital images and artifacts for creating digital stories that communicate climate change issues to engage wide audiences.

The fact that the PSTs acquired knowledge about ecosystems through their B2 experience provided them with a framework for creating their own narratives. Such narratives could be expanded to include the creation of "cli-fi"/science fiction literature (http://tinyw.in/b3JK) (Beach et al., 2017; Goodbody & Johns-Putra, 2018; Smith & Shen, 2017), and use of repositories of images, simulations, and infographics (http://tinyw.in/JLhJ) for use in their future productions.

Application of Critical Digital Literacy Practices

The results of Study 2 highlight the importance of explicit instruction in critical digital literacy for critiquing online information about climate change. The results indicate that, without demonstrating and requiring a critical lens, PSTs demonstrated only limited engagement with the content. This limitation was evident particularly when they brought certain problematic assumptions about their students' literacy abilities that limited their focus on critical analysis of representations of climate change and when climate change was framed in terms of "two sides." When PSTs acquired critical digital literacy practices, they were more likely to adopt a critical stance in response to online information about climate change.

This study indicated the importance of employing a critical, inquiry-based approach to addressing controversial topics at the center of teaching literacy education (Zeichner, 2015) to assure that candidates and their future students are critical digital readers. Given the propensity of readers in responding to online/digital texts to engage in skimming versus deep reading (Kiili et al., 2018), this approach includes ensuring that PSTs sustained time to read and carefully work with sources so that they adopt a critical stance on these sources.

Adopting these "deep reading" critical stances requires that PSTs frame texts in terms of the larger discourses and agendas shaping these texts; for example, how texts from the Heartland Institute (http://tinyw.in/r6Ws) for teachers who deny empirical evidence about climate change are shaped by a discourse of denialism associated with the fossil fuel industry.

In Study 3, PSTs evaluated the four sources and responded to guiding questions across the first two-time intervals (T1 and T2). Most students have needed 60-75 minutes to complete this phase. As with other similar projects, the students from this study commented how rare it was for them to dedicate this kind of focused time to reading and evaluating just a few online sources. Typical responses at the

end of the activity include, "That was a long time!" and "I don't think I've really done that before."

Conclusion

The complementary results of these three studies suggests the importance of PSTs and in-service teachers infusing digital critical literacy practices in their methods courses, including deliberate foci in which students interpret, respond to, and create digital texts and narratives. An additional focus involves learning to critique the media as a system representing climate change issues (Roychoudhury et al., 2017; Share, 2017). It involves planning and delivering instruction centered around identifying the strengths and limitations of media/digital representations of climate change effects, as well as employing digital practices to engage audiences in discussing and taking action on climate change.

For engaging with audiences, PSTs need to learn to frame climate change as not only an environmental problem, but also as a public health problem related to emissions impacts. Additional lenses through which PSTs can be encouraged to view climate change are a security issue (given potential conflicts between migrating populations), as a moral or religious issue (based on the need to preserve the planet), and as an economic issue related to shifting from a consumer dependency on fossil fuels to an economy based on alternative, green energy (Wibeck, 2014).

ELA methods instructors can also provide their students with ways to acquire valid and reliable information about climate change from the media and online sites (see Resources for sites related to climate change). For example, PSTs can access posts on Twitter (Veltri & Atanasova, 2017), with the #OurChangingClimate hashtag (Napawan et al., 2017). They can then employ the Skeptical Science app (http://tinyw.in/9Eo6) or the Scientific Trust Tracker (http://tinyw.in/Bbzd) to access empirical data to determine the validity and reliability of these posts using the six questions with an emphasis on bias, authorship, claims, and evidence employed in Study 3 to critique these posts.

The ELA PSTs and in-service teachers in these three studies demonstrated the ways in which they valued infusing critical digital literacy practices in their methods courses, and teachers in Study 2 applied knowledge of practices in their classrooms. The need remains for further research on their ability to effectively engage students in classrooms (Tomas, Girgenti, & Jackson, 2017).

Future research could examine impacts on PSTs and in-service teachers' knowledge that results from changes in teacher educators' implementation of digital critical literacy practices within their methods courses. Examining the degree to which application of these practices in instruction may result in changes in their students' knowledge, engagement in, and critical response to climate change will pave the way forward for impactful transformation.

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Resources

Alliance for Climate Education https://acespace.org

Climate Change Education (CAMEL) http://goo.gl/5a5UEj

Climate Change Resources for Students and Teachers. Common Sense Media http://tinyw.in/AGRT

Climate.gov NOAA: Multimedia resources http://tinyw.in/XJWO

Climate Literacy and Energy Educational Network (CLEAN) http://cleanet.org/index.html

Climate Stories Project http://www.climatestoriesproject.org

Digital visual representations of climate change effects https://tinyurl.com/wd63a0d

EcoWatch https://www.ecowatch.com/

ELA teachers' presentations on teaching about climate change at the 2018 NCTE conference, Houston, TX http://tinyw.in/suqH

ELATE (English Language Arts Teacher Educators) Commission on Climate Change and the Environment in English Education: Resources for teacher educators on teaching about climate change https://tinyurl.com/y6kskgwb

ETCCC. (English Teachers Concerned about the Climate Crisis blog) https://etcccsite.com/

Mapping the Environment with Sensory Perception. InTeGrate Project http://tinyw.in/g3Ea

Mapping the Stories of U.S. Global Change: the 5 Key Problems http://tinyw.in/F5Dr

Media Constructions of Global Warming. Project Look Sharp http://tinyw.in/EnQI

Media coverage of climate change http://tinyw.in/NmQe

News and podcasts about climate change http://tinyw.in/ap1I

North American Association for Environmental Education (NAAEE) http://goo.gl/jjLEkr

Science Education Resource Center (SERC) http://serc.carleton.edu/index.html

Teaching Climate Change to Adolescents: Reading, Writing, and Making a Difference: Resource website http://climatechangeela.pbworks.com

The Phase Zero Digital Toolbox. New America http://tinyw.in/LJLL

Videos about climate change http://tinyw.in/NAcM

Yale Climate Connection https://www.yaleclimateconnections.org

Appendix
Study 2 Resources

Analysis of the NASA Climate Change Website

1. Visit the following website: https://climate.nasa.gov/
2. Read this article: Boggs_et_al-2016-The_Reading_Teacher.pdf
3. Using what you learned from the all course readings (including the one above) to answer the following questions:

- What digital literacy skills and strategies are necessary for students to navigate and learn from this website?
- How is this different from using multiple texts to teach students about the same topic?

Further Analysis of the NASA Climate Change Website

1: Review your work on the Post: Reading Assignment Module 4

2: Review the NASA website (https://climate.nasa.gov) again

3: Based on your readings throughout the course describe how you would enact digital literacy comprehension instruction that would guide 6th grade students to critically evaluate and synthesize information across the website and how the strategies learned could provide 6th grade students with the tools to evaluate future websites on climate change. You can do this in lists, charts, or paragraphs.

Modules for Analysis of Digital Texts

Module 3:

Added Reading. ILA: Embrace Digital Literacy (To access the reading go to Course Information Required Readings)

In this module, you learned about the theoretical perspectives of New Literacies and the skills required for online reading.

1. Watch this video about improving research with an effective keyword search (http://www.teachingchannel.org/videos/teaching-strategies-internet-research).

2. Read W. Ian O'Byrne's Blog Post (https://wiobyrne.com/critical-literacy) on Critical Literacy (make sure you watch all of the videos embedded in the post) .

3. Think deeply about the following quote and the relationship to the readings that you have done up to this point in the semester and all of the videos you have

watched, “The term ‘functionally illiterate’ refers to readers whose reading ability is limited to a literal comprehension of a text; this is a residue of a period when literacy was conceived as the teaching of reading and writing and seen to produce a cognitive disposition defined as a ‘state or condition of those who are able to read and write’.” (Soares, 2004, p. 20). As is largely known, technological society has contributed to the shift in the meaning of reading…{Today's definition} describes the individual who uses reading and writing…" (Mor, 2007, 40)

After reading, watching and thinking, create a graphic organizer to demonstrate what you have learned from the readings and the video about what is literacy in the digital age and how it is and is not different from literacy in the 1950s. You can use Word, PPT, or another tool to create your graphic organizer (see below for some recommended tools). You can upload a link, image or PDF of your graphic organizer.

Module 4:

Review Information from the website: https://climate.nasa.gov

Module 5: Resources model for Critical Digital Literacy at https://sites.google.com/site/dlframework/home

Module 6:

Read: Pangrazio, L. (2016). Reconceptualising critical digital literacy, Discourse: Studies in the Cultural Politics of Education, 37(2), 163-174.

Module 7: Analyzing Digital Images.

Read the following Blog post: https://www.literacyworldwide.org/blog/literacy-daily/2019/01/11/questioning-digital-images-and-students-digital-literacy-learning

Visit at least one of the websites in this course.

Accessing digital image collections. Interact with at least 2 images from the website using the questions under: Asking questions that inspire learning and digital composition.

Share the website you went to, the responses to the questions, and the implications for critical digital literacy and teaching students to use questions such as these.

Code Book for Analysis of Student Data

How do teachers frame the information that they are trying to help students to access …

- Awareness of ideological context recognizes bias
- Awareness of ideological context framed as neutral
- Definition of critical reading, evaluating
- Do the strategies demonstrate that teachers are working to teach students how to be metacognitive? Do they go beyond telling?
- Plan for implementing strategies
- Scaffolding
- Modeling
- Instruction of argument processes
- Awareness of multimodal processes
- Supporting students' metacognition