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Exploring How Secondary Pre-Service Teachers' Use Online Social Bookmarking to Envision Literacy in the Disciplines

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Abstract

This study considers how pre-service teachers envision disciplinary literacy through an online social bookmarking project. Thirty secondary pre-service teachers participated in the project through an undergraduate literacy course. Online bookmarks and post-project reflections were collected and analyzed using a constant comparative approach to determine emergent themes. Results suggest varying levels of disciplinary knowledge among pre-service teachers, influences of pre-service teachers' envisionments on posted bookmarks, and considerations about standardized testing in disciplinary literacy instruction. Implications for teacher education are discussed in light of these results.

KEYWORDS: disciplinary literacy, pre-service teacher education, envisionment, online social bookmarking

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This study considers how pre-service teachers envision disciplinary literacy through an online social bookmarking project. Thirty secondary pre-service teachers participated in the project through an undergraduate literacy course. Online bookmarks and post-project reflections were collected and analyzed using a constant comparative approach to determine emergent themes. Results suggest varying levels of disciplinary knowledge among pre-service teachers, influences of pre-service teachers' envisionments on posted bookmarks, and considerations about standardized testing in disciplinary literacy instruction. Implications for teacher education are discussed in light of these results.

Exploring How Secondary Pre-Service Teachers Use Online Social Bookmarking to Envision Literacy in the Disciplines

Introduction

Disciplinary literacy, or an emphasis on literacy particular to learning in the academic disciplines, has become a focus of research when considering how to best support literacy in middle and secondary grades, where content is prioritized (Draper, 2008; Lee & Spratley, 2010; Moje, 2008; Shanahan, 2009; Shanahan & Shanahan, 2008). Historically, however, content area literacy, a more generalizable approach to literacy instruction that implements cross-content reading and writing strategies, has been promoted in these grades to improve students' content literacy learning (Moore, Readence, & Rickleman, 1983). The shift from content area literacy to disciplinary literacy has been gradual, and sometimes overlapping, to encourage educators to embrace a literacy mindset that considers unique acts of analysis, communication, and production of text specific to disciplines, such as English, mathematics, history, and science in upper grades. This new mindset deemphasizes discreet skills and instead focuses on the social construction of knowledge to reflect disciplinary learning; as a result, content areas become a study of norms and social cultural practices of disciplinary domains (Moje, 2015).

Content area literacy, on the other hand, often focuses on organizing textual information, which secondary teachers have viewed as irrelevant or add-ons to their instruction (O'Brien, Stewart, & Moje, 1995). As a result, secondary teachers resisted the prospect of incorporating content area literacy into their classrooms (Hall, 2005; O'Brien et al.,1995), making way for disciplinary literacy as a more relevant and appealing approach to literacy instruction at the secondary level (Moje, 2008). Although content area literacy and strategy instruction are still considered important and useful, particularly for struggling learners (Faggella-Luby, Graner, Deshler, & Drew, 2012), it may still be considered for use to organize and make sense of disciplinary text (Gillis, 2014; Hynd-Shanahan, 2013; Moje, 2015). The disciplinary literacy perspective holds

much promise for establishing successful and appealing literacy methods in 6-12 classrooms by emphasizing unique content practices disciplinarians use to study and how to promote literate learning specific to these practices. In sum, this perspective shifts literacy instruction from generalizable reading and writing strategies to instruction, to these specific tools, techniques, and approaches of study in individual disciplines (Shanahan & Shanahan, 2008; 2012; Moje, 2008; 2015).

In part, this shift occurred as literacy research began to focus on social contexts and their influences on learning. Such focus underscored the discrepancies between disciplines and how learning in each might vary if students were to actively consider practices disciplinary experts use (Shanahan & Shanahan, 2008). Further, a more concentrated study of discourse, texts, and practices of individual disciplines emerged to promote literacy learning that more seamlessly aligns with content instruction than do generalizable content area literacy strategies (Moje, 2008; Shanahan & Shanahan, 2008). For example, disciplinary literacy in history may focus on teaching students how to source, contextualize, and corroborate primary resources of information (Wineburg, 1991), while disciplinary literacy in science may instead emphasize inquiry-based practices specific to scientific understanding (Lemke, 1998). Further, such specific attention to literacy, that aligns with authentic learning in the discipline, may be more appealing to teachers who are trained to prioritize content learning and are somewhat uncomfortable with implementing literacy instruction in their middle and high school classrooms (Moje, 2008; Shanahan & Shanahan, 2008).

Indeed, the concept of disciplinary literacy has become a central topic in education, with literature rapidly emerging that considers what it means to be literate in the disciplines (Conley, 2012; Moje 2008; Shanahan & Shanahan, 2008) and how teacher and student educators might promote such literacy (Colwell, 2012; 2016; Fang & Pace, 2013; Girard & Harris, 2012; Nokes, 2010; Pytash, 2012). Recently, researchers have taken a closer look at pre-service teacher education to better understand how preparation to teach from a disciplinary literacy perspective might best be promoted, oftentimes through the use of technological or digital tools (Colwell, 2012; 2016; Wickens, Manderino, & Glover, 2015). For example, what projects, tools, or prompts might we use in higher education to better prepare pre-service teachers (PSTs) to use instruction aligned with disciplinary literacy? Moje (2008) suggested that pre-service teacher

education is a favorable area to conduct research related to disciplinary literacy as their understandings of disciplinary literacy will influence the type of literacy instruction they utilize in their future classrooms. This rationale has been considered and studied in teacher education through projects that prompt PSTs to reflect on what it means to be literate in a discipline, how they might use such instruction (e.g., Colwell, 2012; 2016; Nokes, 2010; Pytash, 2012), as well as how digital technology might be used to prompt consideration of disciplinary literacy (e.g., Colwell, 2012; 2016; Kiili, Mäkinen, & Coiro, 2013). These projects have yielded positive findings in how PSTs consider disciplinary literacy in their future instruction.

For example, Kiili and colleagues (2013) incorporated several aspects of academic literacies, including disciplinary literacy and digital technology, to develop a framework that would support PSTs' literacy development. They found using digital technology enhanced PSTs' disciplinary knowledge as they engaged in inquiry and reporting on a disciplinary topic. Colwell (2016) also found that engaging PSTs in a collaborative blog project to support middle school students' analysis of historical text allowed PSTs to consider disciplinary literacy and grapple with how to use it effectively in instruction. The project allowed PSTs to work through struggles with instruction promoting disciplinary literacy in a low-risk setting and ultimately promote positive overall reflections on using such instruction in future history classrooms. Further, the growing use of digital social media has rapidly emerged in teacher education research and may be a promising vehicle to promote reflection (Benko, Guise, Earl, & Gill, 2016; Krutka, Bergman, Flores, Mason, & Jack, 2014). Thus, we sought to further explore the use of digital technology, this time with a focus on digital social technology, to understand how PSTs think about, reflect on, and develop understandings about disciplinary literacy for their future classrooms by integrating an online social bookmarking project into an undergraduate content area literacy course to: (a) understand how undergraduate secondary pre-service teachers envision literacy in their respective academic disciplines (Langer, 2011), and (b) explore how online social bookmarking facilitates these envisionments through shared resources.

Theoretical Framework

Langer's (2011) theory of envisionment of literacy in the academic disciplines and literate thinking grounded this research to investigate how PSTs

conceptualize academic or disciplinary knowledge development and disciplinary literacy. Expanding her established theory of literary envisionment, Langer (2011) theorized that to be literate in the disciplines one must be able to envision and develop knowledge and be able to use that knowledge in a disciplinary manner, instead of just collecting information. In essence, one must be able to practice the discipline and think in the mindset of a disciplinary expert, which aligns with tenants of disciplinary literacy (Moje, 2008; Shanahan & Shanahan, 2008). When this type of thinking takes place, Langer contended that students have gained discipline-specific knowledge and labels this process as envisionment building. Envisionment in the academic disciplines is grounded in her original conception of envisionment, developed to make sense of how people build knowledge and make sense of text and how teachers can help students engage in such processes, particularly in English Language Arts (see Langer, 1995). She explained:

> Envisionments are the worlds of knowledge in our minds that are made up of what we understand and what we don't about a particular topic or experience at any point in time. They are dynamic sets of related ideas, questions, images, anticipations, agreements, arguments and hunches that fill our minds during every reading, writing, discussion, technology interaction, or other experience where we gain or express thoughts and understandings. (Langer, 2011, p. 17)

To engage in envisionment building, one must consider, accept, decline, modify, and rearrange knowledge and information from multiple sources to develop a personal yet data-driven understanding of a disciplinary topic. Further, sources may be print-based or digital.

This study expands the notion of envisionment to the field of teacher education by investigating how PSTs envisioned literacy practices specific to disciplinary instruction based on the online resources they selected to promote such literacy. An online platform of learning was considered to be a powerful tool for such envisionment because online tools have been found useful as platforms for reflection, sharing of ideas, and knowledge building in literacy (Colwell, 2012; Black, 2005; Davies & Merchant, 2009; McDuffie & Slavit, 2003; Mills & Chandra, 2011; Shoffner, 2007), particularly online social network tools (Mills & Chandra, 2011; Reich, Levinson, & Johnston, 2011).

Consequently, the use of an online social networking tool, *Delicious* (www.delicious.com), was used for PSTs to graphically tag, share, and annotate online sources through bookmarks to portray envisionments of literacy specific to their disciplines (Langer, 2011). Because PSTs developed their envisionments through this shared space of learning, a constructivist viewpoint (Larochelle & Bednarz, 1998) supplemented this study's major theoretical framework of envisionment in the academic disciplines (Langer, 2011). Shared online spaces, such as a social bookmarking website, allow for interaction among users to build knowledge, a principle of constructivism (Larochelle & Bednarz, 1998). PSTs in this study shared online bookmarked resources that represented their envisionments of disciplinary literacy. Those resources could be viewed by other PSTs in the course, which had the potential to influence or challenge envisionments, allowing for a shared space of constructed online learning. The following section offers research perspectives to support this theoretical framework of constructed envisionments.

Research Perspectives

To better understand how PSTs envision literacy, we chose to ground our study in three research perspectives: disciplinary literacy, research on PSTs, and the use of online social bookmarking. Knowledge of each of these perspectives helps the reader to better appreciate the lens through which we considered our research.

Disciplinary Literacy

Recent literature has shifted toward a more discipline-specific method of literacy instruction in the content areas, which provides an avenue for students to use more sophisticated and less generalizable literacy skills and practices rather than basic (i.e., decoding) or intermediate (i.e., summarizing) literacy skills (Shanahan & Shanahan, 2008). Disciplinary literacy practices mirror how discipline experts uniquely read and engage with texts, allowing students to experience reading, writing, and thinking in a manner consistent with the field (Shanahan & Shanahan, 2008). By incorporating disciplinary literacy instruction into content classes, teachers "emphasize what it means to *learn* in the subject areas and what counts as knowledge in the disciplines that undergird those subjects" (Moje, 2008, p.99), a concept consonant with Langer's (2011) theory of envisionment of literacy.

Further, developing disciplinary literacy instruction may provide a solution to content teachers' resistance to "every teacher is a teacher of literacy" (Moje, 2008). Content teachers currently are being asked to use literacy instruction in their teaching, but they have limited declarative knowledge of, and experience with, how to do so (Gillis, 2014). Thus, teacher education programs have an important role in pre-service and in-service teachers' development of, and exposure to, disciplinary literacy within the content areas. Finally, PSTs often come into the field of teaching with an expectation of what teaching looks like based on their own experiences as a student (Lortie, 1975). Being that the field of disciplinary literacy is still relatively new and not practiced by all content teachers, some PSTs may never have had exposure to disciplinary literacy as a student. Therefore, as the current study supports, it is important to capture the disciplinary literacy understandings PSTs hold as higher educational institutions work to strengthen literacy courses and teacher education programs.

Importance of Research on Pre-Service Teachers

In 1996, the National Commission on Teaching & America's Future published its report titled *What Matters Most: Teaching for America's Future*. This report outlined the disconnectedness of teacher education programs, where coursework, practicums, and professional skills were fragmented, thus leaving PSTs to connect the components on their own. While research conducted on teacher preparation programs and teacher education has become increasingly active over the past four decades, researchers argue that more research is needed that specifically addresses the literacy components of teacher preparation programs (Anders, Hoffman, & Duffy, 2000; Dillon, O'Brien, & Sato, 2011; Helfrich & Bean, 2011). This study aims to address this call for research with a specific focus on secondary PSTs.

As teacher educators work to build teacher education programs that prepare future teachers for 21st century classrooms and curriculum, faculty have a unique opportunity to guide PSTs through this recent shift in literacy instruction from content area reading toward a disciplinary literacy approach. Yet, as was the case in this study, many secondary teacher education programs only have one literacy course focused on content area literacy to prepare a variety of content PSTs to incorporate literacy instruction into their future classrooms.

When developing strong disciplinary literacy educators, it is important to recognize the changing identity of content teachers (Cantrell, Burns & Callaway, 2008; Damico, Baildon, Exter & Guo, 2009/2010; Fang & Coatoam, 2013). Therefore, while some secondary PSTs may be open to incorporating literacy in their classrooms, they do not have the background knowledge to make pedagogical decisions to support both the content and literacy needs of the assignment (Lenski & Thiemen, 2013). Coursework and training for PSTs is integral in building knowledge of and experience with disciplinary literacy (Colwell, 2012; 2016; Bain, 2012; Johnson & Watson, 2011; Kiili et al., 2013; Marri et al., 2011). Exposing secondary PSTs to disciplinary literacy principles, and providing them practice using those principles, before they enter the classroom may promote a more thorough understanding of disciplinary literacy and encourage its use in instruction (Colwell, 2016), while allowing educators a window on how PSTs envision disciplinary literacy instruction. Indeed, more research is needed to better understand how secondary PSTs may consider literacy instruction within the content areas. As content literacy courses within teacher education programs often have students specializing in a variety of disciplines, platforms that can accommodate multiple disciplinary viewpoints are necessary. This study utilizes social bookmarking to capture secondary PSTs' envisionment of literacy within their specific disciplines through their choice of online resources.

Use of Online Social Bookmarking as a Tool for Envisionment

Social bookmarking websites allow users to easily save, label (tag), search, and share various online resources in one centrally located web space. Further, research using social bookmarking data has recently been conducted in several areas of education (i.e. Abbitt, 2009; Borrego & Fry, 2012; Kern & Mu, 2011; Lightfoot, 2012; Redden, 2010; Sera, 2015; and Tekobbe, 2013). Web-based bookmarking is a social practice where individuals share their collection of resources with others. This social activity allows users to choose with whom they share resources as well as follow other users to track their marked materials. In this manner, social bookmarking provides a platform for users to communicate with each other. In the field of education, teachers can engage in professional development by sharing their online collection of bookmarked resources (i.e.,websites, book reviews, articles), categorize their materials, comment on each other's resources, and recommend additional resources.

When used in this way, these "social scholarly practices leverage and archive our collective intelligence" (Greenhow, 2009, p. 11). Integrating such practices into teacher preparation courses focused on literacy emphasizes how to use current technology in an instructional manner to provide opportunities for PSTs to build their experiences and brainstorm how they might incorporate technology in their own classrooms while promoting thinking about disciplinary literacy (Colwell, 2012; 2016; Rish & Pytash, 2015).

Method

This research used a qualitative single-case study (Yin, 2009) to collect and analyze data to address the following research questions:

1) How do pre-service teachers envision disciplinary literacy using an online social bookmarking network?

2) What do pre-service teachers' reflections on using online social bookmarks reveal about their envisionments?

Context & Participants

Participants were 30 PSTs, majoring in various secondary content education areas (i.e., visual arts [3 PSTs], English [6 PSTs], theater [2 PSTs], health/Physical Education (P.E.) [3 PSTs], history [8 PSTs], science [3 PSTs], mathematics [3 PSTs], and music [2 PSTs]), enrolled in two sections of a literacy course that focused on promoting literacy specific to disciplinary knowledge and learning. Although 34 PSTs were enrolled in these two course sections, they were only considered participants if they completed the minimum project requirements, described subsequently. The course content sought a balance between understanding content area literacy methods and how to adapt and modify those methods for disciplinary literacy purposes, based on recent commentary regarding the importance of literacy scaffolds in disciplinary literacy learning (Brozo, Moorman, Meyer, & Stewart, 2013; Faggella-Luby et al., 2012; Hynd-Shanahan, 2013). However, the first four weeks of the course were devoted to understanding disciplinary literacy through commentary, research-based readings, and class discussion through which PSTs could consider literacy practices specific to the disciplines they were in training to teach.
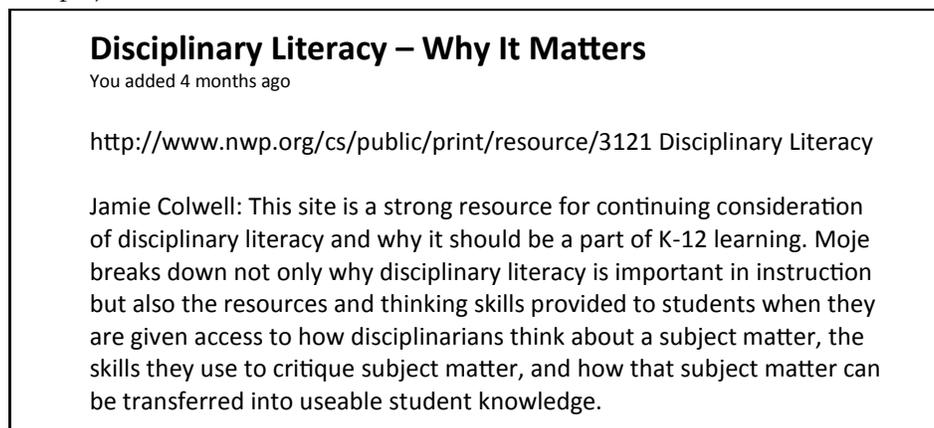
The university where this research took place emphasized training PSTs as content specialists prior to teacher education training, and teacher candidates

either received a master's degree for secondary certification or enrolled in a fifth-year program after completing their content degree coursework. Thus, students were expected to have completed extensive disciplinary coursework (minimum 40 hours) prior to entering the content area literacy course. Additionally, because of this program's structure, the content area literacy course was one of the first education courses required, limiting their experiences in the field. This particular course only had one prerequisite that included a field experience, and that field experience, in which PSTs observed teachers and classrooms instead of teaching lessons.

To understand how PSTs envisioned literacy as a part of disciplinary instruction, all participants completed a course project using a social bookmarking network, *Delicious*, to share and annotate websites and online resources they thought would promote literacy in the disciplines they were preparing to teach. Each website or online resource shared and annotated on *Delicious* was considered a bookmark. Participants were required to post a minimum of five bookmarks during the semester and were given bi-weekly deadlines to post a bookmark so that postings did not all occur at the beginning or end of the project. Although multiple platforms for social bookmarking are available, *Delicious* was selected because, at the time of this study, it (a) was free and easy to navigate; (b) allowed users to tag, or attach descriptors to, each bookmark, grouping similar bookmarks in one location so that PSTs could easily view and locate specific disciplinary bookmarks; and (c) provided a space for PSTs to easily annotate their bookmarked resources. *Delicious* also offers an app that might be used on mobile electronic devices. Essentially, the website allowed participants to come together on a class-specific page within the platform to post resources related to disciplinary literacy and to view other classmates' resources. Only one PST had used *Delicious* prior to this project; this PST was also the only participant with any experience using online social bookmarking.

To prepare PSTs to use *Delicious* and to provide a rationale for using such a platform in a content area literacy course, the instructor, first author, provided an in-class overview during the fourth week of class using the class page within *Delicious* established specifically for this course. On this page, the instructor provided and highlighted four examples of bookmarks related to disciplinary literacy instruction in order to model examples of bookmarks. She provided sample annotations for these model bookmarks that aligned with

principles outlined in the disciplinary literacy course readings so that PSTs could determine how and why such bookmarks were selected (see Figure 1 for example).

Disciplinary Literacy – Why It Matters
You added 4 months ago

http://www.nwp.org/cs/public/print/resource/3121 Disciplinary Literacy

Jamie Colwell: This site is a strong resource for continuing consideration of disciplinary literacy and why it should be a part of K-12 learning. Moje breaks down not only why disciplinary literacy is important in instruction but also the resources and thinking skills provided to students when they are given access to how disciplinarians think about a subject matter, the skills they use to critique subject matter, and how that subject matter can be transferred into useable student knowledge.

Figure 1. *Sample model bookmark.*

This provided PSTs with an example of formatting and annotation, so that all bookmarks would be housed in the same location for ease of sharing. The instructor decided to set up a class page in which all PSTs logged in using the same username and password on the *Delicious* site. Thus, students had to include their name in their annotation so that annotations could be linked to authors. The instructor decided not to provide discipline-specific model bookmarks so as to not influence PSTs envisionments of literacy in their disciplines. Instead, she engaged PSTs in whole class discussion about the types of bookmarks they might post regarding online resources that might be useful in promoting disciplinary literacy in their respective content areas. The instructor then gave students time in class to individually locate, search for, and post their first online bookmark regarding disciplinary literacy so that she could provide support or clarification for students in bookmarking sites. The instructor started this project and provided overview and practice during the fourth week of class so that students had time in the first three weeks of class to at least begin to consider their envisionments of disciplinary literacy based on the course readings and discussion of disciplinary literacy.

After posting the required bookmarks, participants then reflected on their experiences in the project at the end of the course by writing formal reflections through *Blackboard*, the course's online learning management system. They were guided by prompts that addressed the following topics: (a) how they

selected their postings, (b) the importance of their bookmarks to promoting disciplinary literacy in future instruction, and (c) their overall experiences in the project. By studying the types of resources that participants posted, they described their decisions about their experiences posting online bookmarks as well as their overall experience in the project. We hoped to understand how PSTs envisioned literacy specific to the disciplines they were preparing to teach. To somewhat mitigate the instructor's influence on participants' bookmark postings, projects were only graded for completing the required number of postings for the project and for thoroughly responding to the prompts in the final reflection, not for specific content of postings or content of reflection.

Data Collection & Analysis

Data were collected and analyzed in the context of the semester-long content area literacy course in which the online social bookmarking project took place. Because the context was important to understanding results and the research was framed in this particular context bounded by the course and course project, a single-case study was conducted (Yin, 2009). Common to case-study research, multiple data sources were collected. To address the research questions, all online bookmarks with annotations and post-study participant reflections were collected for analysis to understand (a) how PSTs envisioned disciplinary literacy and (b) what their reflections about participating in the project revealed about their envisionments. In total, 158 bookmarks were collected, indicating that while a few PSTs posted more than the minimum required posts, the majority of students only posted the five required bookmarks during the project. Further, as described previously, each PST wrote one post-study reflection, totaling 30 reflections collected for this study. We note here that because a five-minimum bookmark, with deadlines for posting, and final written requirements were established, this study can only speak to the content of the bookmarks and the reflections and not to the sustainability of the project were no deadlines or minimum requirements provided. Nevertheless, the focus of the case study allowed consideration of PSTs' online social bookmarking in the context of a university course project, which is traditionally bounded by requirements and deadlines.

To analyze our case, we used what Corbin and Strauss (2008) refer to as a constant comparison process to code, classify and analyze online bookmarks, and field notes and participant reflections were used in triangulation of the data

to inform results. Although this type of analysis was originally developed for grounded theory research, we found the process of "comparing incident with incident…to classify data" appealing as we compared reflection and bookmark data (Corbin & Strauss, 2008, p. 73). Specifically, after first reading through our data set as a whole, we considered how data were related, or not, by first coding what Corbin and Strauss label "incidences" in data (p. 73). We considered chunks of data, such as individual bookmarks with annotations and paragraphs or groups of related sentences in PST's written reflections, as incidences in our study. We then reread data to code incidences. Next, we compared codes to determine concepts that were represented by our assigned codes. Relationships between concepts resulted in emergent themes. For example, our first theme discussed disciplinary discrepancies in PSTs' envisionments. By using constant comparison, we were able to compare codes (e.g. "historical inquiry," "scientific process," "summary reading") related to the types of bookmarks that PSTs posted and how they described their selected bookmarks in reflection to determine discrepancies between differences in envisionments across disciplines represented in the course. This theme and the other two themes were then used to further expand our understanding of Langer's (2011) theory of envisionment in the academic disciplines as it relates to PSTs' understandings of disciplinary literacy. These themes and understandings are described and explored in our subsequent findings.

Findings

Three themes related to our research questions emerged from analysis: (a) disciplinary discrepancies in the envisionment of literacy; (b) building envisionments through shared resources; and (c) challenging envisionments with standardized testing. These themes are described and outlined with sample supporting data in the subsections that follow.

Disciplinary Discrepancies in the Envisionment of Literacy

Analysis suggested complex yet distinct variation in PSTs' abilities to envision literacy in a disciplinary manner based on their online bookmarks and end-of-project reflections. History and mathematics PSTs posted more resources that spoke to an understanding of disciplinary literacy than did PSTs in other content areas, whose posts often focused on traditional representations of literacy, such as mechanics of reading and writing. For example, history PSTs bookmarked information that might not necessarily be related to a historical

topic, but could be used to facilitate practices that might be used in that discipline. One such example is that of Tyler (all names are pseudonyms), a history PST, bookmarking *Wikipedia* and then annotating the site to describe how students could analyze and corroborate information found on Wikipedia with other primary and secondary history documents that might promote disciplinary literacy (See Figure 2).
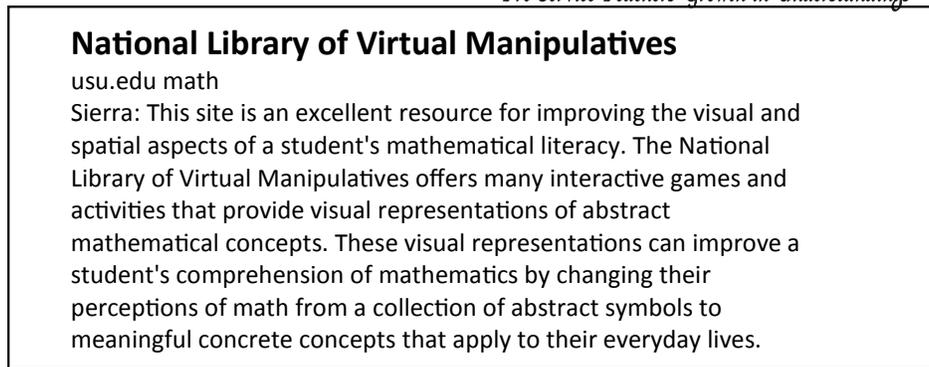
Wikipedia, the free encyclopedia
wikipedia.org art, Social Studies, Health, research, English, science, encyclopedia, math, History, you get the picture, wikipedia, government, wiki, biology, civics
Tyler: I know what you are thinking; Wikipedia is not 100% reliable and should not be used as a source. But, as a springboard for further inquiry and understanding, students could do a lot worse. Likewise for teachers trying to find answers for tricky in-class questions! It has the potential to be useful in any discipline, including social studies. Historians are picky about details and many historical articles are well-written as a result, complete with thorough reference lists. Articles may contain inaccuracies or even be vandalized, but overall the site has a lot to offer the curious and the determined to cross-reference sources of information. The "On This Day" section of the main page is a mine from which a teacher looking to expand student historical literacy could extract a wealth of novel information. Try it - look up any major figure or event from the past and see where the rabbit hole leads!

Figure 2. *Tyler's history-focused online bookmark with annotation.*

Instead of simply overlooking a site such as *Wikipedia*, which teachers often warn students against using in research or academic assignments, Tyler highlighted in his bookmark how history teachers could use a website that may "contain inaccuracies or even be vandalized" for students to consider their knowledge on a topic and other sources that can help determine the accuracy of information on *Wikipedia*. Such processes represent a type of disciplinary literacy in history as students consider sourcing and corroborating information. Tyler's approach to considering how this source could be used in social studies illustrated how he envisioned instruction in history and how comparing multiple sources and considering sources for bias or inaccuracies might be important in history learning.

Further, mathematics PSTs bookmarked resources focused on mathematical concepts such as spatial and visual components to support mathematical literacy (See Figure 3).

> **National Library of Virtual Manipulatives**
> usu.edu math
> Sierra: This site is an excellent resource for improving the visual and spatial aspects of a student's mathematical literacy. The National Library of Virtual Manipulatives offers many interactive games and activities that provide visual representations of abstract mathematical concepts. These visual representations can improve a student's comprehension of mathematics by changing their perceptions of math from a collection of abstract symbols to meaningful concrete concepts that apply to their everyday lives.

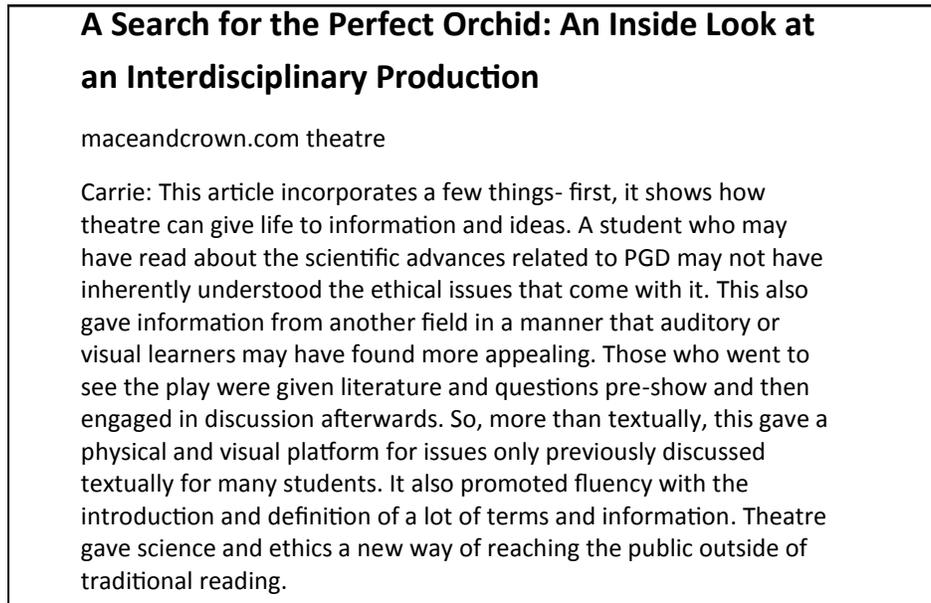**Figure 3.** *Sierra's sample mathematics bookmark.*

Sierra's bookmarked site of virtual manipulatives highlighted her appreciation for a mathematical learning resource that turned the abstract into a more tangible visual for students to comprehend "concrete concepts that apply to their everyday lives." Sierra's concern that students comprehend and be able to apply mathematical learning outside of school aligned with disciplinary literacy, as scholars, such as Moje (2008), consider the application of disciplinary principles to everyday life an important facet of such literacy skills. Indeed, Sierra's bookmark seemed to underscore the importance of application in mathematics as an element of literacy in that discipline to support her envisionment of disciplinary literacy. Other mathematics PSTs reflected on such application processes as they considered why they selected the resources that they bookmarked. For example, Tom noted:

> I really tried to select bookmarks that not only could be useful to myself and other math teachers but that focused on how kids could connect math to their outside of school life. I think many students are turned off to math because it doesn't seem relevant to their lives and so I looked for ways to help them think about application as I thought about teaching disciplinary literacy.

These types of reflections helped corroborate PSTs' intentions when posting online bookmarks, and they shed light on the types of literacies they envisioned in their disciplines. Yet, mathematics and history PSTs seemed to be more adept at selecting resources that spoke to a disciplinary perspectives.

Other PSTs' bookmarks tended to align more with traditional literacy practices, such as reading and writing print-based texts, although their ideas about how these resources supported literacy were nuanced. For example, arts-
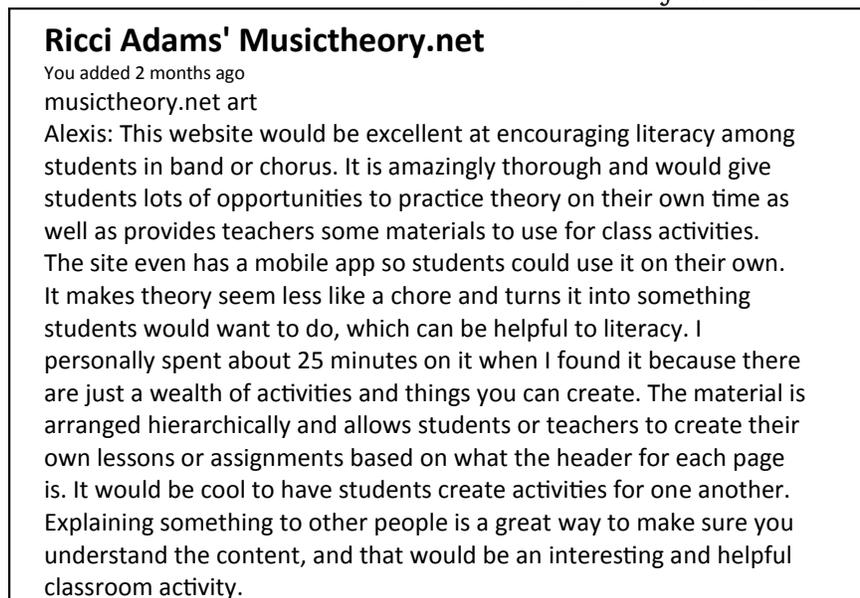
based (i.e., theater, music, visual arts) PSTs also posted visual and auditory resources that, on the surface, touched on disciplinary literacy via listening, viewing, and performance based activities but actualy took a more traditional literacy approach to the arts (See Figure 4).

A Search for the Perfect Orchid: An Inside Look at an Interdisciplinary Production

maceandcrown.com theatre

Carrie: This article incorporates a few things- first, it shows how theatre can give life to information and ideas. A student who may have read about the scientific advances related to PGD may not have inherently understood the ethical issues that come with it. This also gave information from another field in a manner that auditory or visual learners may have found more appealing. Those who went to see the play were given literature and questions pre-show and then engaged in discussion afterwards. So, more than textually, this gave a physical and visual platform for issues only previously discussed textually for many students. It also promoted fluency with the introduction and definition of a lot of terms and information. Theatre gave science and ethics a new way of reaching the public outside of traditional reading.

Figure 4. *Carrie's theater-focused bookmark.*

Although Carrie selected an article focusing on visual and physical aspects of a local theater production and how an art medium, such as theater, can extend thinking about a topic, the resource itself only promotes traditional reading in a theater class. Also, the literacy practices described within the annotation focus on understanding definitions, answering questions about a performance, and traditional discussion, which typically do not define being literate in theater, which is an action-based discipline requiring understanding of stage procedures and direction, creativity, and a unique system of communication (Jensen, 2010). Other arts-based PSTs, such as those in music, also posted bookmarks with more limited understandings of literacy. Alexis' bookmark below is used as an exemplar (see Figure 5).

Music PSTs, such as Alexis, had a particularly difficult time considering the practices students needed to understand to be literate in music, and often turned to theory-based bookmarks, such as the one displayed in Figure 5, because they incorporated traditional reading and writing practices. Although understanding music theory is certainly important to becoming literate in music,

> **Ricci Adams' Musictheory.net**
> You added 2 months ago
> musictheory.net art
> Alexis: This website would be excellent at encouraging literacy among students in band or chorus. It is amazingly thorough and would give students lots of opportunities to practice theory on their own time as well as provides teachers some materials to use for class activities. The site even has a mobile app so students could use it on their own. It makes theory seem less like a chore and turns it into something students would want to do, which can be helpful to literacy. I personally spent about 25 minutes on it when I found it because there are just a wealth of activities and things you can create. The material is arranged hierarchically and allows students or teachers to create their own lessons or assignments based on what the header for each page is. It would be cool to have students create activities for one another. Explaining something to other people is a great way to make sure you understand the content, and that would be an interesting and helpful classroom activity.

Figure 5. Alexis' music-focused bookmark.

the disciplinary aspects of being literate in music tend to be more performance and audio based (Broomhead, 2010). Further, arts-based PST's' reflections on their bookmarks indicated that they had trouble considering literacy in music from a disciplinary perspective, as Alexis noted:

> I always tried to find resources to bookmark that incorporate reading and writing in music because I still think that's what literacy is, and I think it's important to keep those traditional skills in mind when thinking about how to promote disciplinary literacy.

This type of understanding was contrary to the disciplinary literacy perspectives offered through this course, but it speaks to how PSTs envisioned literacy within their disciplines.

Likewise, English and Health/P.E. majors typically bookmarked online resources that promoted general reading and writing practices that might be incorporated on a surface level to promote skills practice into those content areas. Notably, English PSTs often posted game-based resources that had students practice grammar and essay-writing related skills (See Figure 6).

Although disciplinary literacy in English entails analysis and discipline-specific procedures of understanding literature (Langer, 1995; 2011), English PSTs

continued to focus on aspects of literacy such as reading, writing, and grammar, in particular, in their bookmarks, illuminating envisionments of literacy that aligned more with traditional (rather than disciplinary) literacy. These discrepancies between different content area PSTs marked consideration for possible reasons for differences in envisionments of disciplinary literacy, which will be discussed in a subsequent section.

Grammar Ninja

kwarp.com English

Kiley- This link is a little fun. First, it is a game that involves a ninja. What kid does not love ninjas?! Two, it's a game that helps students practice grammar. Okay, maybe the grammar part isn't fun. But I promise, this game actually makes it interesting. Students can pick three different levels, "Beginner", "Intermediate", or "Master", and each level has different parts of speech that need to be identified. Students are then given a series of sentences and a part of speech that they are to identify. They click on the word that fits the description, and if they're right a ninja star flies into it. This really has the students thinking about what the parts of speech are, what they mean, and how they all fit together.

Figure 6. *English-focused bookmark.*

Building Envisionments through Shared Resources

A second theme that emerged from analysis indicated that the ease of accessibility to multiple types of bookmarks through the *Delicious* platform helped build PSTs' envisionments of disciplinary literacy, having them sometimes reconsider how they viewed literacy within their disciplines. Because the online social bookmarking platform was organized using content-specific tags, PSTs could easily view other content-similar bookmarks throughout the project. As Mark reflected:

> The Delicious [platform] was so connected that I easily found other art bookmarks posted by classmates. It was a great way to see what they were thinking about when it comes to literacy in art and the ideas they had for their classrooms – I'm hoping to keep using this resource as a teacher!

Such reflections illustrate that PSTs found the connectedness of the social network to be useful for considering peers' ideas about disciplinary literacy.

PSTs also indicated appreciation for ideas offered by the online social platform into what other disciplines considered to be important and literacy-related. Mattie noted, "It was interesting to see some of my colleagues' posts; it has given me a deeper insight in to their content areas and the resources that are available to them." Further, PSTs often reflected on how they might use the resources that others had posted and also how they might adapt resources for their own discipline, as Bridget, a theater PST, described:

> [Another PST] bookmarked *Poetry 180*, and I liked the idea of giving students a new poem each day of class. I think the love of words and how they work together can be a positive for theatre students. Even though I won't teach Language Arts, I would consider using this in my class, probably as a journal activity to prompt writing a theater scene, which I hadn't thought about prior to this class.
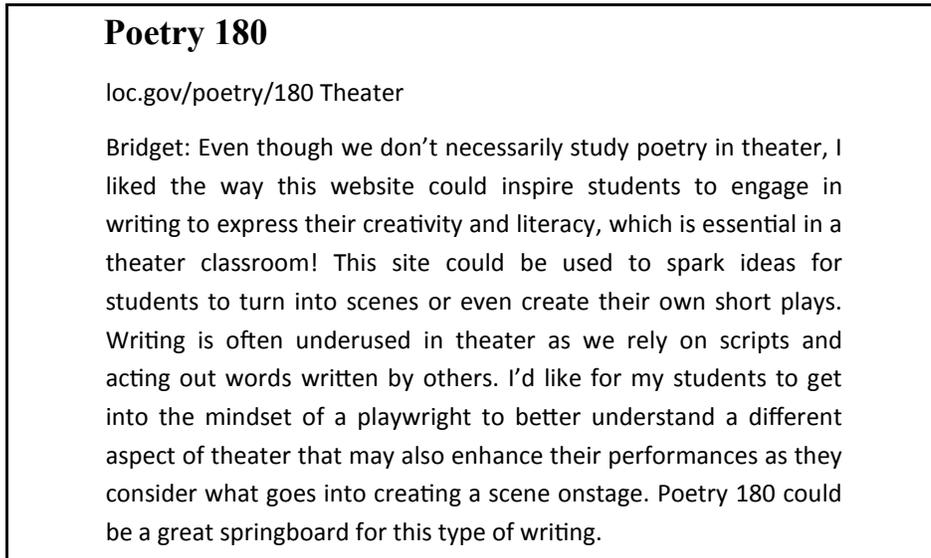
Bridget's proposed modification of using the Poetry 180 website for a theater class highlights how the sharing of resources allowed PSTs to reconsider websites they may not have bookmarked or used in their disciplinary instruction. Bridget also bookmarked the Poetry 180 website but tagged it as a theater bookmark, annotating it to clarify why she selected this website for disciplinary literacy in theater (see Figure 7).

This sharing often prompted PSTs to reflect on how they might use websites not particularly tagged for their disciplines, extending thinking about what they envisioned as literacy in their disciplines. Other PSTs discussed how generic websites were useful in thinking about how to make modifications to literacy planning, based on the discipline at hand. Allison wrote:

> I also liked being able to see other students' bookmarks and see what they thought would be helpful in their content area… I found [another students'] description of how Wikipedia could be used very interesting and made me reconsider how it could be used in an academic setting. It certainly could be used as a "springboard for further inquiry and understanding" and I like the idea of using the reference lists at the bottom of articles for further exploration. I also like the idea of students editing Wikipedia articles. This would work well in a music classroom

by having students edit an article about a certain musical time period, for instance.

Allison bookmarked and tagged Wikipedia for music annotating it with her take on building literacy in music (see Figure 8).

Poetry 180

loc.gov/poetry/180 Theater

Bridget: Even though we don't necessarily study poetry in theater, I liked the way this website could inspire students to engage in writing to express their creativity and literacy, which is essential in a theater classroom! This site could be used to spark ideas for students to turn into scenes or even create their own short plays. Writing is often underused in theater as we rely on scripts and acting out words written by others. I'd like for my students to get into the mindset of a playwright to better understand a different aspect of theater that may also enhance their performances as they consider what goes into creating a scene onstage. Poetry 180 could be a great springboard for this type of writing.
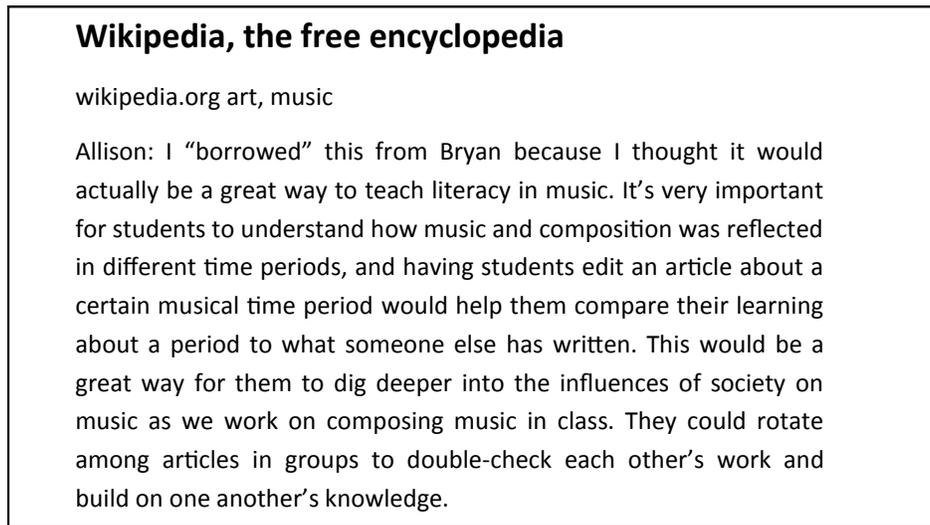

Figure 7. *Poetry 180 as theater-focused bookmark.*

Such bookmarks supported PSTs' reflections regarding the influence of viewing other PSTs' bookmarks on the social network to build their envisionments of literacy in their disciplines. Further, these reflections were holistically positive in describing this influence. However, a third theme linked to this process of building envisionments through a social bookmarking network emerged to illustrate how this network also challenged PSTs' envisionments, sometimes shifting envisionments away from disciplinary literacy to a more standardized form of learning, which is below.

Challenging Envisionments with Standardized Learning

In this study, the sharing of resources sometimes seemed to encourage students who originally posted resources related to disciplinary literacy to later shift their postings and stances toward literacy to align more with standardized rote learning than disciplinary learning. As students began to view each other's bookmarked resources, they began to think about the types of literacies they wanted to promote in their disciplines, and many became increasingly concerned with standardized testing and learning as they viewed their classmates' resources related to test preparation. To illustrate this shift in

thinking, we use Karen, who was quoted previously, as a representative example for consideration. She noted that it was beneficial to have access to other PSTs' posts in her post-project reflection. She stated, "I enjoyed reviewing my peers' chosen bookmarks and found it insightful to see what they felt was important and relevant to literacy in social studies." Karen's first bookmark (see Figure 9) was for resources that might promote disciplinary literacy in history in a manner that encouraged active corroboration of primary sources to draw inferences about history.
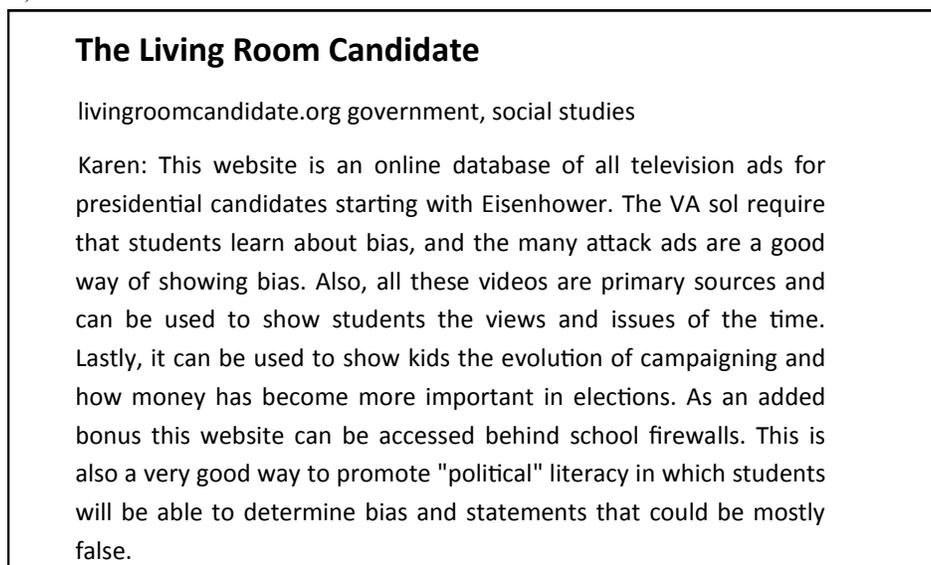

Wikipedia, the free encyclopedia

wikipedia.org art, music

Allison: I "borrowed" this from Bryan because I thought it would actually be a great way to teach literacy in music. It's very important for students to understand how music and composition was reflected in different time periods, and having students edit an article about a certain musical time period would help them compare their learning about a period to what someone else has written. This would be a great way for them to dig deeper into the influences of society on music as we work on composing music in class. They could rotate among articles in groups to double-check each other's work and build on one another's knowledge.

Figure 8. *Wikipedia as music-focused bookmark.*

Such a bookmark highlights the disciplinary role of analysis and bias particular to being literate in the discipline of history. Although managing the reality of school firewalls is noted in her annotation, Karen does not reflect on other obstacles she might face when using such a site. Yet, as the project progressed and she viewed other PSTs' bookmarks related to history resources that might promote literacy, she became concerned with the role standardized testing might play in her history instruction. She reflected:

> I really liked the congressforkids.com website that [another PST] bookmarked. This site would be a great tool in a civics or government class…The downside of this site is that the information is presented in a simplistic manner that does not encourage analysis or student creation. However, as I looked at other bookmarks I realized that I, too, will need to focus on preparing for testing, which isn't always analysis driven.

> Although I would like to really just focus on analysis and using primary sources (that's what history is all about!) other bookmarks reminded me that this won't be a luxury that I will always have. And, it's also important to make sure my students know the facts from a reliable source, so I will have to find a balance in my future teaching.

Karen thus began to seek resources that would help students achieve success on such tests in history as is shown in Figure 10, her final bookmark of the project.

The Living Room Candidate

livingroomcandidate.org government, social studies

Karen: This website is an online database of all television ads for presidential candidates starting with Eisenhower. The VA sol require that students learn about bias, and the many attack ads are a good way of showing bias. Also, all these videos are primary sources and can be used to show students the views and issues of the time. Lastly, it can be used to show kids the evolution of campaigning and how money has become more important in elections. As an added bonus this website can be accessed behind school firewalls. This is also a very good way to promote "political" literacy in which students will be able to determine bias and statements that could be mostly false.

Figure 9. *Karen's first history bookmark.*

Karen's final posted resource, like many of the PSTs in this project, showed a shift in thinking about disciplinary literacy to encompass standardized testing. Her reflections indicated this shift was a result of viewing other PSTs' bookmarks about literacy resources for the history classroom. Although some PSTs shifted their thinking, based on exposure to other bookmarked resources, toward a disciplinary stance, the second theme highlights the influence that the online social network had on PSTs' envisionments of disciplinary literacy.

Indeed, PSTs considered disciplinary literacy and standardized testing simultaneously and sought to find resources that could promote both, creating envisionments that captured their perceived reality of standardized testing while valuing disciplinary practices of their field. For example, Kevin bookmarked an online resource that might promote what he perceived as mathematical literacy

while helping students practice pre-algebra skills pertinent to standard-driven math curriculum (See Figure 11).

Ben's Guide to U.S. Government for Kids

You added 2 months ago

gpo.gov special education, government

Karen: This website provides a wide range of information about the government and activities for various grade levels. Students can learn about the branches of the government visually and their purposes, as well as view symbols of the government and their meaning. It also provides links to define words, which I think is very helpful. I chose this site because of the wide range of learning styles it can appeal to. Government is a subject that requires a lot of memorization which is something that many student with disabilities struggle with. On this website, students are given pertinent information without adding extra information that could discourage or overwhelm them while learning. Similar to the Sea and Sky site I chose, this site can be navigated individually or with assistance depending on the child's specific needs.

Figure 10. *Karen's final history bookmark.*

Although Kevin's concept of mathematical literacy is not clearly explicated in the annotation, he seemed to negotiate finding a resource that balanced disciplinary literacy and required skills that he thought students would need to have for success in pre-algebra. His reflection, however, illuminated his thought process as he selected bookmarks:

> I've gotten to observe two math teachers in [another teacher education] course, and I've been a little surprised by how much of a focus standardized testing is in their classes. I knew that it played a role in the way that teachers' mapped out their classes and how they sometimes approached preparation for testing, but I didn't realize the prominent, every-day manner that it is discussed blatantly with students in the classroom and the weight it is given in instruction. I kept this in mind, in all honesty, when looking for bookmarks because while I value disciplinary literacy I want to be realistic.

Lure of the Labyrinth thinkport.org math

Kevin: Lure of the Labyrinth is a free online game that is designed to teach students pre-algebra through a non-traditional medium. The game incorporates the pre-algebra common core standards and also has a section with suggestions for educators incorporating the game into their classes. I was impressed with the clever ways the developers have embedded the pre-algebra content into the game. One way that this game will improve student's mathematical literacy is by exploring these concepts in a non-traditional method. Students are so used to learning math with pencil and paper that a game such as this is a great way for students to find a new-found enthusiasm for math. Additionally, the game demonstrates practical applications of important pre-algebra concepts. Finally, the game does a great job of incorporating visual demonstrations into the game and would be a great resource for improving student's visualization of mathematical concepts.

Figure 11. *Kevin's math bookmark.*

Kevin's experience in the field seemed to inform his selection of bookmarks, which sought a balance between disciplinary literacy and the "reality" of the classroom. Like Kevin, other PSTs similarly posted bookmarks that considered aspects of disciplinary literacy and testing. For example, Meg, a biology PST, bookmarked a video that she felt promoted disciplinary literacy and would support educational assessment depending on the manner in which the video was used in instruction (See Figure 12).

Again, these types of bookmarks illustrated PSTs' post-project reflections that discussed the appeal of disciplinary literacy but the concern that standardized testing and assessment would be the necessary driving force behind curricular and instructional decisions. We highlight an exemplary reflection excerpt by Ken, another math PST, to note this concern:

> The fourth bookmark I selected for this project was Thinkport's Lure of the Labyrinth. Lure of the Labyrinth is a free online role-playing game designed to teach students the common core standards of pre-algebra through an interactive medium. Throughout the game you are required to solve puzzles and other problems, which are actually visual

representations of pre-algebra concepts such as proportions and equalities. By solving these puzzles students will unknowingly improve the visual aspects of their mathematical literacy. An added bonus of playing this game is the increased interest students will develop and that the game can address standards-based skills important to students' success on tests.

Cell Division and the Cell Cycle - YouTube youtube.com

3-D, Division, meiosis, animation, cycle, biology, video, cell, cells, mitosis

Meg: This video is an extremely well done three dimensional visualization of different cell types, cell functions, cell actions, and the beginning of life (i.e. fertilization). Not only is the video visually captivating for young students but also the effectively added music paints complex interactions and processes shown seen mysterious and awing. My favorite thing about this video is it's lack of explanation of many of the actions and names of cells. This leaves the educational assessment and disciplinary literacy potential wide open. I would play this in a class and pause it periodically and ask the students if they know what is being portrayed. Because this video is so well done and specific, I would even consider it an option for a graded assignment in which students describe and identify cell types and functions.

Figure 12. *Meg's science-focused bookmark.*

Discussion and Implications

Findings from this study raise multiple considerations for understanding PSTs' envisionments of disciplinary literacy and disciplinary literacy instruction through an online social bookmarking project. Langer's (2011) conception of envisionment-building in the disciplines was predicated on the idea that "knowledge grows from a person's desire to make sense, in class or in the world outside" (p. 16-17). Our study indicated that PSTs' sense-making of disciplinary literacy was supported through online social bookmarking. We found that, like Kiili and colleagues (2013), the online space became useful for consideration of disciplinary literacy, open to all PSTs in the course project. Providing such open online spaces in teacher education for PSTs to explore disciplinary literacy in a social manner might encourage critical thought about disciplinary literacy and future classroom practices, as

Krutka et al. (2014) also noted. However, one such consideration is that, particularly in content area literacy courses that enroll multiple majors, PSTs will have to rely heavily on their own knowledge of disciplinary practices to consider disciplinary literacy instruction. Although disciplinary literacy readings and discussion that grouped similar content areas together were used in this course, PSTs were forced to use the content knowledge already gained in their majors to consider practices specific to their disciplines and to envision what those practices might look like during instruction. Similar to Lenski and Theimen (2013) who recognized that PSTs often do not have the background to make pedagogical decisions about content and literacy, our analysis indicated that some majors were more prepared to do so than others. These discrepancies may have been, on some level, a result of different programmatic preparation. It should also be considered that students had completed a field-based observational and tutoring experience for a prerequisite course prior to entering the content area literacy course. This limited but powerful (as it was most PSTs' first) experience may have also influenced how PSTs viewed necessary literacy instruction in their future disciplines, although data related to this influence was not collected and can only be surmised. Such findings reify and further support Moje's (2008) call to prepare PSTs in disciplinary literacy as multiple factors may influence their envisonments of literacy in the disciplines and how it may be used during instruction.

If disciplinary literacy is to be prioritized in secondary education methods-based courses, teacher educators may need to explore additional avenues to support students as they envision the practices of their disciplines and how those practices might be instantiated into content area instruction to increase their knowledge and comfort using these methods (Moje, 2008; Pytash, 2012). Pytash's suggestion to connect PSTs with disciplinary experts to inform their understandings of disciplinary practices (2012) might also be a useful consideration to integrate into such coursework or even to supplement an online social network project. Further, as disciplinary experts are often not teachers and may not be able to offer more practical classroom advice, university instructors might partner with classroom teachers and include them in the online social space where PSTs may share bookmarks and receive practical guidance. Other social online spaces, such as Twitter, might be also be considered for connecting PSTs with knowledgeable others to help build their envisionments. As other social media research has cautioned, careful

scaffolding and modeling for such a project is necessary so as to not alienate PSTs in such an open online space (Benko et al., 2016; Kist, Tollafield, & Dagistan, 2014). Yet, the benefits of using social media for connecting PSTs with knowledgeable others and to develop critical reflection are promising (Benko et al., 2016).

Further, some PSTs, particularly those in history or mathematics, were able to positively describe disciplinary literacy and find resources that would promote their envisionments, but finding resources that may appropriately be used to promote disciplinary literacy seemed troublesome for many PSTs. Their envisionments about disciplinary literacy were often stifled by "knowledge collecting" (Langer, 2011) resources that transmitted facts to students, particularly after viewing other classmates' bookmarked resources. Thus, more attention may be necessary to not only prepare PSTs in conceptual understandings related to disciplinary literacy, but also practice-based instruction to support procedural knowledge (Gillis, 2014). Again, the structures of the specific course in this study may not have provided sufficient opportunities for students to do so, and thus it may be beneficial for methods instructors or content departments to collaborate with literacy instructors to provide effective instruction in disciplinary literacy, which has also been suggested by others in the field of literacy (Draper, Broomhead, Jensen, Nokes, & Siebert, 2010; Nokes, 2010). It may also be useful for content area literacy coursework to supplement these methods courses by providing digital experiences for PSTs to connect with experts and other content area teachers to learn more about using disciplinary resources in practice (Pytash, 2012) and to potentially consider their own beliefs about disciplinary literacy (Colwell, 2012; 2016). Allowing PSTs extended opportunities to compare their envisionments with others while participating in and considering disciplinary literacy coursework may also be useful for negotiating their understandings. PSTs in this study seemed readily willing to alter their envisionments when faced with a different understanding of disciplinary literacy, highlighting the complex role of constructivist learning in this project (Larochelle & Bednarz, 1998).

Indeed, the social nature of the bookmarking platform provided opportunities for PSTs to collect and share digital resources for collaborative learning purposes, an activity found to be beneficial for students in other

content areas (Lightfoot, 2012; Redden, 2010; Sera, 2015) as well as for the 21st century teacher (Gormley & McDermott, 2010). Through this activity, PSTs were able to explore and sometimes reconsider their envisionments of disciplinary literacy and how it might be integrated into their content areas, which aligned with Langer's (2011) basic principles of envisionment in literacy. Although Langer primarily considers envisionment building as a part of understanding and analyzing topics and information within a specific core discipline, her idea that to engage in this envisionment, students "weave together a conceptual construct that they can fine-tune, build upon, or even disagree with at a later time…to own [knowledge]" holds true for PSTs as they consider what it means to be literate in the disciplines and how they might use this literacy in their instruction (p. 2). As noted in our findings, some PSTs' bookmarks evolved over the course of the project as they considered their own bookmarks and understandings of disciplinary literacy in light of their classmates', highlighting the process of envisionment as Langer conceptualized. Thus, Langer's (2011) theory of envisionment in pre-service teacher education might be useful for expanding how we educate PSTs in disciplinary literacy instruction so that they can grapple with their own ideas as well as others' to conceptualize disciplinary literacy in a manner that might be useful and appealing for future instruction, particularly as they construct their identities as secondary educators and the importance of literacy in that role (Cantrell et al., 2008).

For example, standardized testing and standards based learning, in particular, became a common thread in annotations and in reflections as PSTs evaluated each others' bookmarks as they decided on their own bookmarks to post, indicating the influence of social networking. Indeed, standardized testing played a major role in many PSTs' decisions to select bookmarks. Teacher educators may face barriers when focusing on disciplinary literacy as standardized tests in some content areas, particularly the core content areas, tend to drive content instruction (Colwell & Enderson, 2016). Although it is possible to teach to the standards and to prepare students for multiple types of assessment using disciplinary methods, PSTs may not feel comfortable doing so, nor have the skills or knowledge necessary to be effective in this type of instruction. Practical experiences in coursework that utilize digital technology to connect PSTs to students to practice such instruction may be useful to supplement the field experiences and methods those teachers are receiving in

their teacher preparation programs to help consolidate and integrate this reality of schooling into PSTs' envisionments of disciplinary literacy, making such instruction more relevant and promising for their future classrooms. Offering PSTs a framework for instruction of disciplinary literacy, such as Moje's (2015) 4E heuristic, may provide additional support PSTs' teaching. Such a framework could be used in teacher education to allow students to develop instruction in disciplinary literacy, and this instruction could then be practiced with students in a low-risk setting using digital tools. Our previous work (Colwell, 2012; 2016) speaks to such experiences as we studied PSTs' blogging with students in a social space devoted to disciplinary literacy learning in history. These experiences encouraged a positive PST outlook on incorporating disciplinary literacy into instruction, and may be a promising start to developing well-rounded envisionments of disciplinary literacy that consider the realities or more practical aspects of schooling.

Conclusion

Although obstacles were present in this study that informed PSTs' envisionments of disciplinary literacy, the online social bookmarking project provided participants with experience considering literacy in their disciplines using online resources. PSTs were able to experience a blended learning activity to augment their lessons and discussion in the classroom, a benefit experienced in other content areas (Kern & Mu, 2011; Lightfoot, 2012; Sera, 2015). Further, PSTs were able to view their classmates' resources and consider their own knowledge in light of others. This component of the project was promising for developing a collaborative resource data bank that could support teacher education. Yet, this component also shifted some PSTs' viewpoints about disciplinary literacy. Perhaps connecting PSTs with disciplinary experts and disciplinary teachers through online social networks prior to or simultaneously with a social bookmarking project with classmates could be a promising extension of this research. Further, this avenue of research may prompt collaboration between content experts and literacy specialists to support disciplinary literacy learning in teacher education, which is needed in the field of literacy (Draper et al., 2010).

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