21st Century Literacies in Teacher Education: Investigating Multimodal Texts in the Context of an Online Graduate-Level Literacy and Technology Course

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This study investigated the modes, semiotic resources, and intersemiotic relationships present in the design of multimodal electronic texts. The participants comprised 10 women and 2 men, who were enrolled in a graduate-level course focused on multimodality and who used a virtual poster tool to respond to a classroom assignment. Content analysis of the virtual posters and constant comparison analysis of case narratives revealed three important findings. First, the web tool used to develop the virtual posters influenced the participants' responses by confining space, encouraging participants to shift away from words and rely upon video, images, and hyperlinks to convey information. Second, although participants incorporated numerous modes, many times the resources were not relevant to overall meaning, disrupting readers' comprehension of their responses. Third, given the impact of reading path on the comprehension of multimodal texts, participants who incorporated textual features to help guide their readers were more successful at creating unified multimodal responses. The authors discuss these findings in detail and discuss important lessons learned from the study.

Web 2.0 tools, the current generation of Internet technologies, facilitate interactive, information sharing in collaborative digital environments. Accessibility, coupled with nominal usage costs, has dramatically increased their use in K-12 instruction, leading to the development of educational versions specific for student and teacher use. More importantly, research indicates web-based tools can support student learning in the development of critical reading skills, the ability to evaluate online texts, and provide opportunities to construct texts for authentic purposes (Baker, Pearson & Rozendal, 2010; Love, 2004).

Examining multimodality in the context of Web 2.0 tools is a critical area of study for several reasons. First, writing is one of the most powerful modes of communication, allowing individuals to exchange ideas and transmit knowledge (MacArthur, Graham, & Fitzgerald, 2006). Likewise, reading is important because it supports content area learning and the development of critical literacy skills (Biancarosa & Snow, 2006). Many experts theorize that reading and writing are changed in a multimodal environment as the reader engages with texts in ways that might be different than those intended by the writer (Kress, 2003, 2010; Leu, Kinzer, Coiro, & Cammack, 2004). That is, the reader of a multimodal text decides which signs to attend to first, which links to follow, then synthesizes the meanings of modes and semiotic resources to construct a unified message. Web 2.0 tools are blurring the line between writer and reader as they allow readers to dictate their own reading paths (Kress, 2010). Second, consider technology's role in today's society. The global job market is in desperate need of workers with 21st century competencies such as critical thinking skills, knowledge of complex multimedia development, and problem-solving skills (U.S. Department of
Education, 2010). The need for a highly skilled 21st century workforce is undeniable. Third, although some educators believe traditional literacy instruction is sufficient, many literacy experts argue that reading and writing in electronic environments necessitates the teaching of new skills (e.g., Kress, 2003; Leu et al., 2004). For this to occur, teacher educators must recognize the new literacy demands of the 21st Century and, most importantly, transform their programs so that classroom teachers can meet these demands with timely literacy instruction.

Although it is clear that information and communication technologies are heavily utilized in the lives of students (Lenhart, Arafah, Smith, & MacGill, 2008), there is overwhelming evidence that teachers are unprepared to use them effectively in their teachings (Lawless & Pellegrino, 2007). Perhaps more importantly, preservice teacher education is doing a poor job of reconceptualizing what it means to read and write in the 21st century. Despite clear evidence that students have a critical need for digital literacy skills, traditional notions of reading and writing dominate literacy instruction in the United States, directing preservice and inservice teachers towards focus on static symbols, read top to bottom and left to right. Although these skills are needed to help young readers develop concepts of print and foundational reading skills, they are insufficient for teaching students the complexities of digital environments. As Baker et al. (2010) warned, “If our schools continue to limit the literacy curriculum to reading and writing traditional, alphabetic, printed texts, then our children will be well prepared for 1950 but ill prepared for 2050” (p. 2).

Multimodal literacy is too complex to assume teachers and students will figure it out on their own (Bezemer & Kress, 2008). Thus, it is imperative to examine carefully new technologies and identify best practices for developing dynamic multidimensional texts that effectively communicate messages to different audiences (Leu et al., 2004). But what is the most effective way of investigating this important issue? Bateman, Delin, and Henschel (2002) argue the importance of studying an environment that supports the line of inquiry. Hence, to understand truly how people learn to develop multimodal texts, researchers must study the learning process within an active, educational environment. To that end, the purpose of the study described in this article was to examine how educators, enrolled in a course specializing in multimodality, used what they learned in the course to design multimodal responses to a classroom assignment. The goal was to determine how educators translate instruction in multimodality to their own development of multimodal texts.

**Related Literature**

**What is Multimodality?**

Multimodality is the use of many modes and semiotic resources to create a coherent space or message. Kress (2010) described multimodality as a simple concept best understood by examining examples of the ways modal resources are used in socially situated contexts. Specifically, he illustrated a familiar use of multimodality, the combination of images and words used in road signs to provide drivers with essential information that can be read and interpreted quickly. Words, audio, images, hyperlinks, and video are examples of modes; traditional print and electronic texts are media by which multimodal messages can be presented (Bezemer & Kress, 2008). In order to interpret a multimodal design, it is necessary to synthesize various modes into a cohesive, unified whole that takes the form of representation into account (Jewitt, 2011). In a multimodal text or space, modes cannot be interpreted individually, but, rather, they must be read as a connected unit.

For the reader of multimodal texts and settings, interpretation and meaning making can be quite complicated. The meanings of modal resources are influenced by the intention of the writer and the interpretations of the reader. For instance, words are a mode and can utilize a variety of resources such as grammar, syntax, font type and size, and color to convey meaning. A writer may choose to write in caps lock to emphasize certain words. However, a reader may interpret the same words differently, instead wondering why the writer is so emphatic. Although some modal resources might seem superficial (e.g., font size, color, spatial placement, background color), they can, in fact, carry great meaning for the writer or reader of text (Karchmer-Klein, 2007). Moreover, constructing multimodal texts is a complex task that must be carefully planned. As Jewitt (2011) explained, “At times, meaning realized by two modes can be ‘aligned’, at other times they may be complementary and at other times each mode may be used to refer to distinct aspects of meaning and contradictory” (p. 25).

In order to understand the components of and relationships among the individual modes of a multimodal text, it is necessary to understand the language used to describe them. Although theorists such as Bezemer and Kress (2008) discussed multimodality using slightly different terminology and define these terms in different ways, for the purposes of this article, Jewitt’s (2011) use of terms are used to frame this discussion. Specifically, she referred to modes, semiotic resources, and intersemiotic relationships. A mode is a type of
meaningful sign or symbol, such as words, images, or gestures. The meaning represented by a mode is derived from the cultural and social uses and interpretations of that mode over time. Semiotic resources are “the actions, materials, and artefacts we use for communicative purposes” (Jewitt, 2011, p. 304). The forms and functions of the semiotic resources are culturally driven and determined by the creator of a multimodal text or space. Finally, intersemiotic relationships refer to the relationships between modes and semiotic resources such that they coalesce into meaningful, multimodal texts or spaces. In digital texts, for example, modes cannot be read separately. Thus, the relationship that exists between and across the modes is vital to the message.

What is Reading Path?

An important consideration of multimodal texts, particularly those created for digital environments, is the reading path (Kress, 2003). Kress (2010) described reading path as “the route of interest, attention, engagement, prompt, [and] framing” (p. 176) a reader uses to engage with and read a text. In traditional, print-bound texts, the reading path depends on culturally constructed rules (Kress, 2003); that is, in some cultures texts are read left to right, in others, texts are read right to left, and so on. In digital environments, however, reading path is largely determined by the reader; consequently, the reader may not follow the reading path the writer intended. The reader of a multimodal text created with a Web 2.0 tool must rely on modal cues, interest, and reading purpose to construct the reading path. This might result in a different interpretation of the text than the writer intended. Kress (2003) argued that the need to determine a reading path when reading a multimodal text places different demands on readers; therefore, readers take on different reading behaviors including modal scanning and identification of the dominant mode.

Research on Multimodality

Despite a growing interest in multimodality and its relationship to learning (Jewitt, 2011), a review of the literature revealed little empirical research examining effective instructional practices using multimodal texts to support the development of 21st century literacy skills. Multimodality has been studied widely in relation to non-technological considerations; for example, studies have been conducted to examine the relationship among modes, function, and design in classroom and commercial settings (Kress, 2003; Stenglin, 2011). Studies examining the instructional benefits of multimodality using traditional, paper-pencil learning tasks have yielded promising outcomes. For example, Kress (2000) described a study examining the benefits of a multimodal learning task to support students’ understanding of cell structures; furthermore, there is evidence in the literature of the effectiveness of paired use of image and text in children’s writings (Kendrick & McKay, 2002; Vincent, 2006). However, studies addressing multimodality in relation to the classroom use of Web 2.0 tools and the implications for literacy instruction were not found. In fact, there is little evidence to suggest that teachers are using available technology to support the development of complex digital literacy skills. Although the importance of teaching multimodality and digital literacy skills is discussed in the literature from a theoretical perspective, research suggests that technology is used in a tangential, supplementary fashion in most classrooms, undermining its true importance in social, economic, and occupational settings (Labbo & Ryan, 2010).

Although relatively few studies of explicit instruction of multimodality in the reading and writing classroom could be found, case studies of students’ use of digital texts hint at the importance of multimodality instruction. In a pair of case studies examining the online reading practices of middle school students, Rowsell and Burke (2009) observed readers’ strategic behavior as they read and engaged with interactive, online websites. Using the multimodal framework developed by Kress and Van Leeuwen (2001), which includes consideration of discourse, design, production, and distribution, Rowsell and Burke analyzed students’ engagement with multimodal texts, noting the ways in which students adopted the discourses of the sites they visited and used the semiotics and design of the sites to read online. In a similar study, Thomas (2011) examined the ways that six students used the features of an animated composition tool to create multimodal narratives. Thomas found that students used the modes flexibly to build plot, reveal genre, and incorporate literary elements to enhance their narratives. Taken together, the findings of these studies suggest that, when given ample opportunities to engage with multimodal texts, students take on discourse patterns and strategic behaviors that support meaning making.

Theoretical Framework

This study is grounded in two theoretical perspectives. First, it was viewed through a situated socio-cultural lens. Situated cognition frames learning as a process where real-life experiences advance learner knowledge. For example, a student will learn to make a cake not only by learning the basics of ingredients, measuring, and oven
temperature, but also by watching and helping an expert bake a cake. The student learns within the context in which the knowledge will be applied, preparing him to problem-solve and work efficiently. Socio-cultural perspectives (Au, 1997; Gee, 2010; Tracey & Morrow, 2006) suggest social and cultural norms, values, and perspectives drive people’s interpretations and interactions. For instance, how one approaches a writing task is directly related to how he identifies himself as a writer. If a person identifies himself as a lawyer, he will approach a legal document differently than perhaps an historian.

Gee (2010) merged these two concepts when he suggests a situated socio-cultural approach to literacy and technology. Digital environments, he explains, are made up of “specialist text” (p. 182) that require a “specialist language” (p. 180) to understand effectively. A specialist (i.e., reader or writer of electronic text) can easily navigate these digital environments; he not only has a verbal understanding of the language but a situated understanding. That is, using his sense of community, he can apply the unique characteristics of electronic texts to real world situations. Gee’s situated socio-cultural approach strongly pertains to this study. The participants were apprenticed into the specialist language of multimodality by learning to use modes and semiotic resources and thinking deeply about how to use them in educational settings.

The second perspective framing this study is the social semiotic theory (Bezemer & Kress, 2008; Kress, 2003). This perspective posits that readers and writers of text use signs purposefully and in a variety of ways to represent meaning. The complexity of the signs and the meaning that each carries is dependent upon the writer’s abilities and interests as well as the culturally influenced meaning of the signs (Jewitt, 2005; Kress, 2010; Kress & Van Leeuwen, 1996). Importantly, writers represent signs using a particular design; the design reflects social, cultural, economic, political, and technological influences. Readers must interpret both the signs and the design; this meaning-making is informed by social and cultural perspectives that the reader brings to the text. The social semiotic theory provides an appropriate framework for this study as the participants reflected on their use of signs and design in the intersemiotic relationships they created to represent and reflect on their learning. The signs they used conveyed meaning beyond traditional written signs represented by the alphabetic code and reflected their growing ability to engage in the purposeful creation of multimodal compositions.

Method

Participants
This research examines data collected from 12 students enrolled in Literacy and Technology, an online graduate-level course designed and taught by the first author. The participants included 10 women and two men matriculated in either an M.Ed. or Ed.D. program in Educational Technology at a large Mid-Atlantic university. The course was not a requirement. Rather, all participants took it as an elective. A total of eight participants were practicing classroom teachers and the remaining four were in education-related positions (i.e., doctoral student, counseling, administration). All participants were currently employed in education-related environments providing them context from which to make sense of course content.

Participants described themselves as intermediate- or expert-level technology users who utilized technology at work and at home daily. The teachers described their classrooms as well-equipped with technology, including SMART Boards, laptops, digital cameras, and document scanners. They also implemented a wide-range of technologies in their teaching including wikis, blogs, and podcasts. Table 1 provides more details about each participant including pseudonyms.

Educators, specifically those with different levels of technology expertise, have important stories to tell because they bring a combination of technology skill and education know-how. In fact, in many ways, educators are leading the way in designing effective use of new technologies in classroom instruction (e.g., Karchmer, Mallette, Leu, & Kara-Soteriou, 2005). Likewise, research clearly values educators’ perspectives of technology integration as illustrated by numerous studies that examine their work in the schools (e.g., Karchmer-Klein, 2007; Schrum, Galizio, & Ledesma, 2011; Swan & Hofer, 2011).
Case-Based Instruction

Case-based instruction, used in both preservice and in-service education, organized this course to help participants bridge the gap between theory and practice (e.g., Darling-Hammond & Hammerness, 2002; Mouza, 2011). Research indicates that documenting one’s own learning experiences increases depth of understanding (Hammerness, Darling-Hammond & Shulman, 2002). Thus, students in this course participated and reflected upon multiple opportunities designed to immerse them in realistic learning focused on multimodality and Web 2.0 tools in education (Korthagen & Kessel, 1999).

In tandem with thoughtful discussions of multimodality, students were required to examine Web 2.0 tools in depth. To do so, they followed steps carefully chosen by the instructor. First, students chose a tool from a list. Along with the list came an array of resources to get them started. The tools were chosen based upon their popularity in K-12 instruction and the resources were chosen to support learning of the tool and included tutorials, readings, and models (MacArthur & Karchmer-Klein, 2010; Solomon & Schrum, 2008). All 12 participants in this study chose to examine Glogster, a virtual poster tool. Second, once they identified a tool, students were required to spend at least two class periods exploring the tool, examining the resources, and simultaneously practicing using the tool with content of their choice. The third step was to use the tool to respond to one of two class readings assigned by the instructor: Orchestrating the Media Collage by John Ohler (2009) or Is Google Making Us Stupid by Nicholas Carr (2008). Students were required to respond to a 3-2-1 prompt: three things you learned from the article, two questions about the information presented, and one way you could apply what you learned to your own teaching or learning. This instructional strategy required students to summarize what they learned, question the content presented, and apply what they learned to a familiar educational context (Zygouris-Coe, Wiggins, & Smith, 2005). Additionally, students were told to present their responses within multimodal texts, using multiple
modes and semiotic resources to deliver cohesive assignments. Scoring rubrics reflected this expectation by allocating full credit when multiple modes were integrated. Using the same article, response prompt, and evaluation tool created a common context for all participants to respond.

Concurrent to these activities, students were required to write a case narrative, reflecting upon their new understandings of multimodality and the process of learning the new tool. The case narrative, posted on the class forum, was a detailed reflection, including specific examples and/or scenarios that illustrated the challenges confronted when learning new web-based tools and creating multimodal texts. To organize the narratives, the instructor provided specific questions to prompt detailed analysis (Lunenberg & Korthagen, 2009) including: (a) Why did you choose this tool? (b) Describe your progress in learning how to use it and any questions you may have about how to use it, (c) What do you think a reader must know how to do to read the content presented in the tool? and (d) What do you think a writer must know how to do to compose content presented in the tool? Additionally, students were required to comment on their classmates' narratives with questions, advice, and/or constructive feedback.

Data Sources and Analysis

A complete data set was collected from all 12 participants. Each set included a case narrative and one multimodal text. The multimodal texts examined for this study were created using Glogster, a virtual poster Web 2.0 tool. Glogster enables writers to compose multimodal messages merging video, images, text, hyperlinks, and audio. The writer is limited to the space provided on the poster, but can easily add and link pages to include more content. These virtual posters can be shared with a global audience by posting them publically on the Glogster website. The content of the poster was a response to a class reading, providing students with the same context from which to develop the multimodal text. Students were encouraged to design the poster however they wanted, as long as the response reflected the 3-2-1 prompt (see description above).

The virtual posters were analyzed with focus on core concepts of multimodal analysis (Jewitt, 2011): mode, semiotic resources, and intersemiotic relationships. First, a content analysis was conducted to identify the modes used to develop the virtual posters. Five modal categories—video, [written] words, images, sound, and hyperlinks—were identified; these categories were derived from a situated understanding of the tool’s affordances. Both researchers analyzed all of the virtual posters, recording the type and frequency of modes on each poster. The researchers discussed the analysis afterwards, comparing their interpretations to ensure modes were defined and counted in the same way. Data were entered into an Excel spreadsheet and percentages were tabulated to represent quantitatively the frequency, commonalities, and differences. The findings uncovered from this analysis provided a general overview of the texts from which to base further detailed analysis of the data.

Second, the semiotic resources were examined. Specifically, a list of resources used in each poster was developed. Semiotic resources reflect the writer’s choice (Jewitt, 2011); thus, it was important to evaluate if the choice made sense within the context of the assignment. After listing the resource the relevance of each was evaluated using a simple coding scheme illustrated in Table 2. In some instances the resources were clearly relevant and other instances required additional modes and resources to clarify meaning. Table 2 includes examples of each level of relevance. Researchers worked separately to code the semiotic resources and then met to discuss the results. Discrepancies were discussed at length until 100% agreement was reached. Analyzing the virtual posters in this way allowed for deep consideration of the modes and semiotic resources and how each was used.

<table>
<thead>
<tr>
<th>Criteria</th>
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<tbody>
<tr>
<td>Clearly relevant</td>
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<tr>
<td>Relevant but needs additional mode(s) to further clarify meaning</td>
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<tr>
<td>Relevance is unclear. Needs additional modes to clarify meaning.</td>
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<tr>
<td>Irrelevant</td>
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Table 2

Coding Scheme Used to Evaluate Relevance of Semiotic Resources
Modes and Semiotic Resources

Participants demonstrated an understanding of how to blend different modes and semiotic resources to develop intersemiotic relationships. It is important to reiterate that modes are signs or systems and semiotic resources are the materials or artifacts used to convey meaning. The following discussion is framed by the modes and the semiotic resources are described.

Words. Not surprising, words were used to convey meaning in the posters. All participants used this mode to state the title of the poster, their name, and as headers to organize their responses. However, most of the participants \((n = 10)\) realized the limited poster space and chose to utilize modes other than words to respond to the prompts. In fact, clarity and brevity of one’s message was a prominent theme in the case narratives. Opal, a sixth-grade language arts teacher, believed writers needed to be prepared to “cut the fat.” She pondered what this meant for her own writing instruction explaining,

> Words, when used, must be used sparingly. While this does not seem like it would be a problem in the classroom [because] most kids try to write as little as possible, being concise is not the same as using a few words. So writers must not only learn to cut out the extra, they must also be sure to leave in the necessary words so that their meaning is clearly conveyed.

Likewise, Taylor, the elementary science teacher, commented, “On a Glog there are fewer words, so the wording needs to be effective for maximum impact.”

Participants used font, size, and color differently with no similarities beyond using size to represent a hierarchy of information. For example, larger fonts were used for the headers of each section and smaller fonts were used to represent responses. This topic was discussed in several participants’ case narratives. Bonnie, the middle school business teacher, captured the essence of the topic when she wrote, “[Writers] should also know how to size the text so that the main title is largest and work down from there. . . It has to have some type of organization and layout.”

There were a few instances where words were sized too big to fit within the confines of the text boxes, making them difficult to read. Data from the case narratives indicated participants struggled with the technical aspects of inserting text:

> Connie: I found it frustrating to fit my text onto some of the graphics. Is there a way to make a [text box] wider, without changing the length?
Tabitha: I wish you could dump all your writing in a [text] box and then change the design of the box. This way I could have gotten all my thoughts down and then played with the way to present it all.

Overall, participants used words to convey meaning but many times they were used in conjunction with another mode that carried greater meaning. This could have been in response to a few themes discussed in the case narratives. First, words and their possible semiotic resources (i.e., font, colour, size) were not emphasized in the course content for the purpose of directing students’ attention to the modes in which they were less versed. Similarly, participants voiced excitement over learning new modes and resources. Thus, the assignment gave them the opportunity to try new approaches to reader response. Additionally, the technical difficulties with inserting text might have convinced some of the participants instead to utilize the modes they could more easily include.

**Images.** Glogster provides clip art for writers to insert into their virtual posters. These include images that are static or moving. The tool also allows writers to upload their own images from the computer. Images were used in 100% of the virtual posters. Some of the clip art choices directly related to the poster content and others did not seem to be relevant. For example, Tabitha, the eighth-grade language arts teacher, included pictures of the brain, eyes, and a computer—images that directly related to the article. On the other hand, Tara, a college administrator, inserted pictures of birds on her poster, with no mention of birds in the article or her content. Many times the images chosen seemed to support a theme like in Connie’s work. Connie, an eighth-grade social studies teacher, wrote about the aesthetics of her poster detailing her interest in using complimentary colors and images:

- Is there a way to change the color scheme of the text templates to match my background?
- I found it was difficult to use a funky background and then find a text graphic that complimented it. And I want to upload my own background.

She chose a grass-like background image to frame her poster and then inserted images of flowers around the content. Although the theme did not relate to the article, it did unify the aesthetics of the poster.

Several participants used images as portals, directing the reader to additional modes such as video and audio. What was especially unique about this was that the only way you would know the image was a portal was if you scrolled over it with a mouse and a pink circle would appear. Of course, this is Glogster’s design, but the participants needed to recognize this so that the reader would not miss the information. In fact, the first researcher missed content on at least two different posters when initially evaluating the assignments because the portal was not evident.

Perhaps most interesting was how images of arrows were used on a few of the posters to direct the reader through the intended reading path. The arrows were part of Glogster’s clip art gallery and included both static and moving options. A total of four participants utilized the arrows for directionality and they were typically placed beside the 3-2-1 prompt headers. Using the arrows in this way illustrated the participants’ acknowledgement of reading path.

**Audio, video, and hyperlinks.** Audio, video, and/or hyperlinks were included in all of the virtual posters—six used audio, eight used video, 10 used hyperlinks, and five participants used all three. These modes were either embedded or hyperlinked. With the former, the reader would remain on the virtual poster. The latter directed the reader to a new page. Participants used a combination of approaches. Specifically, audio and video were typically embedded, although there were two instances where participants kept the video in its original site. Websites were always hyperlinked rather than embedded.

In relation to these three modes, participants included a combination of self-generated semiotic resources and those developed by others. The self-generated resources included audio and/or video of the participants elaborating upon the words presented on their posters. Resources created by others included YouTube videos, education blogs, and music clips.

Analysis revealed two important issues related to these modes and the semiotic resources. First, like other Web 2.0 tools, Glogster provides a confined amount of space to convey meaning. Therefore, as several participants mentioned, writers need to present concise messages or include additional modes to convey their entire scope of thought—this is known as layering. The problem with layering is that it can easily confuse your reader by complicating the reading path.

Consider Lisa’s poster first (see Figure 1). Lisa, a middle school language arts teacher, created three text boxes on her poster to represent the three things she learned from the article. She included a heading in each stating *Did You Know?* followed by a topic sentence. The text box was a portal to an audio clip where she elaborated upon the topic sentence in a well-rehearsed description of what she learned. The reader remained on the virtual poster and was able to continue on his own reading path.
Kayla, a fifth-grade teacher, created a poster that exemplified more complex layering. To circumvent the constrained space, she created additional virtual posters, including an array of modes and semiotic resources, and linked them to the one she submitted for the assignment. Like Lisa, Kayla’s initial virtual poster included text boxes representing the 3-2-1 prompt. Each text box included a topic sentence and acted as a portal to an additional poster where she elaborated upon her points. What complicated her design were the modes and semiotic resources presented on the supplemental posters. That is, the use of 53 semiotic resources muddled the reading path and could easily overwhelm a reader. Moreover, she did not include links back to the original poster to help the reader navigate home.

Jasper, also a fifth-grade teacher, created posters to provide additional space to elaborate upon her work. However, she included a link back to her home poster on each one, ensuring her reader would not get lost. She wrote about Glogster’s space limitations and this strategy on her virtual poster:

Writing on the web provides us with concise formats that change depending on the resource being utilized. For Glogster, I had a limited amount of space, so I had to be concise. However, knowing the importance of elaborating on my topic, I used hyperlinks to [lengthen] the texts . . . Teaching students to understand both the needs of the audience, the constraints of the resources, and how to utilize all of these tools seems like a daunting task.

Figure 1. Lisa’s Glog.
A second issue related to audio, video, and hyperlinks was relevance. A total of 68 videos, audio clips, or hyperlinks were used in the 12 virtual posters. When participants used self-generated resources, the resources were scored as clearly relevant to the overall purpose of the assignment. Examples include Talia’s video description of how she could apply what she learned from the article, Lisa’s link from her name to her biography on her school website, and Jasper’s link to ePals as an example of technology integration. Yet, this was not the norm when audio, video, or hyperlinks developed by others were used to represent meaning. For instance, Lisa provided four examples of how she could apply what she learned from the article. Connecting With Colleagues for Additional Ideas was one idea and hyperlinked to the International Reading Association’s (IRA’s) website. Although both researchers are reading specialists and members of IRA, the exact connection between the idea and the link was unclear. How would the main page of the IRA website support teachers’ collaborative relationships? Although this resource clearly needed an additional mode to illustrate further the connection, it did not affect the overall meaning of Lisa’s virtual poster because it was supplemental to the primary content and not vital to the coherence of the message.

Resources deemed less than clearly relevant on the coding scheme directly impacted overall meaning when they were the primary source of content. Bonnie’s poster illustrated this issue most prominently (see Figure 2). She used the fewest number of words out of all the posters, instead relying on one audio clip, two hyperlinks, and three videos to convey meaning. The audio clip was that of a clock ticking. Both researchers scored it as irrelevant given that there was no context from which to make meaning of it. The title of the poster, Digital Expressions, was a hyperlink to a web design company’s website. Researchers scored it as irrelevant due to the lack of context. The other hyperlink connected the reader to a 28-page newsletter written by a state technology association. After reviewing the document, both researchers scored it as irrelevant given no connection to the assignment. The topics of the three videos related enough to the article that the authors scored them as relevant but needing additional modes to clarify meaning. Given the poor development of the poster, it was clear that Bonnie did not understand the purpose of multimodality. She needed further instruction on identifying appropriate semiotic resources as well as audience awareness. That is, she assumed her audience would be able to follow the design of her poster as well as make subtle connections among and between the content.

Beyond these issues is perhaps a more concerning one. Historically, when students submit assignments, it is assumed they are the sole authors of the work presented. Multimodality challenges this notion when no constraints are put on how semiotic resources should be integrated to represent meaning. In other words, Bonnie submitted an assignment that represented a collage of other people’s thoughts and ideas, rather than her own.
Intersemiotic Relationships

Intersemiotic relationships were examined in this study in reference to reading path. Multimodal texts allow for unique reading paths because the reader must choose which modes to follow, which hold the most meaning, and which will lead to the overall purpose. These decisions are socially and culturally situated. For example, participants’ roles as educators and students in this study influenced the way they responded to the academic task. As students they all followed the assignment’s directions, and as educators, they related their learning to their educational environments.

In their case narratives, participants acknowledged the importance of creating logical, fluid multimodal texts to support reading comprehension:

Tara: A writer must know how to creatively manipulate technology offered by the tool so that a reader has a clear and intuitive path to follow as they interact with Glogster.

Alan: Reading a glog requires the ability to read text in a non-linear fashion.

Krissy: A reader must make sure to follow the flow the author has set forth, and not just aimlessly point and click on the different media offered.

However, analysis of the posters indicated that some participants understood how to create these fluid, interconnected reading paths, whereas others struggled to pull them together. To illustrate this, we
summarize the analyses of two virtual posters: Alan and Tabitha. These data underscore the different levels of understandings represented by the participants.

Alan’s work was particularly illustrative of intersemiotic relationships. He used a combination of words, video, images, and hyperlinks. All semiotic resources were scored relevant by the researchers. Importantly, Alan’s poster reflected a collage-like presentation unlike other posters with a top to bottom, left to right trajectory. The visual overlapping of modes reflected a cohesive message informing the reader of the relationship between the content even before it was read.

As the course instructor, the first author approached the text from an academic context. Her reading path was directed by the assignment. In other words, when she opened the poster she scanned it for the elements of the 3-2-1 prompt, focusing on Alan’s presentation of the information first and then viewing the poster as a whole. This led to a nonlinear reading path.

Conversely, the second researcher approached analysis as an outside observer because she was not a part of the classroom community. Her reading path reflected this different perspective. As Kress (2003) suggested, after opening the poster she scanned the landscape looking for the dominant modes. Then her reading path was dictated by the modes she found most interesting, beginning with text, moving to hyperlinks, and transitioning to video. This created an alternative non-linear path that did not take the prompt into account. Most importantly, regardless of the path followed, discussions among the researchers indicated that the same meanings were gleaned from the modes and semiotic resources reflected in Alan’s work.

Tabitha’s virtual poster included video and images and all primary content was conveyed with words. The semiotic resources received a range of scores from clearly relevant to needs additional modes to clarify. Tabitha’s design reflected a top to bottom format; stating the three lessons learned at the top of the poster, the two questions in the middle, and classroom application at the bottom of the page. However, her virtual poster did not reflect cohesive intersemiotic relationships. That is, she connected the elements of the prompt to develop a sophisticated response to the task, but fell short when presenting her message through multimodality.

Again, the first researcher approached the analysis with the prompt in mind. She identified the required elements and then viewed the video, which extended the primary message. The researcher did take note of the distracting aesthetics presented in the poster such as a spotted background, different font styles, and color scheme. Thus, it was determined that the purposeful navigation, organized by the given prompt, aided the researcher’s comprehension.

The second researcher struggled to make meaning of Tabitha’s work. She approached Tabitha’s poster by following a clockwise reading path; a result of first scanning the presentation and noticing a clock positioned at the bottom of the poster. This path, however, turned out to be confusing once she reached the video placed at the bottom of the poster. There was no context from which to understand the video because there was no connection between it and the previous information the researcher had read. This confusion resulted in the need to retrace her steps and read the remaining resources. This nonlinear path led to eventual comprehension once all modes and semiotic resources were synthesized.

Although both participants responded appropriately to the prompt, Alan’s ability to develop a cohesive multimodal text—one that effectively combined meaning and modes—was far superior to that of Tabitha. The sequential nature of Tabitha’s response dictated a predetermined reading path; yet, she did not provide adequate supports for the reader to follow. On the other hand, Alan’s modes and semiotic resources worked together to create a unified message.

**Discussion**

The purpose of the course described in this study was to design an experience that would fully immerse graduate students in the topic of multimodality. Case-based instruction provided a realistic approach to their learning by engaging them in similar concrete explorations, allowing them time and opportunity to think deeply about new concepts. Although this study’s findings represent an initial exploration into multimodality, three important lessons were learned that can inform teacher education.

First, a blend of traditional and digital literacies is necessary to read and write in rapidly evolving web-based environments (Leu et al., 2004). Given the inherent complexities of multimodality, students’ learning must be scaffolded. This can be undertaken in three ways. First, assignments should be carefully constructed explicitly to guide students as they engage in this complex content. Second, students must be provided opportunities to practice the procedural knowledge needed adequately to utilize Web 2.0 tools. Third, assessments must be designed to evaluate different dynamics of multimodal texts. As indicated in this study, students might be able to develop sophisticated responses but struggle to create unified multimodal messages. Alternatively, they
might have the skills to utilize video, audio, images, and hyperlinks to take their reader on a journey, yet the message might be muddled or might not even be their own.

Second, in some ways Web 2.0 tools influence the texts that writers create. The complexity of the tool might dissuade students from utilizing its capabilities to the fullest. For example, Karchmer-Klein (2007) found that fourth graders relied heavily upon words in their multimodal webpages when they struggled to insert graphics. As data revealed in this study, participants were challenged by components of Glogster, requiring them in some instances to modify their original layout in response to technical challenges. Similarly, space limitations indicative of some tools (e.g., Glogster, Twitter) require writers to develop concise, succinct messages. This lesson is of particular relevance to the study presented here. Most participants figured out ways of utilizing modes to elaborate upon the points made in their virtual posters. Although the tool constrained the amount of space they were given, it also allowed them the use of multiple modes and semiotic resources.

Third, this study reconfirmed the complexities of not only teaching but also professional development and analysis of multimodality (Jewitt, 2011). As a result, several questions emerged. In terms of teaching, how do we move beyond traditional conceptions of written text to prepare teachers to use multimodality? Likewise, how do we introduce multimodal texts in K-12 instruction so that school-based conceptions of literacies reflect 21st century skills? In terms of professional development, how can districts develop and maintain infrastructures needed to be cutting edge and competitive? And related to analysis, how do researchers think deeply about multimodality in light of everchanging technologies? These questions and others will help move the field towards a better understanding of how Web 2.0 tools fit within education.

**Conclusion**

Courses that expose educators to multimodality have the potential to bring the complexities of digital environments to the forefront of teacher education. Most importantly, a shift from epistemic to phronesis knowledge will engage educators in meaningful learning opportunities that allow them to think deeply about these important issues. Although theoretical discussions are important, systematic empirical research investigating how students learn effectively to utilize multimodality can only help broaden the scope of our understanding and better prepare the next generation for literacy skills we have yet to imagine.

**References**


