

Multimodalities, Neuroenhancement, and Literacy Learning

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Abstract

In the United States, children are in front of the “screen” about six hours a day, and because schools are a microcosm of society, educators need to incorporate more screen-oriented activities into the literacy program. Transmediation, based in social semiotics, promotes collaborative conversations, which nurture positive translations from one sign system to another, for example, from print to the Internet or from print to dance. In support of this pedagogy, related theory and research are presented as well as strategies and activities for engaging students in multimodal learning while demonstrating potential neuroenhancing effects.

Key Words: social semiotics, transmediation, sign systems, multimodality, pantextual meaning, neuroenhancement

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Introduction

Twenty-first century literacies are defined, in part, by immersion in different sign systems or multimodal texts (NCTE, 2008), and Kress (2003) considers the “screen” to be the dominant site of texts. He states, “Two distinct yet related factors deserve to be particularly highlighted. These are, on the one hand, the broad move from the centuries-long dominance of writing to the new dominance of the image and, on the other hand, the move from the dominance of the book to the dominance of the medium of the screen” (p. 2). According to *IRA Inspire* (2012), today’s children are in front of screens about six hours every day, watching television, exploring the Internet, and playing video games. Children’s and adults’ increased use of video and computer games is documented in Tobias & Fletcher (2011), and these types of popular culture have become increasingly complex, involving highly specialized styles of language that are more challenging and engaging than are conventional elementary reading materials (Gee, 2008). While seemingly in opposition to reflective practices because their presentation is often quickly paced, carefully selected video and computer games actually support language development, analytical thinking, critical responses, and other reflective habits. In a recent publication titled *Learning Science through Computer Games and Simulations*, the National Research Council (2011) stated, “Computer simulations and games have great potential...They enable learners to see and interact with representations of natural phenomena that would otherwise be impossible to observe—a process that helps them to formulate scientifically correct explanations for these phenomena” (p. 1). Furthermore, researchers, theoreticians, and practitioners (e.g., Ajayi, 2009; Bitz, 2004; Calo, 2011; Chun, 2009; Cowan & Albers, 2006; Danzak, 2011; Gallagher & Ntelioglou, 2011; Jenkins et al., 2006; Kirkland, 2009; Kress, 2010; Lotherington, 2011; McAllister, 2008; McCormick, 2011; Morgan & Rasinski, 2012; Moyer, 2011; Rudd, 2012; Sanacore, 2004; Serafini, 2009; Siegel, 2012; Symthe & Neufeld, 2010; Turner, 2011; Walsh, 2007, 2008, 2009, 2010) support the stance that reading, interpreting, and demonstrating a text can involve such multiple modalities (or sign systems) as print-based and screen-based texts, primary sources (print and nonprint), video games, art, music, mathematics, graphic stories, graphic poems, performance poetry, animated narratives, comics, drama, drawing, portraiture, digital photos, claymation, tattoo designs, dance, audiobooks, picture books, e-books, and podcast and multimodal media production. These and other sign systems are not essentially competing with one another because each offers a specific type of meaning (Harste, 2009). Studying a sign system, or engaging in social semiotics, increases the chances that a student will choose this communication system to generate meaning. In Kress’s (2004) perspective,

...the ‘social’ in ‘Social Semiotics’ draws attention to the fact that meanings always relate to specific societies and their cultures, and to the meanings of the members of those cultures. Semiotics takes the sign—a fusion of a form and a meaning—as its basic unit. In making signs, we—embedded in our cultures—select forms in such a way that they express the meanings that we ‘have’ always ‘aptly’ [intended]; hence signs always express, through their form, the meanings that the makers of signs have wished to make.

Multimodal experience can support students’ choice of a sign system and their translation of meaning from one sign system to another—for example, from print to interactive digital text or from print to dance (McCormick, 2011; Walsh, 2008). As students move in this inquiry-based direction, they experience transmedia navigation as they demonstrate “the ability to follow the flow of stories and information across multiple modalities” (Jenkins et al., 2006, p. 4). They also inevitably face degrees of ambiguity as they analyze different systems, and these reflective practices require students to reexamine the main concept and related ideas in the first sign system so they can create an equivalent in the second sign system (McCormick, 2011). In this social semiotic context, different texts or sign systems are generative because the signmaker can extend the initial meaning (Cowan & Albers, 2006; Kress & van Leeuwen, 1996).

Pantextual Meaning and Converging Sign Systems

At the core of transmediation are the processes of developing, shaping, integrating, and expanding the previously discussed sign systems including art, music, poetry, video games, comics, audio books, and podcasts into full-spectrum literacy (Eisner, 1998; Goodman, 1976). In all of these, some form of visual encoding is involved. Kress and van Leeuwen (2006) talk about reading images as a new grammar of visual design. For them multimodal learning broadens the definition of literacy and provides a new “habitus” of learning that takes in the linguistic, auditory, tactile, and visual. Perhaps in developing a cueing system for children who are learning literacy practice, we need to pay attention to designing an infrastructure not only for “linguistic” grammar but also for equivalent grammars.

Because these grammars reference the visual, auditory, and motor, this speaks to another theoretical base for multiple literacies that of dual coding theory (Paivio, 1975). For example, because of early experiences with picture books as gateway linguistic experiences, children do not only think in written language but in visual image as well (Broudy, 1987). They are, in effect, using linguistic and non-linguistic strategies to dually encode information for storage and retrieval in long- and short-term memory. This Dual Coding Theory, championed by Paivio and a forerunner to transmediation, suggests that associative thinking utilizing both linguistic and non-linguistic systems are involved in language production. Paivio (2006) affirms that instructing “learners to form images during reading further enhances reading comprehension and vocabulary learning. Combining pictures, mental imagery, and verbal elaboration is even more effective in promoting understanding and learning from text by students ranging from grade school to university level” (p.11). This statement speaks to the direction where information age literacy instruction is pointed. While building upon balanced literacy approaches where deriving meaning requires the learner to employ traditional interpretive strategies of reading, writing, speaking, and listening, striving for a pantextual approach integrating these behaviors within multiple sign systems may help advance combinative thinking as a literacy platform.

Engaging Students in Multimodal Learning

McCormick (2011) explains this process as a part-whole relationship of multimodal learning. In her research, she describes transmediation efforts in a sequence of classroom language arts lessons, supported by a sixth-grade teacher, a visual artist, and a professional dancer-choreographer. Initially, a small, flexible group of students engaged in a series of self-portraits as an experiential vehicle for interpreting Chilean poet Pablo Neruda’s (1970) “*Muchos somos.*” In this series on portraiture, students used the tools of memory and the mirror as they became immersed in drawing detailed portraits of themselves, which were influenced by careful observation. According to McCormick (2011, p. 583), “the more details they see, the greater their power to distinguish the internal features of an object (or a system) and forge complex comparisons based on structural relationships. Perceiving structure necessitates moving beyond superficial observations and recognizing the relationship between part and whole.” This reflection of “self,” based on experience, helped the students to focus on detail and to progress from portraiture to an interpretation of the poem “*Muchos somos.*” Thus, two seemingly dissimilar texts—drawing and poetry—were joined to promote meaning, while also providing a foundation for joining other sign systems.

The sixth-grade teacher then read aloud several poems by Langston Hughes, a Harlem Renaissance poet, and encouraged the class to create a response. Melissa, a twelve-year-old student, wrote a poem about immigration and worked cooperatively with several peers to translate the poem into the movement of dance. Melissa and her peers engaged in transmediation by having analytical conversations about her poem and then aligning the creative structure of the poem to the compositional structure of the dance. With the support of the classroom teacher and professional dancer-choreographer, the students reexamined the central concept (macrostructure or whole) and related ideas (parts) of the poem so that the structure and content of this original composition could result in a creative equivalent with the dance. This analytical process seemed to foster a positive

confrontation with ambiguity as the students had to “look and look again to see if the meanings created in one system [poem] are *explaining* and *enhancing* the meanings in the second system [dance]” (Wolf, 2006, p. 18). One of the most poignant aspects of this meaning-making translation was when Melissa reflected on her poem and choreography and decided to spin back, stop, and “wait for a little while,” thus representing her mother’s hesitation before crossing the border into America. The success of this social semiotic reflection was deeply grounded in this signmaker’s environment and experiences as she applied her knowledge of the tools, methods, and language of a sign system and integrated it with the texts she produced (Berghoff, Egawa, Harste, & Hoonan, 2000; Cowan & Albers, 2006).

Social semiotic processes were also the basis of Cowan and Albers’ (2006) work, which highlighted the arts in literacy with fourth and fifth grade students. Briefly described, these ELA teacher-researchers focused on literacy as reflective practice, in which “students reflect consciously on their created texts, the ideologies that underpin these texts, and the process through which they make meaning” (p.126). In a series of performing and visual arts lessons, students engaged in the composing process by initially playing with words while connecting them to personal experiences and feelings. Thus, words like *happy* and *merry* might be generated to express a positive experience, while words like *sad* and *sorrowful* might be used to reveal a negative incident. Then, students were invited to dramatize or act out one of their emotions and also to share the event that is associated with this emotion. One child shared her visual imagery when she said,

Gloomy. She’s the feeling that I wanted to dramatize. My best friend moved away, and I felt really sad, like the color gray. It was hard to be alone, and no one would talk to me. I felt dark and down, like black in a dark, dark world...(p. 127). These playful activities were essential for learning because they provided students with opportunities to experiment with their environment as practice for problem solving (Jenkins et al., 2006).

These and other approaches to word study also offered multiple experiences with words, including learning about antonyms and synonyms and using them purposefully when writing. Following such word study activities, the teacher-researchers Cowan and Albers (2006, p.129) conducted focused lessons “that examine art as a knowledge domain.” They introduced elements of art—e.g., color, design, shape, and line—and their connection to meaning making. Then, they shared Marcia Brown’s (1982) Caldecott Medal-winning book titled *Shadow*, a long adapted poem from an African folk tale. *Shadow* provides excellent examples of simile, metaphor, and personification. These experiences served as a foundation for all students to engage in their own writing. With specific guidance from the teacher-researchers, the students generated imagery as they moved between the two sign systems of writing and revising their poems and creating drawings. In addition to these activities, the students had opportunities to build three-dimensional papier-mâché masks and to reflect on the relationship between their personification poem and their mask. Finally, the students were encouraged to become “reflective enough to think about their own thinking and to become conscious of their own consciousness” (Greene, 1995, p. 65). According to Cowan and Albers, (2006, p. 133),

Students’ performance and reflection complete this literacy experience...and enable [students] to become conscious of what it is that they have learned. Students point to their masks and then read their poem with expression. Students respond with such comments as, “I like how you repeated ‘outrageous’” or “Your phrase, ‘dark and down; black in a dark, dark world’ really made me feel gloomy.”

Interestingly, in her research with young children in urban inner city Toronto, Canada, Lotherington (2011) found that kindergarteners also benefited from their multimodal engagement, in that they “can program—at a very elementary level—before they can write alphabetically” (p. 112). Multimodal complexity actually facilitated the children’s acquisition of emergent print literacy, but the children needed scaffolded intervention to grasp the story’s alphabetic text. From her observations, Lotherington concluded,

This is a wake-up call to those in formal education who prioritize alphabetic literacy in the physical world over digital access, treated so often as an add-on...Policy makers as well as teachers need to rethink the prioritizing of alphabetic print as the primary or, worse, the exclusive interface to emergent literacy learning (p. 113).

Overall, engaging all learners in different sign systems helps them to make connections with literacy and the arts and to realize that both activities share syntactic and semantic properties (Piro, 2002). Such immersion also increases students' awareness of and respect for varied ways of learning and knowing. Specifically, students have opportunities to select a sign system that represents their interest and comfort zone and to express personal and academic meaning through their sign system. As important, social semiotic immersion helps students to slow down and reflect more deeply on their literacy learning experiences.

Transmediation, Multimodalities, and Neuroenhancement

A vital part of social semiotic immersion and a pantextual approach involving sign system selection involves enhancing neurocognitive and visual processing skills including visual attention, discrimination, detection, and tracking and how this, in turn, augments literacy capacity. Brice-Heath (2000) talks about the "literate eye." She cites brain science research telling us how post-retinal visual processing works and what effect focused attention has on conscious cognition. She also cites experiments investigating the visual brain noting that "what amounts to visual perception carries meaning because the imagistic character of neural activity manages to link up with stored experience that gives coherence and embeddedness to primary sensory images" (p. 122). For her, the line between transitioning from image to word is becoming harder to set, but why should it be set at all? She comments that young children have been "observers" of the worlds of word and image since birth, repeatedly blurring the lines between environmental print and image, so what better developmental juncture than early childhood to begin training readers about their close interdependence using principles of transmediation? For her,

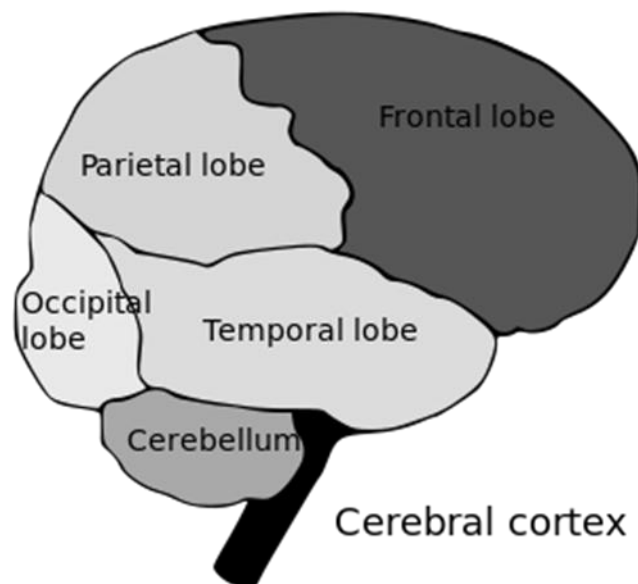
the visual arts with accompanying focus of attention on details of features, such as color, form and line, ensure attention to perception and engagement of the 'visual brain' which, in turn, resonates with remembered experience and linguistic representation. Manipulation of these features of the visual arts, [through] drawing or finger painting in early childhood provides essential opportunity for focusing joint attention, taking on numerous roles, bringing memory to external form and developing language. All of these skills are critical for academic achievement and all underlie literacy ...as traditionally conceived (p. 123).

In mapping word and image onto linguistic and pictorial representations of environmental cues, we have a unique opportunity to mix stimulus formats that, in turn, have important neurocognitive effects, notably the recruiting of differential cortical processing routes within the brain. There is some new and very promising research in brain science suggesting that the information processing of both visual and non-visual stimuli may reduce cognitive overload since this brain mapping process is being shared and, hence, can be more efficiently accomplished by the learner who is using collaborating neural pathways (Paivio, 1975; Patel & Hellige, 2007). Thus, while we can continue to stress reading and writing basics, we can enhance meaning through targeted signaling of information processed by the visual association cortex (e.g., color, shape, texture) in response to platforms such as digital narratives, comic books, video games, and graphic poems. This mix of stimuli may improve overall task approach through reductions in interhemispheric interference, promoting gains in visual literacy and acuity skills and increasing task motivation.

The neuropsychological rationale supporting this outcome centers around the suggestion that because of overlap in cortical networks used to process visual, auditory, and motor information, as well as the continuing neuroplasticity in children's brains, mixing stimuli may actually enhance neural

encoding (Pantev, Oostenveld, Engelien, Ross, Roberts, & Manfred, 1998; Peretz & Zatorre, 2005) through a process that might be labeled “neuroadditivity.” This provocative hypothesis is still being tested and is far from conclusive, but evidence continues to grow that practice and training in a variety of knowledge domains can improve targeted global cognition in children, especially primary school children. This emphasis on mixing stimuli returns us to dual coding theory and its impact on learning. According to Sadoski and Paivio (2004), the value of explaining reading under the aegis of a theory of general cognition is compelling. Reading is a cognitive act, but there is nothing about reading that does not occur in other cognitive acts that do not involve reading. We perceive, recognize, interpret, comprehend, appreciate, and remember information that is not in text form as well as information that is in text form. Cognition in reading is a special case of general cognition that involves written language. Theories specific to reading must eventually conform with broader theories of general cognition for scientific progress to advance (p. 1329). For example, there is support for the idea that neural structures for both language literacy and visual art are bilaterally distributed in and across the neurotypical brain and because of this may anatomically overlap (Figure 1). In right-handed individuals, linguistic information processing appears lateralized, primarily, to the left hemisphere, while domains of non-linguistic information, such as visual art, are more efficiently processed by the right. In the case of language, functional neuroimaging has shown tasks such as language comprehension and sentence formation involve greater left hemisphere activation (Gaillard, Balsamo, Ibrahim, Sachs, & Xu, 2003; Meltzer, McArdle, Schaefer, & Braun, 2010). Neural pathways in the left occipital-temporal region, especially, are more likely to be engaged by better readers, as some studies of dyslexic children have reported (Bosse, Tainturier, & Valdois, 2007; Shaywitz, 2003). However, the right temporal area has also been associated with components of language competencies including fluent, grammatically correct speech, word and object meaning, metaphorical processing, and lexical decision making and performance (Mashal, Faust, & Hendler, 2005; Taylor & Regard, 2003).

Figure 1. Diagram of the lobes of the brain



Areas of the brain implicated in visual art processing include both right and left temporal regions as well as the occipital-temporal areas on both sides of the brain, homologous to those engaged by many linguistic activities. An art-making activity such as drawing appears to recruit regions in the right temporo-parietal area, the same locus involved in writing (Gowen & Miall, 2007). Because of this neurophysiological proximity, some have hypothesized that neuronal pathways influencing both the expressive arts (namely music) and language arts may, following long-term experience and practice, acquire some sort of networked interdependency especially involving

component sharing, adaptive coding, and cross-domain communication, and sustained and intensive practice and training in one domain may structurally influence the other (Brown, Martinez, & Parsons, 2006).

Let us take the activity of *Picture Partners* as presented in an article by Soundy and Drucker (2010). In this project, K-1 children were asked to produce picture books which were themed around the topic of winter. Two to three children, along with a pre-service teacher, worked together as “picture partners.” After an initial read-aloud activity of a focus book on winter as the verbal component of the activity, children were asked to visually represent their individual responses from their picture book and share these with their partners. No prompts were given and children did not have access to picture books, composing their responses from memory. Following this, children were asked to write about what they depicted in their images. Throughout both activities, children were encouraged to communicate any thoughts, responses, or ideas and share these collaboratively with their picture partners as well as view each other’s work. Finally, children were asked if they wished to add anything else to their products, and resulting oral reports were also recorded by the pre-service teachers. This lesson nicely parallels in principle the earlier experience cited in the paper (McCormick, 2011), where children combined sign systems of drawing, poetry and dance overarched by a socio-semiotic structure.

For the next phase of the project, images of winter composed by the children were examined by groups of pre-service teachers and their mentors. When the colors, textures, and shapes the children used in their drawings were “aesthetically assessed,” it was discovered that many of the children felt free to experiment with their own ideas, tools, and images and that drawing perspectives, color choices, shape delineation, and compositional balance and texture, differed from partner group to partner group along with “emotional engagement” levels experienced by viewers. The encouragement to transmediate, mixing the balanced literacy behaviors of reading, writing, listening, and speaking with visual art experiences in order to deepen ideas, resulted in an ideationally dense, compositionally rich, and, because of the partner design, socio-semiotically driven product. Most important, the researchers noted that encouraging these students to represent ideas across multimodal platforms resulted in a shift away from any fixed interpretation of visual realism and towards children’s own intents. This allowed teachers “to focus on the way drawings represent meaning in the children’s sociocultural world” (Soundy & Drucker, 2010, p. 459), providing these teachers with special understandings of their students’ creative lives as well as expanded communicative lexicons.

Let’s further examine this activity for its neuroenhancing effect. First, we see behaviors involving creative drawing, writing, speaking (motoric activities) as well as features of color, design, and texture all mediated by memory, attentional, and executive function skills. The concept of neuroadditivity mentioned previously, relating to progressive neural contributions distributed throughout the brain supported by scaffolded learning experiences, is robustly demonstrated because the general pattern of neural interplay of these components appears to involve bilateral brain contributions. For example, right hemisphere frontal areas have shown activation in imagery skills such as drawing (Gowen & Miall, 2007; Molnár, 2008). Left hemisphere frontal area superior skills, including those involving lexical, orthographic, phonological, and semantic decision tasks, prove important for writing, spelling, and vocabulary comprehension (Schlagger & McCandliss, 2007). In split-brain studies, imagic memory related to animals, human faces, and landscapes were shown to be more efficiently recalled by the right hemisphere. Color detection, perception, and discrimination appear to be right hemisphere superior as well (Sasaki, Morimoto, Nishio, & Matsuura, 2007). Finally, the neural signature of “consolidated” creativity, in which brain activation synthesizes to yield novel behaviors, has been empirically demonstrated to provoke intercortical interactions especially involving the pre-frontal cortex (Kowatari, Lee, Yamamura, Nagamori, Levy, Yamane, & Yamamoto, 2009). Thus, multimodal activities scaffolding students along hierarchies of literacy learning may afford neurocognitive profit because the combinative framework of using multiple sign systems may contribute a steady stream of high-quality differential stimuli that generate complementary

interactivity and networking of overlapping anatomical areas of the brain (Stowe, Haverkort, & Zwarts, 2005).

Reflecting on the Practice of Different Sign Systems

The success of these growth-oriented journeys—from one sign system to another—is predicated on the substantial scaffolding provided by classroom teachers and specialists. We believe these efforts are most effective in helping students translate different sign systems when learning is based in meaningful, social semiotic experiences, in detailed reflections of the experiences, in dialogic classroom practices, and in opportunities to appreciate literacy in all its forms. Specifically:

- (a) Students need time to become immersed in serious play about uncertainty. Thinking, reflecting, and imagining are all part of the process of translating ideas across sign systems. In McCormick's (2011) study, learners spent hours wallowing in and gradually feeling comfortable with uncertainty. When they translated ideas, they dealt effectively with ambiguity in its varied forms.
- (b) During the reflective practice of wallowing, students benefit from the support of the classroom and special educator as the students grasp the parts that form the macrostructure (or whole) of each mode of learning. Having students retell the text and related pictures and illustrations is helpful, especially when the teacher asks prompting questions that focus on important ideas and their connection to the whole. Part of this meaning-making process should involve not only an understanding of print but also a grasp of related pictures and illustrations. In support of this instructional direction, the teacher and specialist need to understand and to help students understand aspects of visual codes and "visual grammar," including color, shape, angle, size, line, perspective, and vectors (Kress & van Leeuwen 1996; Walsh, 2007). These and other elements, as well as different media and artistic styles, guide literacy learners in how to interpret the meaning connected to these elements, how to interpret the interaction between visual images and print, and how to *feel* about different types of text (O'Neil, 2011; Serafini, 2009; Wolf, 2003). Picture books are excellent resources for promoting visual literacy, and two of our favorites are Polacco's (1994) *Pink and Say* and Tsuchiya's (1951/1988) *Faithful Elephants*. When students have successful experiences with this perspective, the movement across other sign systems—for example, artistic paintings, sculpture, and choreography—is more likely to be successful, especially when the teacher, special educator, and creative specialists demonstrate the process, guide students to make choices, and nurture collaboration among group members.
- (c) Successful group work is focused, productive, and necessary for crossing different sign systems. Educators therefore become an important factor in promoting a community of learners who engage in pertinent interactions with one another. Adapting some of Vaca, Lapp, and Fisher's (2011) suggestions for productive group work, the classroom teacher and specialists might consider a variation of three principles:

The first, and most obvious, characteristic of successful group work is to design tasks that cause students to talk with one another, to hear how their peers approach the content and then to be able to compare this with their own approach. Second, the task must provide a stimulus question or problem that causes students to cooperate as they formulate, share,

and compare ideas with one another. Finally, all tasks should be broad enough to involve both individual and group accountability. (pp. 372-373)

Vaca, Lapp, and Fisher applied these principles to productive group work involving U.S. history instruction. Small heterogeneous groups of students were to determine the benefits of the 1935 Social Security Act and the U.S. government's use of posters to communicate those benefits to the American people. Each group received a packet, which included five tasks to be completed. Task 1 highlighted preparation for group work (e.g., students were given guidelines for analyzing, discussing, and responding to U.S. government posters to promote the Social Security Act's passage). Task 2 supported collaborative efforts (e.g., after analyzing the posters, group members shared and recorded classmates' reflections). Task 3 invited critical analysis (e.g., students supported the Social Security Act by creating present-day posters that made connections to current issues and to today's diverse society). Task 4 assessed group performance (e.g., group members presented a comprehensive collection of posters that represented social diversity, and they reflected on the messages of each poster and determined each poster's appeal to the unemployed, widowed women, and retirement-age citizens). Task 5 assessed individual performance (e.g., students wrote individual responses to thoughtful prompts as a way of showing their understanding of the Social Security Act's intent).

Although these efforts were primarily intended to improve productivity in group work, they also supported aspects of transmediation by encouraging students to analyze and visually divide government posters into four sections (parts) as a way of interpreting the government's purpose for producing the posters (whole). Students also reflected on this experience and then created their own present-day posters that provided support for the Social Security Act. Examining the details of government posters helped group members to understand their intended message and, in turn, to generate original posters, thereby reinforcing the same sign system. Another dimension of this translation is to encourage students' efforts to create other sign systems, such as dressing in costumes and pantomiming varied roles that support different views on the Social Security Act. For example, they can incorporate instrumental music, dance, song, or only physical manifestations, as they pantomime and express their 1935 or present-day perspectives on Social Security.

- (d) After-school programs can provide additional support for students' reflective experiences in analyzing, critiquing, and producing multimedia. In Turner's (2011) qualitative study, students engaged in multimodal media production as a vehicle for developing their information and communication technology literacies. Briefly described, students learned to analyze and critique media with the purpose of not reproducing stereotypes found in corporate media. They also incorporated newly gained insights with a community research project. Supporting these successful efforts were in-school teachers and tutors as well as the lead multimodal media production teacher, who had an extensive background as a hip-hop artist. Among the positive outcomes of this extended-day literacy intervention were students' lyrics and digital stories, which reflected text-to-self and self-to-text connections.
- (e) This ability to negotiate seamlessly between imagery and text continues to escalate in importance in twenty-first century learning enterprise. For example, the enGauge Project at the North Central Regional Education Lab (NCREL, 2003) has identified eight Digital Age literacy categories. Among these are both basic language literacy and visual literacy. In their report, *Literacy and the Digital Age*, they write that, "students need good

visualization skills to be able to decipher, interpret, detect patterns, and communicate using imagery,” (p. 24), in other words, active and well-trained visual processing skills. In their 2020 Forecast, the KnowledgeWorks organization underscores the importance of the skill of pattern recognition which is integral to the multiple sign systems involved in transmediation. They note that advances in the integration and visualization of multiple data streams will assist in amplifying learning, enabling students to create what they label as ‘personal multi-media learning logs.’ By combining these learning logs with game-based interfaces and visualization tools, learners will be able to create “learning footprints” that show how they learn in different geographic locations and blended settings (Knowledge Works, 2008).

- (f) Professional development is vitally important for helping the key players—students, classroom teachers, special educators, creative specialists, and school library media specialists—to work collectively in promoting effective translations across different sign systems. Study groups, in-person workshops, online sessions, or blended approaches can be effective for learning about transmediation and applying related activities in schools. Our experience in professional development suggests that it is most successful when it initially focuses on thought-provoking curricular topics, such as love, greed, prejudice, revenge, politics, culture, gender, social class, adversity, death, honesty, loneliness, and belonging. Topics that translate into themes serve as the thread that binds learning and teaching across different modes of expression, including conventional print, sculpture, painting, drawing, acting, and choreography. These detailed, hands-on experiences are most beneficial when the participants have opportunities to reflect on them, to experiment with them in school settings, and to reflect on them again in subsequent professional development sessions. A frequently neglected but vitally important ingredient in professional development is students’ active participation. For example, they can attend some of the before-, during-, or after-school sessions; join related discussions; articulate their experiences; and reflect on these experiences with the intent of suggesting ways of improving small-group interactions and transmediation efforts. The teacher-researchers in Mills and Jennings’ (2011) study shared with students Daniels’ (2001) video titled *Looking Into Literature Circles* and also engaged students in analyzing audiotapes of their literature circle discussions. These activities promoted reflexivity, helping students (and teachers) “to study themselves to outgrow themselves individually and collectively” (p. 592). Not surprisingly, these efforts resulted in the improvement of literature circles, and similar energy can be directed toward making small-group, multimodal interactions more productive so that students’ engagement in different sign systems is more effective. Also beneficial to students’ learning needs is to incorporate these professional development efforts into an instructional framework that highlights a gradual release of responsibility from teachers to students (Pearson & Gallagher, 1983). Important components of this model of instruction include purpose for learning, teacher modeling or demonstration, guided instruction, student engagement in productive group work, and instructional goals that “move students to an *independent* level of mastery of the concept or skill being taught” (Fisher, Frey, & Nelson, 2012, p. 555). Furthermore, professional development should consider big-picture perspectives, involving online training modules, MOOCs (massive open online courses), digital badges, and other options for research training and professional development (Tierney, 2012). Additionally, November (2012) suggests that teacher educators, professional developers, and classroom teachers use Diigo (an

information management tool for collecting and organizing virtually anything), Jing (a program for immediately capturing images, recording videos, and sharing them with anyone), Wolfram Alpha (a computational knowledge engine), and Poll Everywhere (a service for gathering live responses in any venue including classrooms, presentations, and conferences). Of course, any of these approaches should be thoughtfully introduced and monitored, with a sense of where we expect education to be in the next several decades. Otherwise, these approaches will be reduced to hype cycles and fads.

Wallowing in uncertainty, grasping and connecting important parts to the macrostructure, engaging in productive group work, becoming involved in after-school programs, and supporting these and other efforts through effective professional development are among the ways of helping all students and teachers develop the patience, confidence, and reflective ability to successfully transition to different sign systems.

Some Closing Thoughts

Immersing students in collaborative conversations that support important translations from one sign system to another can nurture a greater appreciation for the value of each system, while increasing a social semiotic awareness of the many ways of learning and knowing. All students deserve this learning and teaching context, including English language learners, struggling learners, and reluctant learners. The classroom teachers, special educators, and creative specialists in Lotherington's (2011) study worked with English language learners, many of whom "had diagnosed learning challenges" (p. 165). Without bottom-up, segmented, decontextualized instruction, the children prospered with their engagement in such meaningful activities as reading and discussing an authentic novel and focusing on the main character's development. For example:

After the children had become familiar with [the main character's] life by reading the novel, they plotted it as a series of scenes and interpreted these in movement. This constituted a retelling of [the character's] life story in another genre—an excellent test of reading comprehension. The class developed a narrative script, and choreographed dance and dramatic moves to enact it...The story in movement was staged as a narrated shadow play, which involved scientific thinking to calculate the lighting for shadows against a screen. The performed shadow play was videotaped and programmed as a movie with narrated voice-over (Lotherington, pp. 163-164).

Thus, the children, including those with special needs, benefited substantially from their meaningful immersion in multimodal literacies, which nurtured their dimensional movement from textual understanding to multiple senses and expression modes. Although there is no guarantee that *equal success* will be achieved with all children who have special needs, they still deserve *equal access* to learning through multimodal literacies. As educators move in this direction, they increase the chances that their community of learners will maintain substantial interest in learning and also will demonstrate growth and development in a variety of literacies.

In terms of the inclusion of transmediation as part of everyday teacher practice that can be readily adapted for a continuum of learners, we must, finally, acknowledge the Common Core Standards (<http://www.corestandards.org/>) that are being rolled out in schools across the nation and their potential to alter the literacy landscape. The academic standards for English language arts span grades kindergarten through twelve and are the outcome of the collective efforts of the National Governors Association Center for Best Practices and the Council of Chief State School Officers. The integration of these Standards is escalating in importance with most states shifting teacher practice by aligning textbooks and assessments to them. Two examples of common-core standards in grades 11-12 in the area of writing include these:

- (a) Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience
- (b) Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics

The interdisciplinary response channels these standards present to teachers offer secondary school students opportunities for transmediation to encode text for deep learning and scaffold through levels of cognitive complexity as well as mix stimulus formats to promote neuroenhancement. For example, let us take Lincoln's 1861 *First Inaugural Address* as an anchor foundational nineteenth-century document. To begin, students can read the speech (which includes such poetic lines as "the mystic chords of memory, stretching from every battlefield and patriot grave to every living heart and hearthstone all over this broad land, will yet swell the chorus of the Union") as hypertext on the Library of Congress website (www.loc.gov) or on the Papers of Lincoln website (<http://www.papersofabrahamlincoln.org/>). They then can transmediate as well as mix stimulus formats by "reading," as complementary text, Winslow Homer's illustration of the event which appeared in *Harper's Weekly* (the most popular American newspaper during the Civil War known for its striking illustrations). Further mixing in processing modes, they might decode multiple images of Lincoln including photographs, oil paintings, and sculptures becoming encouraged to interpret his image by crafting a composite of their own. These experiences can be supplemented by the "moving image," specifically Ken Burn's *Civil War* PBS video which includes references to the inaugural event or the 2012 Stephen Spielberg film *Lincoln*. These practices may be further neuroenriched by guided listening to a performance (available on www.YouTubecom) of the 1942 orchestral work *Lincoln Portrait* by American composer Aaron Copland, a musical interpretation (itself somewhat of a transmediated work because of its mixing of orchestral and vocal music traditions with spoken narration) on the life and accomplishments of Lincoln. Students can compare, contrast, and critique all these diverse artifacts, differentially recording their responses using audio or video podcasts, blogs, a documentary, or another digital product publishable on the Internet. They can curate an exhibition in an online museum which contains their Lincoln images and prepare a cyber-guide about its e-installation.

It is important to remember that these divergent learning experiences are not all equivalent in scope and depth, and students will need to engage in more metacognitive thought to grasp intertextual relationships (Mills, 2011) because, in a sense, each sign-system uniquely retells the story. This tapestry of multi-modal, pantextual activities, embracing a host of sign systems, can not only deepen students' comprehension of American history but also expose them to an array of resources affording flexible learning platforms richly leavened by visual, aural, and motor neurointegration. This, in turn, reinforces the belief that all these sign-making systems contain dynamic expressive possibilities that can amplify conceptual understanding. It is in ways like these that we can seize multiple opportunities for immersing students in multimodal learning. Short, Kauffman, and Kahn (2000) write of their practices of having children respond to literature using multiple sign systems. They cite the benefits of such an approach including the creation of a larger pool of ideas, the opportunity to think more broadly as well as think through feelings, in effect calling upon executive functions. Children, they write,

could more fully enter into and reflect on the story world because they experienced it from so many perspectives...By engaging in transmediation across sign systems, they were encouraged to think and reflect creatively and to position themselves as meaning makers and inquirers. They were supported in gaining new perspectives and creating new visions about literature and life (pp. 170- 171).

What better testament to 21st century literacy education than to not only acknowledge but also celebrate the multiple, sign-sensing pathways students can now encounter. By creating, presenting, and using these pathways to promote meaningful generative thinking, we ensure that abundant opportunities for intellectual advancement will persist. This, in turn, will build a knowledgeable, sophisticated, and literate society where the life of the mind and its myriad meaning-making possibilities will help all of us continue to make sense of the ever-changing and ever-challenging human experience.

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