Sensory literacies, the body, and digital media

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The human senses have always been vital to literacy practices but are seldom acknowledged within literacy studies in education. Historically, the senses have been central to the aesthetics of representation across cultures (Howes & Classen, 2014). The senses are essential to everyday communication practices, necessitated by an expanding range of new technologies that interact with a greater range of the sensorium. Devos (2014, p. 68) contends: "Sensory perception constitutes the primordial channel through which a person acquires knowledge about the material world." So too, the senses are primordial to channels of communication with the world and with others. What is needed in current understandings of literacy practices is systematic attention to the role of the full sensorium evoked in the process of meaning making.

In this chapter, we build up examples of the sensorial dimensions of reading, extending Mills' (2016) theory of sensory literacies to focus on the role of haptics and interpretive meaning-making possibilities with interactive tablet e-books. The theory of sensory literacies concerns the multisensorial nature of literacy and communication practices that varies across cultures, practices, and technologies. This theory extends ongoing work located in sensory studies more broadly and draws on an anthropology of the senses. Some of the key principles include as follows: (a) the prioritization of the role of the human body in communication practices; (b) a recognition that the mind is not separate from the body, nor the role of the body taken for granted, but mind and body are seen as integral to literacy practices; and (c) a critique of Western hierarchies of knowledge, which privilege the visual over other forms of perception and expression, at the expense of researching the whole body in communication practices.

Of particular interest is the neglected realm of the nonvisual senses, including haptic communication (involving touch), olfaction (smell), taste, and locomotion (Mills, 2016). This has been demonstrated through sensory ethnographic research in which kinesis—movement of the body, limbs, hands, and feet—was central to the digital filmmaking of Indigenous and non-Indigenous children (Mills, Comber, & Kelly, 2013). The children filmed themselves as they glided down slides and balanced on walls, or used breath to blow dandelions. Walking feet and climbing bodies were salient in the children's films, essential to both the process and product of text making. It is timely for literacy educators to attend more consciously to the senses in the study of communication practices in everyday life and in education sites.

There has been an upsurge of agreement among philosophers, sociologists, ecologists, ethnographers, and sensory anthropologists that the role of the body must be taken into account seriously in

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theories of knowing, perceiving, and practising (Howes, 2003; Pink, 2009). The burgeoning sensorial turn in literacy studies has been foregrounded by a paradigm shift across the social sciences. This shift is a critique of ocularcentrism, which privileges what is seen with the eyes over other modes of perception. As Howes (1991, p. 3) argues, a central tenet of sensory studies is to recognize the "visual and textual biases of the Western episteme." It is only by beginning here that "we can hope to make sense of how life is lived in other cultural settings" (p. 3). Likewise, from the perspective of "sensory literacies," it is only by understanding the hegemony of sight that we can hope to make sense of how the full sensorium is intimately involved in communication (Mills, 2016).

Here, we focus on the role of the affordances of the touch screen and interactive e-book design in the process of navigating the text to make meaning. We also highlight examples of the sensorial dimensions of primary classroom literacy practices, including handwriting lessons and process drama. In doing so, we aim to expound a revitalized way of conceptualizing the multisensoriality of literacy practices in an era of new communications and new pedagogic possibilities.

Dominance of the Visual

The privileging of sight has blinded literacy theorists to the central role of the senses in communication, such as touch and kinesis (movement, including movement of the feet). Societies and cultures ascribe varying values and meanings to different sensory perceptions and experiences (Howes & Classen, 2014). An historical view of the senses affords an appreciation of why the senses matter to literacy practices, why they have been ignored for so long, and why they matter now. In Western society, there has been a long period of empiricism in which objective truth is determined by what can be observed through the eyes. The dominance of the visual mode over other forms of human perception has influenced many disciplines (Howes, 1991; Porteous, 1990). However, societies and cultures beyond the West have given attention to a range of multisensorial experiences, including sight, sound, touch, movement, smell, and taste. For example, Feld (1991, p. 81) elaborates the varieties of Kaluli drum sounds of the Southern Highlands of Papua New Guinea that actively "embody deeply felt sentiments" of the Kaluli—a symbolic system, based on a socially organized acoustic assemblage.

Yet even in early Western history, such as in ancient Rome (500 BC–500 CE), attention was given to the senses and to social identity, including cultural meanings that extended well beyond vision. There was a close connection between the senses and social status, and social outsiders were linked to unacceptable sights, smells, and sounds associated with manual labor and dirty work (Toner, 2014). In the second half of the Middle Ages (1000–1450), sculptures were often created to evoke emotions through the senses of touch and sight, such as through the practice of liturgical dramas for pilgrims (Palazzo, 2014).

During the period of the Enlightenment (1650–1800), the flow of printed materials from the presses increased impressively. This was a time of accelerated literacy rates and the role of vision gained prominence for accessing specialized knowledge. Yet the intensification of the role of vision did not occur in isolation from other senses, as talk was still vital for gaining news and information in the taverns. Listening and speaking practices, such as reading aloud and listening to sermons, were important forms of learning. Significant social meanings were attached to the sounds of bells to mark worships, births, deaths, and other announcements in townships (Rath, 2014).

In contemporary societies, sensorial and embodied actions in social life are performed everyday, such as in occupational (Green & Hopwood, 2015) and domestic duties of many kinds (Wall, 2010), in exercise and recreation (Headrick Taylor & Hall, 2013), and in the performance of the arts (e.g., Wilf, 2010). The role of the senses and the body has been acknowledged in literacy practices, such as in writing with technologies (Haas, 1995), digital video production (Potter, 2010), claymation figure making (Mills, 2010), filming places and playgrounds (Mills et al., 2013), and tablet technologies (Flewitt, Kucirkova, & Messer, 2014; Walsh & Simpson, 2014). The increased focus on the senses has

been called a sensual revolution or paradigm shift that has sought to focus on the corporeality of social interaction (Howes, 2003).

Touch across Cultures and Time

Touch has only recently received attention in literacy studies and semiotics (e.g., Bezemer & Kress, 2014). This may be attributed in part to changes to the materiality of the book and associated changes to the sensorial engagement of the body in the interpretative practices of reading and literacies (Do Rozario, 2012; Mills, 2016). Irrespective of the dematerialization inherent in many historical accounts of literacy practices, touch has always been an important means of communication across many cultures and throughout history. In modern psychology of the West, touch is critical in a baby's first experiences of the world, particularly through sharing physical contact with a mother's body, which influences a child's thoughts and feelings throughout life (Ong, 1991). Touch is considered vital to the construction of a child's first utterances. This is not only true of Western society. A conspicuous example of touch in infant life is a Moroccan ritual in which a mother and her new baby are rubbed daily with a mixture of henna, mastic, oil, sugar, marjoram, mint, sugar, walnut bark, and kohl. The crying child is held above the smoke of burning incense, providing a rich sensory experience associated with protective touch and soothing aromas (Griffin, 1991).

Touch has been ascribed many complex and contradictory meanings throughout history, denoted by Aristotle as an elementary form of sense, functioning through direct contact, like taste, and essential for well-being. Yet touch is also deemed morally inferior to the other senses (Synnott, 1991). For Aristotle, touch and taste are animal senses. So too, in the 1900s, the visual work of paintings was always regarded more highly than the technical craftwork required to prepare the canvas or frame the artworks. Sight was regarded as more noble than touch, and the artist more visionary than the common craftsperson (Daley, 2014). The Greek or Cartesian dualistic separation of the mind and body has continued to influence many disciplines. Disembodied accounts of communication, learning, and reading reflect a centuries-old epistemology that places knowledge obtained through reason or cognition above knowledge that is derived through the senses. Such accounts render invisible the bodily dimensions of lived experiences (Green & Hopwood, 2015).

The advent of touch screen technologies, such as tablet and smartphone apps, have opened up a range of playful potentials for children's sensorial literacy learning with digital media, and these interpretive potentials differ from the kinds of touch that are involved in reading conventional printed books. Many video game technologies are now responsive to much more than pressing buttons on the game controls, including swiping, tapping, dragging, shaking, and tilting. This can be accompanied by human breath and voice activation. Motion sensing technologies in games are responsive to the users' whole body movements, including the movement of the hands and feet. As Mills (2016, p. 39) has argued, "It is not that the technologies of communication have made the senses matter for the first time to literacy practice." Rather, the context of increased affordances of multisensory response technologies has highlighted how "bodies…are central to the practical accomplishment of literacy" in its widened array of forms (Mills, 2016, p. 139). As the advent of the printing press afforded new status to the sense of vision in the hierarchy of the Western episteme, so too do digital technologies afford new status to the senses of touch and movement.

Sensory Elements of Tablet Picture Book Apps

Sensory literacies are readily appreciated through digital media and concomitant new bodily engagement with multimodal text and interpretative practices. An example of this is the exploration of picture book apps designed for touch devices such as tablet computers or smartphones. Many

picture book apps are adaptations of existing picture books, although some have been developed independently of book versions (Sargeant, 2015). Picture book apps are stand-alone mobile applications as distinct from e-books or animated e-books, which require reading apps (Zhao & Unsworth, 2017).

A defining feature of picture book apps is their interactivity, entailing the bodily engagement of their readers, most significantly for sensory literacies, through physical interaction with the touch screen. The touch design involves touch-sensitive areas of the screen, in the form of buttons or hotspots, that can be activated through finger movements, such as tapping, swiping, and drawing the thumb and fingers together in a pinching movement on the screen. Conversely, haptic interaction can involve moving the thumb and fingers apart from a closed position, as well as by larger movements, such as shaking the mobile device. Recent research has begun to explore the meaning-making potential of this aspect of interactivity in negotiating the interpretive possibilities of picture book apps (Zhao & Unsworth, 2017). Here, we compare a picture book app with the paper version from which it was adapted to show how bodily engagement through the touch design of the app involves the reader in constructing interpretive possibilities for the narrative in ways that are distinctively different from those available through reading the book version.

Firstly, we outline the typology of "touch interactives" in picture book apps described by Zhao and Unsworth (2017). We illustrate these in the picture book app of *The Heart and the Bottle* adapted from the picture book of the same name by award-winning author, Oliver Jeffers (2009). We apply systemic functional semiotic (SFS) accounts that elaborate the metafunctions or dimensions of meaning in texts (Halliday & Matthiessen, 2004; O'Halloran & Lim, 2014).

Two kinds of touch design were identified by Zhao and Unsworth (2017). The first involves "extratext" interactivity. An example of this is a hotspot in the form of an icon of a microphone, which signifies its functionality in activating an audio recording. The second kind of touch design is "intratext" interactivity—interactivity that is not just a function of the technology, but a resource for making meaning within the narrative context of the picture book app. These hotspots are typically part of the images that are the characters or background in the visual portrayal of the narrative. For example, in *The Heart and the Bottle*, when the app user drags the little girl toward the top of the screen, she gradually turns into a grown-up, and a bottle appears around her neck. In this book, the "extratext" touch design includes a "hint" button, which when tapped produces a dotted line indicating the intratext hotspot and the type of touch gesture required for activation. While a detailed account of touch design in picture book apps is provided in Zhao and Unsworth (2017), in the discussion here, the focus will be on intratext touch design and the activation of sensory literacy experience. In intratext touch design, the interactivity is not simply a function of the technology but is also a resource for making meaning in the context of picture book apps. Physical tapping or swiping of the screen, for example, is also a semiotic or meaning-making action, and hence, integral to interpretive processes of sensory literacies.

The story of *The Heart and the Bottle* portrays a little girl's journey through grief as she grows to adulthood. In the orientation the reader is introduced to an unnamed white girl "whose head was filled with all the curiosities of the world." She was close to a paternal figure depicted in the drawings—perhaps her father or grandfather—with whom she shared her rich intellectual and emotional life. Then the little girl finds an empty chair where he used to sit, symbolizing his death. Unsure how to deal with the grief, the girl put her heart in a bottle. The girl is then depicted as a fully grown woman with a heart in a bottle hung from her neck, who "was no longer filled with all the curiosities of the world." She tries and fails repeatedly to get the heart out of the bottle. Eventually, she meets another curious little girl who takes the heart out of the bottle for her. The ending of the story shows the woman able to enjoy a rich inner life again.

The intratext bodily interactivity in the app augments the visual experience of the static images in the book in a number of ways. First, gratuitous additional action occurs when touch initiates

peripheral actions not shown in the book. Second, revelation involves touch-activated appearance of image elements present in the book version. Third, elaboration activation occurs when touch makes static depictions of processes dynamic. Fourth, elaboration explication involves the dynamic depiction of a process that is implied but not explicitly portrayed in the book. Fifth, extension refers to the touch-activated appearance of characters and/or processes additional to their portrayal in the book. Finally, changing ambience occurs when touch changes the color of the app images.

The actions of touching, swiping, and shaking the screen result in intratext interactivity augmenting the static images in these various ways to construct three different kinds of meanings. SFS accounts of the meaning-making resources of language and images propose that all instances of language use and all images simultaneously communicate three dimensions of meaning: ideational, interpersonal, and textual. Ideational meaning refers to material and mental processes, the characters who engaged in the processes, and the circumstances in which the processes occur (Halliday & Matthiessen, 2004; Kress & van Leeuwen, 2006). Interpersonal meaning concerns the nature of the relationships among the characters in terms of their interactive roles, their relative power and status, and the evaluative positions characters assume in relation to what is being communicated. Textual meanings deal with the relative emphasis or prominence of visual or verbal elements and the ways in which the text is constructed as a cohesive whole.

In most of the *elaboration* and all of the *extension* instances analyzed in the app, the touch action of the reader initiates the visual communication of a process in which the main character, the girl, is doing, seeing, thinking, or feeling. This physical participation of the app user in the semiotic representation of the story may increase the reader's involvement and identification with the main character. For example, an image is shown where the girl tries the saw, drill, and several other tools to break the bottle. The app user is physically involved in depicting these ideational meanings through touch initiation of the sawing and drilling processes (i.e., elaboration as explication). But this bodily participation also invokes interpersonal attitudinal meaning through a sensory involvement in the determination and growing frustration of the character.

In the example of *extension*, the user, through touch, accesses many more processes in which the main character is involved and is hence vicariously participatory in those processes. For example, if the reader successfully traces the pattern in the stars indicated in the speech balloon of the paternal figure, as the two stare at the night sky, a realistic image of what the star pattern represents appears in the child's thought/speech balloon. Several such opportunities occur. It is as if the reader is participating in the activity as the girl with her loved one.

As the reader shakes the tablet, the character shakes the bottle, so again the user engages bodily in the construction of ideational meaning through vicariously participating in the process with the character. This pseudo participation in events as the character also tends to more strongly invoke interpersonal meaning in terms of affect. Examples of this include the satisfaction the reader can experience in achieving the recognition of star patterns or the determination and frustration of the reader when trying to shake the heart out of the bottle. This seems to be a kind of kinesthetic focalization that positions the reader's point of view as being aligned with that of the main character.

This kinesthetic focalization is also emphasized in the role of the reader in changing the ambience or color of the images through touch in several places of the book. For example, the reader's role is to rub his or her fingers over the screen to cast a shadowy, muted, and dark overlay onto the image of the room with the empty chair.

This positions the reader in a form of vicarious experience of the sadness that has come over the girl's view of this room. After painting over this scene, there is only a fraction of the former light, with only the warm red, pink, and brown colors on the top part of the empty chair resisting the shadowy effect. Similarly, the ability of the reader to erase the entire image of the stars and sea becomes a metaphorical expression of these phenomena being virtually wiped from the young girl's consciousness.

There is also at least one very stark instance in the app of difference in compositional meaning from that of the book. This follows after the girl had tried the saw, drill, and mallet to break the bottle, and the narration indicates that "…nothing seemed to work." On turning the tablet "page," the reader is then confronted by the girl standing on the edge of a very high wall.

Unlike the book, the bottle is nowhere in sight in this first tablet image. This seems to invoke the possibility of a suicide attempt. It is not until the "hint" (touching the girl) is enacted by the app user that she produces and drops the bottle. This, of course, is very different from the book, which conveys this sequence by juxtaposing two images of the girl standing on the same wall: The first showing her holding the bottle, and the second showing her outstretched arm and the bottle hitting the ground.

While the interpretive possibilities of the book and the app of *The Heart and the Bottle* are not discrepant, they are also not isomorphic. However, the sensory literacy practices in exploring these possibilities are certainly very different in experiencing the book and the app versions.

The new sensory potentials of e-books and other technologies have also prompted changes to the design of printed books. A novel example is the children's board book *Press Here*, by Hervé Tullet (2010). The book mimics the features of tablet e-books by instructing the reader to "press here" on a simple yellow dot framed by an expansive white page. The reader turns the page to reveal two identical yellow dots. The written text offers praise, such as "*well done,*" as if pressing has resulted in the duplication of the dots. Tullet's (2010) book continues to invite different forms of tactile engagement—"*rub the dot on the left…gently*" (p. 4), "*try shaking the book*" (p. 9), "try *blowing on them*" (p. 18), and "*…clap your hands…*" (p. 21). With each new page, the dots are dispersed as if shaken, gathered to one side as if tilted, and so on.

Accordingly, the book becomes a pastiche of children's contemporary haptic engagement with a tablet, mimicking simple "cause-effect" physics to expand conventional tactile relations between the user and the book. Sensory engagement with children's reading materials is not exclusive to touch screen technologies, but digital texts evoke different kinds of sensorial and haptic affordances, and there are certainly possibilities for the interplay between digital and nondigital textual formats. There are also limits to the varieties of sensory literacy experiences that are possible in educational institutions, and these are discussed below in relation to the regulation of the senses.

The Regulation of the Senses for Literacy Learning

Technologies mediate the sensoriality of language practices in highly politicized, regulated, and institutionalized learning environments. In the nineteenth-century schools, like armies, factories, prisons, and modern museums, "the sense of touch was disciplined, the sense of taste controlled…" (Classen, 2014, p. 16). The uniform seating of children or prisoners in rows has been likened to the rows of letters and words on the printed pages from the printing presses of the era (Classen, 2014, p. 16). Even today, schools continue to be an apparatus that regulates how the senses are proscribed and prescribed for literacy learning. In the context of schooling, the body of the young child as a reader and writer is shaped by the social and institutional forming of the schooled subject as the student learns to sit still, listen, and "perform" reading or writing. For example, Luke (1992) described and theorized the literate bodies of Year 1 students (ages 5–6 years) during a whole-class book reading on the mat demonstrating how literacy practices are inscribed in and on the bodily habitus. Teachers observe the children's bodily engagement with the text and "inscribe and read the student body as the surface of the mind" (p. 118).

As another example of the multiplicity of sensorial practices and the dominance of particular actions over all others, we turn to a handwriting lesson—lower case letter to upper case letter transcription—observed in a low-socioeconomic, multilingual, multicultural classroom in France.

Observational data were collected and translated into English by French researcher Richard-Bossez and analyzed by Exley and Richard-Bossez (2013). The researchers were interested in these transcripts for the way seemingly routine lessons not only employ multiple sensorial practices but also make complex demands of young children as they participate in writing lessons within the institute of schooling.

Visual identification of congruence between lower and upper case letters is often a focus of literacy teaching and learning tasks in the early years where the Latin alphabetic script is the medium of instruction. Aside from the focus on visual senses, during the teachers' instructional discourse on learning the alphabet, five-year-old multilingual, multicultural Francophone children from the *école maternelle* (nursery school) were required to listen to a story book being read by the teacher that contained the target vocabulary. Children were then required to individually complete a worksheet about lower and upper case letters used in the story book. The teacher provided the following instruction (Exley & Richard-Bossez, 2013, p. 350), asking the children to write the upper case letters in the word Yumi, which was written in lower case letters on a worksheet:

> …The alphabet, you've got it underneath in lower case and in upper case. So, if, for example, the [lower case] 'y', you don't know how to do it in upper case, you look for the [lower case] 'y' at the bottom, and underneath, it's in upper case. So, you look at the bottom if you don't know how to do the letter, OK?

However, the teacher's instructions did not stand-alone as text to be heard. Wall posters became part of the pedagogic discourse when a young boy questioned the teacher, literally asking in the original translation, "Upper case, how is it?" The children were required to internalize the visual cues of letter learning as the teacher pointed to a salt dough alphabet hung on the wall, "The upper case, it's the letters which are up there, in salt dough, up there" (Exley & Richard-Bossez, 2013, p. 350). During the independent transcription task, one child said the names of the letters and tried to sound them out. He then chatted to another friend about the French word "éventail" [fan], noting that no sound corresponded to the letter "n." He explained that it is a "dumb [silent] letter" but still must be written (Exley & Richard-Bossez, 2013, p. 351). Another girl asked, "How did you do the [upper case] 'I'?" and her friend responded, "Just a line." The little girl subsequently wrote a vertical line on her worksheet. A little boy began the writing task, commencing from the right end of the word, and working toward the left. The literal translation of the teacher's feedback was, "That is not the good way. Please begin to write from the left side" (Exley & Richard-Bossez, 2013, p. 351). Finally, another little boy sat with his thumb in his mouth. The teacher approached him with the instruction, "Get your thumb out of your mouth" (Exley & Richard-Bossez, 2013, p. 351).

In theoretical terms, through a pastiche of teacher instructions and resources, the teacher explicated both the conduct, character and manner required of the children's visual senses and embodied actions for regulative discourse, as well as the way the children's senses are put to work for mastery of the instructional discourse of letter formation. The role of visual senses, touching of learning materials, and unsanctioned self-soothing are regulated to meet the learning objectives. Children are also inducted into societal norms for the appropriate use of eyes, hands, mouth, and manipulation of materials. Accordingly, mastering the regulation of sensorial habits is interconnected in conflicting ways with the children's acquisition of knowledge and skills in the earliest years of school.

The Affordances of Sensorial Engagement with Literacy Learning

In contrast to the aforementioned practices, the importance of children's spontaneous tactile interactions with developmental toys and learning objects has been prominent in early learning and child

development theories (e.g., Montessori, 1991; Vygotsky, 1978). Until recently, the privileging of sight has blinded literacy theorists to the central role of the senses in communication, such as touch and kinesis (movement), including locomotion of the feet. The active participation of whole bodies—the eyes, the ears, the feet, the hands, and other organs—as well as active minds, are involved in communicating through many kinds of multimodal texts. The senses are essential to representing perceptions and knowledge of the world.

Another oft-used pedagogical strategy that capitalizes on bodily literacies for enhancing literacy learning is process drama. Process drama is a form of applied theater in which the children, together with the teacher, take on the role of characters to "constitute the theatrical ensemble and engage in drama to make meaning for themselves" (Bowell & Heap, 2005, p. 59). As shown in classroom lessons recorded by Exley and Dooley (2015), young children are not involved with rehearsing and performing lines from a prewritten play; instead, in process drama, the children are both the theatrical ensemble who creates the drama and the audience who views it. In a fairy tales unit with 4.5–5.5-year-old children, a classroom teacher introduced a series of reinterpreted fairy tale picture books. A reinterpreted fairy tale somehow "twists" a time-honored fairy tale to make aspects of a familiar story unfamiliar.

One picture book was the focus of the lesson, *Beware of the Bears* (MacDonald, 2004). This book begins where the modern-day version of *Goldilocks and the Three Bears* usually closes. The three bears return from an outing to find their home ransacked during Goldilocks' unauthorized visit. The bears decide to seek revenge. After finding out where she lives, they make an unauthorized visit to her home, wreaking a similar sort of havoc. Goldilocks enters the home, nonchalantly exclaiming that she's not the homeowner but trespassing yet again. A double page, wordless spread shows the bear family sneaking out the rear door while an unwitting wolf enters the front door. The wolf's reaction is captured in another wordless, double page spread. As is typical of the staging features of narratives in postmodern picture books, the reader must actively compose the ending from an amalgam of visual clues and knowledge of other texts. The children responded well to the humor in this postmodern picture book, spontaneously erupting with discussion about the choice of words and visual images (Exley & Dooley, 2015).

In the process drama activities that followed, the teacher asked the children to describe each character with an adjective, and to act out the adjective as they presented their character to the remainder of the class. For example, one child nominated "a happy Goldilocks," while showing a happy expression and skipping on the spot (Exley & Dooley, 2015). Embodied action became intertwined with spoken language as the key mechanism for "unmaking or unpicking" (Janks, 1993, p. iii) the ideological choices of the author and illustrator.

In another activity, the children worked in groups of three to "sculpt" each other from a "lump of clay" into a character statue. Touch and vision, either in unison or in syncopation, are the two dominant senses for a sculptor. However, in a point of departure, the teacher instructed the children to give one another oral instructions and descriptions about how they were being sculpted, rather than using their hands to "sculpt" their peers into different forms. In the regulatory context of the classroom, child-on-child touch was proscribed due to matters concerning personal safety and litigation when personal safety is breached. The verbal instructions to the children in role as "statues" substituted the sense of touch that otherwise would have been made available to the child sculptor, as well as the tactile perception that would have been made available to the child who was being sculpted. The dominant sensorial experiences became oral as instructions were translated into bodily forms, embodied as each child twisted and contorted their own bodies to better appreciate or demonstrate the pose. It also became visual as poses were watched and judgments were made. Digital photography was also used as a mechanism for documenting the artifact of the children's pseudo-haptic communication.

In another activity, the children returned to a scene from the picture book. They collaboratively used their own bodies to recreate a freeze frame of that scene. Again, no child-on-child touching ensued as each child took responsibility for their own pose. Once poses were judged and approved by the group members, each group of children presented their freeze frame to the class. The teacher used the process drama "tap-in" technique to bring one individual character to "life." Under this circumstance, the teacher was permitted to physically touch each child with a "tap," which served as the cue for the character to keep moving or to share an utterance that the character would make, until the teacher tapped the child a second time to indicate that the character had to return to the original freeze frame position. All characters were tapped into and out of life. Digital photos were taken of the freeze frames, uploaded to a software program, and edited so the character's spoken words were recorded as printed text. In this activity, bodies provided the communication for inferential comprehension of a picture book, touch provided the teacher with control of the action and dialogue, and digital media provided the resource to archive the children's embodied and oral demonstrations of inferential comprehension.

In total, when process drama was employed as a mechanism for children to respond to a shared picture book, the multiple sensorial literacies of sight, sound, touch, and movement permitted the participating children to enter characters' different subject positions and explore the possibilities of meaning making behind each character's action, thoughts, and reactions. Such activities enhance children's inferencing skills, moving beyond listening to a story or reading a story to becoming "with and in" the story.

The examples explored in this chapter suggest that what is needed in current understandings of literacy practices is systematic attention to the role of the full sensorium evoked in the process of meaning making. Of particular interest is the hitherto neglected realm of the nonvisual senses and their role in children's literacy learning.

Conclusion: A Democracy of the Senses in Literacy Learning

Reading, writing and process drama are embodied practices. Tactility and other sensorial and material dimensions of reading, writing, and drama have been neglected in literacy research (Paterson, 2007). This chapter has demonstrated how the sensorial engagement of the body is intertwined in meaning making with different material presentations of digital and print copies of a picture book and in handwriting and process drama lessons. The e-book version of the *Heart and the Bottle* and process drama activities that draw on *Beware of the Bears* invite the reader to participate with the body in sense-making through haptic affordances that open up a rich set of possibilities for vicarious sensory engagement with the feelings and perspectives of the characters. Similarly, the letter formation lessons demonstrate the sensory dimensions of handwriting, which can extend to the sanctioned and unsanctioned performances of the regulated body in writing classrooms. Haas (1995) has argued in relation to writing that "the body is the mechanism through which the mediation of the mental and the material occurs" (p. 226).

This principle is equally applicable to the reading and comprehension tasks when engaging with interactive e-books and process drama activities. In particular, the movements of the eyes and the hands are essential to reading practices. Reading can be more fully understood by attending to the materiality of the text and the related sensorial meanings and engagement of the literate body. Such accounts of literacy experiences can potentially free theory from a hegemony of sight to move toward a democracy of the senses (Berendt, 1992). There is scope for literacy research to attend more consciously to the forgotten role of the body and the senses, whether of touch, taste, smell, or locomotion, particularly in the digital context of use where new sensory possibilities are likely to emerge in the future.

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