Chapter 15
Using Tablet Technology for Multisensory Learning

15.1 Introduction

Because vision tends to be the dominant human sense, at least in the Western world, learning designs often focus largely on the visual—text and images—without sufficiently recognizing that some students learn best through other senses, such as hearing and touch or movement. Tablet technology readily allows teachers to use multisensory learning strategies, from apps that capitalize on the touchscreen technology and provide tactile/kinesthetic learning to audio technology capable of recording and producing spoken words and music.

The idea of multisensory learning draws on theories of multiple intelligences and learning styles. Neither are novel theories at this point, though both still evoke debate. Practicing educators, parents, and others who work in learning situations with children and adolescents, or even adults, know firsthand that individuals learn in many different ways. For learning designers, the challenge is to engage as many sensory channels as possible in order to accommodate the varied ways that students acquire knowledge and understanding.

Multisensory learning strategies and tablet technology also are key to working effectively with students with sensory disabilities. Tablets are inherently assistive devices, and adaptive features that are not already built in to most tablets can be added on, by using apps and after-market or companion tools.

The purpose of this chapter is to explore facets of multisensory learning in the context of learning design for tablet classrooms.

15.2 Multiple Intelligences and Learning Styles

Harvard developmental psychologist Howard Gardner proposed his theory of multiple intelligences (MI) in a 1983 book titled, *Frames of Mind: The Theory of Multiple Intelligences.* Gardner's idea is that individuals' pathways to learning

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follow certain identifiable modalities, or "intelligences." In the 1980s, this proposition contradicted the prevailing notion that intelligence is a single quality of mind. Most modalities align with sensory experiences. Originally, Gardner proposed seven intelligences:

- Musical—rhythmic
- Visual—spatial
- Verbal—linguistic
- Logical—mathematical
- Bodily—kinesthetic
- Interpersonal
- Intrapersonal

In later writings, Gardner added naturalistic and existential intelligences, and other writers have suggested additions and adaptations that need not be considered here. Suffice to say, this perspective finds resonance in learning theories and practices—particularly constructivism. Gardner himself has taken up the educational ramifications in various ways over the course of his career. For the thirtieth anniversary reissue of *Frames of Mind*, Gardner provided a new introduction, in which he suggested not only using multiple intelligences theory to individualize learning experiences but also to "pluralize" learning. Pluralizing, according to Gardner, involves teachers and learning designers in many contexts prioritizing topics or concepts and then presenting them in a variety of ways. According to Gardner:

> Pluralization achieves two important goals: when a topic is taught in multiple ways, one reaches more students. Additionally, the multiple modes of delivery convey what it means to understand something well. When one has a thorough understanding of a topic, one can typically think of it in several ways, thereby making use of one's multiple intelligences. Conversely, if one is restricted to a single mode of conceptualization and presentation, one's own understanding is likely to be tenuous. (2011, p. 7)

Both of Gardner's goals in this suggestion find iteration throughout this chapter. The same can be said of another approach to multiplicity in learning: learning style theory. Unlike MI, no dominant figure has emerged in learning style theory; consequently, there are a variety of style theories and approaches. David Kolb's (1984) model of information processing often is used as a starting point. Kolb offers a useful perspective, namely, that learners need to become proficient in recognizing how they learn best. He writes:

> By developing their effectiveness as learners…students can be empowered to take responsibility for their own learning by understanding how they learn best and the skills necessary to learn in regions that are uncomfortable for them. (2005, p. 209)

This idea strongly resonates with the constructivist notions underpinning this book. Ultimately, learning styles tend to be distilled into four modalities:

- Visual
- Aural/auditory
- Reading/writing
- Kinesthetic/tactile

These broad categories identify individuals' preferred ways to approach and acquire information. Some years ago, as a teacher of writing, I became concerned that most writing instructions were conducted as though all students learned best through a reading/writing style. While this seems logical as a learning design approach for teaching writing, in my experience, it does not accommodate many students' actual learning modalities. My goal, therefore, in *Teaching Writing to Visual, Auditory, and Kinesthetic Learners* (Walling, 2006) was to suggest that learning designs can approach the teaching of composition—though it is inherently reading/writing—in alternative ways to better match the learning styles of students for whom a reading/writing style is an ill fit.

Multiple intelligences theory and learning style theories, despite long, practical use in classrooms, not only in the United States but in many other parts of the education world, are still contested. Critics point to a lack of proof, of empirical research in both cases. But, after all, that is the nature of theory. Most rational theories—theories that are largely confirmed by practice and observation—are at least tentatively adopted *during* the search for proof or until they can be proven wrong. Darwin's theory of evolution, for example, remains to be conclusively proven, although a great deal of evidence in support of the theory has accumulated. Most scientists act as though the theory is correct, absent conclusive proof that it is not, even as it continues to be hotly debated.

So, it is with theories of multiple intelligences and learning styles. In their broadest outlines, they make sense. They resonate with educators' and observers' experiences with learners, including themselves. Learning designers can draw on these ideas without being wedded to the nuances or being drawn into the debate over whether they have been sufficiently researched. These theories are philosophical rather than scientific—at least from the standpoint of learning design, which is as much about art as it is about science.

15.3 Multisensory Tablet Functionality

Tablet computers are up-sized smartphones without the phone function. Most students (77 % of 12- to 17-year-olds) at this time do not own personal tablet computers, but increasing numbers are learning in schools and classrooms that supply tablets. One reason that tablets are catching on so quickly is that they are an immediate "fit" for young people. This is where the comparison to smartphones is important. According to Pew Research, 78 % of teens (ages 12–17) have cell phones. As of 2012, 37 % of all teens have smartphones, up from only 23 % in 2011, a scant year earlier. Among teens with smartphones, fully half report using their phones as the main way they access the Internet (Madden et al., 2013). All of these figures appear to be on a steep rise as time goes on.

Tablet computers are an easy transition from devices that many students already use, and for others, it usually is a quick learning curve. This is one reason that it is simplistic to view the tablet device itself—a high-tech toy to some critics—as the main draw.

Interest more likely derives from functionality and is sustained by student interaction with the device's features. Susan Linn for the Campaign for a Commercial-Free Childhood is opposed to electronic toys, in general but for the very youngest learners in particular. Her notion is, "The best toy is 10 % toy and 90 % child" (Szabo, 2011). Philosophically, I agree; and the notion should apply to learning tools of all sorts for students of all ages. Tablet computers are not merely high-tech toys. They are toolboxes for learner engagement. As education blogger Justin Reich writes, "In the best iPad classrooms, students are constantly making things" (Reich, 2013). That sounds like 10 % tablet, 90 % student.

When learning designers fully use the multisensory functionality of tablet computers, students work through problems, talk aloud to themselves and others, record their work using tablet microphones and cameras, record videos of lab experiments and art project and processes, develop multimedia reports and presentations, facilitate historical reenactments, and engage in all sorts of creative learning. "A big part of what they are doing," says Reich, "is documenting their learning." Reich also comments that such creative learning endeavors "evoke ideas from Project Zero's Making Learning Visible and Visible Thinking programs" (Reich, 2013). Founded at the Harvard Graduate School of Education by philosopher Nelson Goodman in 1967, it is no coincidence that Project Zero was codirected by Howard Gardner (with David Perkins) from 1973 to 2000, the period in which Gardner formulated his theory of multiple intelligences. Readers who want more information about Making Learning Visible should visit the website at http://www.mlvpz.org. The Visible Thinking project also has a website at http://www.visiblethinkingpz.org.

Built-in functions and apps put into students' hands an optimized devise that can facilitate learning in any preferred style or dominant intelligence. Tablets support reading and writing; looking at and creating still and moving images, whether graphic or photographic; hearing live or recorded speech, sounds, and music and recording same; and touching and moving objects or even drawing or painting electronically using the touchscreen. Virtually all of these multisensory functions support and encourage creativity and active construction of knowledge and understanding.

At root, however, is the learning design. Tablets are toolboxes. "Technology does not necessarily improve education," as Gardner and many others have pointed out (Veenema & Gardner, 1996, p. 69). But, as Shirley Veenema and Howard Gardner also say so clearly in their 1996 article, well before the innovation of tablet computing, "If we believe that the mind is neither singular nor revealed in a single language of representation, then our use of technologies should reflect that understanding" (p. 73). That is precisely what the tablet is capable of doing.

15.4 Adaptive Tablet Technology

Tablet computers come equipped with a number of built-in features that allow learning designers to tailor device functionality to meet the needs of students, including those who have serious physical challenges. Three of the five senses—visual, auditory, and kinesthetic, omitting taste and smell—provide a useful way to categorize the principal adaptive features. There are many types of tablets now available, and some share similar functions. The examples in this discussion refer to the most often adopted tablet, Apple's iPad.

Visual. For students with impaired vision, an essential function on the iPad is Speak Selection, which allows the device to read aloud the student's messages, e-mails, e-books, and so on. This function works across applications and can be adjusted in terms of dialect and rate of speech. Voice Dream Reader (http://www.voicedream.com) is an inexpensive iPad app that can provide an enhanced experience: 60 voices, 20 languages, and seamless text navigation.

Another built-in function is VoiceOver, a gesture-based screen reader. Students with impaired vision cannot rely on tactile cues from the smooth glass of the iPad touchscreen, and so VoiceOver provides a spoken description of everything on the screen. Students are told which app they are touching and can find text, images, and other visual elements they may not be able to see.

Siri (on iPad 3 and later) is a built-in personal assistant that uses voice prompts. This function permits students to set reminders, send messages, and look up information. It requires Internet access for at least some functions, however. But it is integrated with VoiceOver.

Dictation (on iPad 3 and later) is a function that converts speech into text for students who cannot see to use the onscreen keyboard. Zoom is a built-in magnifier for students who simply need text and images to appear larger.

Finally, a number of Braille displays and keyboards are available as add-ons to the iPad for visually challenged students. These are wireless devices that link to the tablet using Bluetooth and most integrate with VoiceOver.

Auditory. For students with impaired hearing, a useful function is FaceTime. This video function is standard on iPads with cameras (iPad 2 and later) and allows students to communicate face-to-face with teachers and others across the hall or around the world using a Wi-Fi Internet connection.

Mono Audio is a function that converts stereo to play both audio channels in each ear, which can help students who are deaf or hard of hearing in only one ear. The sound also can be balanced to match hearing differences in a user's ears.

Closed captions are supported on the iPad and available in many education products, such as podcasts and videos. Apple also suggests that GarageBand, available as an iPad app, "can help improve comprehension among deaf and hard of hearing students—particularly those adjusting to new cochlear implants" (see http://www.apple.com/education/special-education/ios/#hearing). Garage Band is a music and voice recording program that comes standard on most Mac computers.

Kinesthetic. Assistive Touch is a built-in function that helps students with limited motor capabilities use the touchscreen effectively. The function reduces the tablet's many gestural commands—such as multiple-finger pinch and swipe gestures—to a simple finger tap. Gestures such as shake and rotate can be made available even if the tablet is firmly mounted to a desk or a wheelchair.

Siri and Dictation, described previously, also are functions that can assist students with motor challenges because they permit voice commands with minimal touch.

The numerous built-in adaptive functions, such as these described for the iPad, should answer most concerns about whether students with sensory physical challenges can participate fully in tablet classrooms. Learning designers also can apply these functions in working with all students to enhance multisensory learning.

15.5 Summary

Options abound in tablet classrooms for learning designers to engage students in multisensory learning. Awareness of multiple intelligences and learning style theories can set a foundation for thinking about how to use tablet functions and apps that go beyond the dominance of the visual to tap auditory and kinesthetic learning options and strategies.

Another frame of reference for learning design is to think of tablet computers as up-sized smartphones, albeit without an actual phone. Smartphone functions are familiar to many students, and so the transition to tablet technology can be virtually seamless. This is increasingly true for even quite young learners and essentially is a given for high-school and college students. Easy familiarity can enhance students' access to learning designs that focus on construction of knowledge and understanding. Echoing Susan Linn, quoted earlier, multisensory functionality helps to ensure that learning designs can be 10 % tablet and 90 % student.

Finally, tablet computers, especially as exemplified by the dominant brand, Apple's iPad, can be adapted to help students with sensory challenges, such as impaired vision, hearing, or motor function. The tablet technology toolbox has tools such students need to engage fully in technology-mediated learning activities. Adaptive functions built into the tablet or added on using apps or after-market devices level the teaching and learning playing field for all students.

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