

Learning Goals

Grades: K–12

All subjects: improved comprehension; improved retention; multimodal learning; selecting appropriate technology for learning task

Using broadband multimedia, educators can teach to the different ways in which the brain learns and reach every child effectively.

Digital Learning

by David H. Rose, Ed.D., and Anne Meyer, Ed.D.

I say to you today, my friends, that in spite of the difficulties and frustrations of the moment, I still have a dream. It is a dream deeply rooted in the American dream. I have a dream that one day this nation will rise up and live out the true meaning of its creed: “We hold these truths to be self-evident: that all men are created equal.”

Most of us easily recognize this passage as text from Dr. Martin Luther King Jr.’s “I Have a Dream” speech. We would recognize the passage even more quickly if we could hear Dr. King’s voice or see the scene on videotape or on the World Wide Web. Although one might argue that the literal content of “I Have a Dream” remains the same whether it is presented as text, speech, or image, it is clear that each medium produces a qualitatively different effect. The textual version of Dr. King’s speech contains the words, powerful and evocative. The audio offers vocal cues—intonation, pauses, volume, and pitch—tools this eloquent orator used very skillfully to convey the meaning of his message. The video version adds to the vocal cues a variety of visual ones, such as Dr. King’s gestures and facial expressions; the large, responsive audience; and the majestic setting on the Mall in Washington, D.C.

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Traditional Instructional Media

Text, speech, and images—the traditional media for teaching—are so ingrained in our methods and curriculum that we rarely pause to consider which to use in a given situation. Instead, we usually select what we have chosen in the past or what is convenient now. However, as Dr. King’s speech illustrates, these media have very different things to offer. In fact, a closer look at the unique

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“Digital media surpass traditional media in their ability to meet students’ needs in a variety of instructional contexts.”

characteristics of each medium reveals that barriers to learning do not necessarily lie within a student’s physiological or psychological makeup. The barriers arise at the intersection of the task, the student’s strengths and weaknesses, and the instructional media and tools.

Many classrooms continue to be dominated by a single inflexible medium—printed textbooks. We categorize as disabled those students for whom a printed textbook or a lecture are difficult or impossible to use. We then prescribe for them special goals, teaching methods, and materials—often with a remedial focus. Even students able to access text are missing out because we know that there are other media more suitable for communicating particular kinds of material, and for deepening particular students’ engagement with that material.

When selecting a medium for teaching, we should consider whether it is appropriate for the particular content or activity. But the selection process does not stop there. We also need to consider the strengths, weaknesses, and inclinations of each student’s brain networks for learning (see box, pg. 22), and the particular demands each medium makes on these networks. New electronic media offer the opportunity—and we believe, the obligation—to re-examine old assumptions about teaching media and their impact on learners.

The Power of Digital Media

Although digital media also represent information through text, sound, and images, the similarities to traditional media end there. By virtue of one essential feature—flexibility—digital media surpass traditional media in their ability to meet students’ varied needs in a variety of instructional contexts. Digital media can save text, speech, and images reliably and precisely, and yet they offer tremendous flexibility in how and where those text, speech, and images can be redisplayed and adapted. Further, the inherent flexibility of digital media makes it possible to create curriculum with embedded learning supports that can, in turn, be individualized. This is very useful to teachers with diverse classrooms.

Four aspects of digital media’s flexibility are particularly beneficial for classroom application.



Digital media are versatile. Unlike a printed book, digital media can display content in many formats—text, still image, sound, moving image, or any combination of these. What’s most exciting is that this versatility offers students the chance to work in a preferred medium or interact with multiple media simultaneously. In a digitally equipped class studying Dr. King’s “I Have a Dream” speech, for example, a student with reading problems, a student with a preference for visual material, and a student who loves to read could access the material as speech, video, and text, respectively—or in

The Brain's Learning Networks

The complex organization of the cortex—the deeply fissured and folded gray matter that forms the outer layer of the brain—gives it a central role in learning. The approximately one trillion neurons in the cortex are linked by approximately 10 trillion connections, creating an incredibly dense network. Within this large network, many smaller networks are specialized for managing particular learning tasks. Three primary networks, structurally and functionally distinguishable, but closely connected and functioning together, are equally essential to learning.

- *Recognition networks* are specialized to sense and assign meaning to patterns we see; they enable us to identify and understand information, ideas, and concepts.
- *Strategic networks* are specialized to generate and oversee mental and motor patterns. They enable us to plan, execute, and monitor actions and skills.
- *Affective networks* are specialized to evaluate patterns and

assign them emotional significance; they enable us to engage with learning tasks and with the world around us.

These three neural networks work together to coordinate even simple acts such as signing a birthday card for a friend. Through recognition networks, we understand the concept of a birthday and identify the card, the pen, our hands as we write, and our signature. Through strategic networks, we set our goal of signing the card, form a plan for picking up the pen and moving it to produce our signature, monitor our progress, and make small course corrections, such as reducing the size of the letters if we begin to run out of space. Affective networks connect us to our feelings for our friend, motivate us to sign the card, and keep us on task.

Although all brains share these general characteristics, individual brains differ substantially—a point that bears critical implications for teaching. Understanding the specialized functions of the recognition, strategic, and affective networks can help us appreciate the unique strengths and weaknesses of individual students.

any combination of media.

Digital media are transformable, allowing content to be displayed in multiple ways. Learners accessing the same Web page, for example, can alter how content is presented. They can change the appearance of the text or images, adjust sound volume, or turn off graphics simply by selecting a different browser or changing browser settings. Transformations from one medium to another are also possible.

Speech-recognition software, which translates spoken language into text, is one example. Text-to-speech software, which transforms written words into spoken words, is another. These tools can now be embedded into Web browsers and other software programs. Using media transformations, students who have trouble seeing small text can increase its size; those who have trouble understanding speech can slow the speech down or increase its volume; or a teacher can set up a computer to read words aloud on demand for a student with dyslexia.

Digital media can be marked.

Markup languages such as HTML and XML allow Web page designers to tag different structural components of digital content, such as the title, subheadings, or main body. With only a small amount of training, teachers and students can use these markup tools to flexibly alter content to accommodate educational needs or preferences. A Latin teacher, for example, could mark the text to italicize all words that have Latin roots. Students trying to understand a detailed piece of text could mark the text to underline all the summary sentences as a way to keep track of the most important information. The same content can be marked in different ways for different students. It can also be unmarked and marked again to suit

the evolving needs of any particular student.

Digital media can be networked, making it possible to link one piece of digitally stored content to another via embedded hyperlinks. Such “networkability” makes possible rapid navigation between a word and its definition, an image and its description, a video and its caption, or a text passage from Robert McCloskey’s *Make Way for Ducklings* and an audio file of real ducks quacking. All these things are possible with multimedia packages and a local network of rich digital resources. In addition, if the network includes the World Wide Web, teachers and students gain access to a wide variety of continually updated materials, or the perspectives of diverse experts and peers throughout the world.

With a better understanding of new and traditional media, and how individual brains interact with each, teachers can reevaluate how they teach, how students learn, and how best to use various tools and techniques to individualize these processes. The digital capacity to combine and transform text, speech, and images leads to a more diversified palette for communication—one that can accommodate the strengths and weaknesses of each medium and every brain. ◀

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Links

ASCD Online Store

<http://shop.ascd.org/ProductDisplay.cfm?ProductID=101042>

Information on purchasing the book on which this article is based

Teaching Every Student in the Digital Age

<http://www.cast.org/teachingeverystudent/ideas/tes>

Online version of the original text

When Dinosaurs Roamed America

<http://dsc.discovery.com/convergence/dinos/dinos.html>

Discovery Channel’s interactive multimedia feature is a good example of a site using text, animation, sound, and photos that could appeal to different learners.