The Conflicted Brain:
The Impact of Modern Technologies on Our Cognition, and How Arts Education Can Be the Keystone to Whole-mindedness

Jennifer Groff, Ed.M.
Visiting Fulbright Scholar
Futurelab
Bristol, United Kingdom

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NOTE: This chapter is a blend of a discourses, intersecting education policy and philosophy, neuroscience, and digital technologies in contemporary society. Given the breadth of these areas, and the breadth of intended audience for this book, I've tried to build a cohesive argument at a very accessible level for all audiences.

Introduction

Education, as a field, is an unusual institution. From a systems view, it has changed incredibly over the last 50 years—yet in many ways is just the same. Instruction still generally takes place in individual classrooms, led by one teacher, with academic content arranged into the appropriate disciplines. Yet in an effort to improve the system for all and ensure increased student learning and achievement, the education system has evolved to a place where standards, accountability and high-stakes testing have become the system drivers and considerably changed everyday teaching and learning (Teachers Network 2007). As a result, arts education has suffered considerably. Many schools and districts have pared down their instructional time on everything except math and traditional literacy—and in some cases completely removed instructional time on subjects such as music and art (Jennings and Rentner 2006).

This undoubtedly has caused upheaval in the community of arts education stakeholders, and yet ironically, a confluence of new research from cognitive psychology and neuroscience – intersected with the current proliferation and presence of digital media and communication – supports the critical need to emphasize and extend opportunities to engage in the visual arts during the K-12 experience. As high-stakes education has progressed, education stakeholders across the field have questioned the effectiveness of this type of system (Hoff 2009; Teachers Network 2007). This re-questioning of the system comes at an opportune time, when the rapid digital transformation of our world is changing everything. Even more critically, emerging research in neuroscience from the last several decades, and particularly the last several years from the burgeoning interdisciplinary field of Mind, Brain and Education[1] is illuminating powerful evidence on human learning and cognition—providing critical evidence as to why arts education is pivotal to robust cognitive development. Such evidence serves as a foundation for designing educational policy, curricula and learning experiences that are diverse in orientation and medium. Leveraging this knowledge of the multiple facets to human cognition to design learning experiences will not only help to engage all learners, but help all learners approach *whole-mindedness*—the rich and robust development of all cognitive capacities and processing systems.

In this chapter, we will describe this research, starting the heart of education – *learning* – and recent advances in cognitive psychology and neuroscience that underpin the educational decisions we make. Building on this, we will explore the behaviors and learning styles of today's students, the opportunity for arts education in this area, and examples of innovative pedagogies leveraging arts education to intersect traditional academic instruction.

Learning: how do we process information?

Every second our minds are inundated with information that comes in multiple formats—spoken language, visual stimuli, tactile touch, and so on. Yet how does one use this information to make sense of the world? Language (both verbal and written) has been a primary mode of information processing. As a result of this influence in our culture, language processing has largely dominated the research of informational processing in cognitive psychology and neuroscience. Since the 19th century we've known that language is largely held by two areas of the brain, now known as Broca's

[1] For more on this new field, see the website for the International Mind, Brain and Education Society – http://www.imbes.org/

and Wernicke's areas; since then, neuroscience and the use of fMRI has shown how these two major areas are central to the distributed circuitry for language in the brain (OECD 2007).

Yet what about the other ways of processing information? Over the last several decades there has been a steady increase in the attention paid toward understanding the non-verbal means for processing information, propelled by notable figures like Jean Piaget and Stephen Kosslyn.

Towards the end of his career in the 1970s, world-renowned developmental psychologist Jean Piaget became increasingly concerned with imaginal symbols and the development of mental imagery in the child. Piaget's research emphasized the concern that verbal symbolism alone is insufficient and must be augmented by a system of imaginal symbols to represent figural and conceptual aspects of objects, concepts, relations, and transformations (Piaget and Inhelder 1971). He noted that by around 6 to 8 years of age, children begin to use these cognitive functions more frequently and effectively to represent the physical and social environment, and these systems are developed through interaction with the child's environment (Greeson and Zigarmi 1985). Allan Paivio's work has supported Piaget's notions, demonstrating the complementary nature of the verbal and imagery processes in the child's thinking—where imagery allows for the concrete representation of the child's environment and verbal representations help account for the more abstract (Paivio 1971). Paivio's work led to his development of Dual-Coding Theory, which describes that humans process information through two systems: the *verbal* (language, including all spoken and written text) and the *non-verbal* (objects and events), also referred to as the *imaginal* processing system (Paivio 1986).

Over the past several decades, research of the imaginal, or nonverbal, processing system has helped us to identify and understand the nature of the imaginal processing system. This system has been linked to the capacity to perceive, remember, and problem-solve, and as a critical component to creativity—including exceptional scientific-breakthroughs, by manipulating and transforming existing mental images (Kosslyn 1996; Shepard 1978; Paivio 1971; Rothenberg 1986; Campos and Gonzalez 1995; Forisha 1981; Greeson 1981). The fascination with and examination of Einstein's cognitive patterns lead much of the research in this area. Known for his exceptional scientific breakthroughs, Einstein derived many of these through imagery and mental image manipulation. Interestingly (yet perhaps not coincidentally), Einstein's verbal processing system was severely delayed (Patten 1973). Authorities on visual thinking like Stephen Kosslyn (2002) have examined Einstein's tremendous facility with his mental images through visual, spatial, and motoric representations, all of which are components of the non-verbal processing system.

Of these two systems, Piaget saw them as serving separate but complementary roles in cognition. Paivio (2006, 3) offers a clear picture of how these two systems operate:

> *"The verbal system is a necessary player in all "language games" but it is sufficient in only a few. In the most interesting and meaningful ones, the verbal system draws on the rich knowledge base and gamesmanship of the nonverbal system. Conversely, the nonverbal system cannot play language games on its own, but it can play complex nonverbal "solitaire." The verbal system dominates in some tasks (crosswords is a simple example) and the nonverbal imagery system in other (e.g., jigsaw puzzles). Cognition is this variable pattern of the interplay of*

the two systems according to the degree to which they have developed."

The supporting research of Dual-Coding Theory has demonstrated that we do indeed have two processing systems – for both verbal and non-verbal stimuli – and these two processing systems work together in an ebb-flow dynamic, depending on the cognitive stimuli and task at hand.

More recently this work has been expanded to look at the preferred cognitive styles of individuals. Research has further demonstrated that the imaginal system can be further broken down into 'object' and 'spatial' visualizers, and that different cognitive tasks can stress the individual processing systems (Ungerleider and Mishkin 1982; Haxby et al 1991). Object visualizers tend to be strong at constructing static representations or images in the mind while spatial visualizers tend to be strong as manipulating images or working with the relations between objects. With this in mind, The Group Brain Project at Harvard University set out to understand if certain patterns of activity (such as video-game play, creating representational art, word games, etc.) correlated with an individuals' dominant cognitive style (verbal, object visualizers and spatial visualizers). Using online questionnaires with over 3,800 participants, Chabris et al found that the dominant cognitive style of more than 80% of the participants was some form of visualization, with around half of all participants identifying as object visualizers[2]. Additionally, people with experience playing video games scored higher on the spatial visualization scale and those with experience in representational art scored more strongly on object visualization assessments. They also found that teams

2 About one quarter of the participants split between "spatial visualization" and "verbalizers," and the remaining one quarter of participants were "non-classified" as their preference between object and spatial visualization was too close to be delineated.

composed of individuals with differing cognitive styles, with each team member assigned to roles that align with their cognitive styles, outperformed homogeneous teams (i.e., teams of two spatial visualizers or two object visualizers) (see Woolley et al 2006). Figure 1 depicts these cognitive styles in relation to Dual-Coding Theory.

	Cognitive Processing Systems		
	Non-verbal		**Verbal**
Cognitive Style	Object Visualization (static images)	Spatial Visualization (moving/manipulating images)	Verbal (language-based)

Figure 1. Model of Cognitive Processing Systems

Of course, in everyday problem-solving and learning, one of these systems never works solely independently; both the verbal and non-verbal systems work complimentarily and both are critical to comprehension. Yet the research of Chabris et al denotes how that processing will play out differently in each individual. This has real-world implications for how we create collaborative learning experiences in the classroom and at work. How are we to be teaching when the vast majority of learners prefer visual over verbal cognitive processing? If we are not aligning students with tasks, and then combining them in teams leveraging their cognitive style, are we really able to capture their true ability in a given task or domain? Likewise, if we are not offering learning experiences that leverage all of these cognitive styles, are we under-developing all students' cognitive capacities?

Technology and your brain

Given that video games are a relatively new technology, it is interesting to consider how many of the spatial visualizers in the Harvard Group Brain Project study were intrinsically strong at this cognitive style, or is it that they are strong at this cognitive style as a result of interaction with video games? Given the unprecedented influx, and influence, of digital technology in our world, the question is worth considering. The old neuroscience adage, "the neurons that fire together, wire together"[3] exists for a reason; it's meant to capture one of the brain's most powerful abilities, *plasticity*—the ability to change, strengthening some neural connections while eliminating others (OECD 2007; Small and Vorgan 2008). In other words, depending on your experiences, learning and interaction with stimuli over time, different cognitive capacities will strengthen and increase, while others will decrease. It has been extensively demonstrated that experience shapes our neural networks (Singer 1995; Doidge 2007). Small and Vorgan explain that with "enough repetition to any stimulus [the brain] will lay down a corresponding set of neural network pathways in the brain, which can become permanent" (2008, 5). It's common sense in many ways—if you practice the violin, over time your ability to hear correct pitch, place your fingers properly, and so on, will increase; yet if this has taken away from the time you would be spending on writing and constructing complex narratives and sentences, you might be less good at that. But it's important to note that this occurs at the neural level—the structures and networks of the brain physically change as a result of your interacting with certain stimuli. A good reflective learner might then ask, "what stimuli am I

[3] Paul Howard-Jones offers an explanation as to where to learn more about the genesis of this phrase, see: "Philosophical Challenges for Researchers at the Interface between Neuroscience and Education" *in Journal of Philosophy of Education*, Vol. 42, No. 3-4, 2008.

interacting with mostly?" In today's rapidly changing world, that's a very important question.

Neuroscientists and cognitive psychologists have long been interested in trying to understand how the technologies we are shaping, are actually shaping us. While this research is slowly developing – with many more questions than we have answers – initial studies have shown that interacting with new digital technologies such as the Internet and video games does affect the processing patterns of our brains. Small and Vorgan have cited some of these effects—including quickened reaction time, pattern recognition, increased executive function and some forms of attention (2008). Some of these skills are directly transferable to real-world activity. Researchers at the New York Beth Israel Medical Center have demonstrated that this in their examination of laparoscopic surgeons; those who played video games more than three hours per week had over 40 percent fewer errors in surgery, when compared to their non-playing peer surgeons (Rosser et al 2007). That's a remarkable number given the gravitas of the task! This notion of transferability has serious implications given the exponentially growing public engagement with digital technologies—particularly digital games, and particularly with developing minds of adolescents and pre-adolescents.

Yet studies on the effects of our interaction with technology do not always paint such a rosy picture. Paradoxically, other research has shown that too much exposure to these digital technologies can have numerous negative effects—both *in the moment* (such as fatigue and loss of focus) but also *long-term*, including addiction to the activity from the chemical reactions in response to the stimuli, reduced executive function (responsible for judgment and decision-making) and diminished capacity for patience and delayed gratification (Small and Vorgan 2008). Many find these last two effects particularly concerning, as the capacity for patience and delayed gratification produce engaged citizens capable of behaving in a way that benefits the overall system rather than solely choosing self-serving actions. Other negative effects include "video-game addiction"—a very real phenomenon, attributed to the release of dopamine in the brain in response to "flashy graphics and rapidly changing visual stimuli" which causes the user to develop a very real physical addiction (Small and Vorgan 2008, p. 38). While it is unclear as to how prevalent this phenomena is in modern culture, given that 31 percent of teenagers alone are playing video games every single day, it certainly is critical to understand this as part of a spectrum of effects, both positive and negative, of digital technologies on the brain (Pew Internet and American Life Project 2008).

As a result of this emerging research, the spectrum of effects paints a mixed picture. While there have been demonstrable benefits to digital experiences, there are countless negative affects as well. It seems that the key lies in finding the right balance, and appropriate time/experiences with these technologies. So then, *what interactions with technology then are beneficial, and how does this impact how we think and learn*?

Perhaps the key lies in purposefully designing and implementing the right types of digital experiences for learning. Research on digital simulations[4] is helping to make this situation more clear, with some preliminary success in demonstrating their ability to improve visio-spatial processing (McClurg 1992). Using simulation programming tools, like Microworlds[5] and StarLogo[6], the student programs a turtle on the screen to

[4] Klopfer et al. (2009) define digital simulations as a modeled or modified version of a real world situation, which lack game dynamics or the "win state" that exists in digital games.
[5] Microworlds is an education technology that is a programming environment in which students can explore and test their ideas as they create science simulations, mathematical experiments, and interactive multimedia stories. See http://www.microworlds.com
[6] Starlogo is an educational technology that is a programmable modeling environment where you can build models of many real-life phenomena, such as bird flocks, traffic jams, ant colonies, and market economies. See http://education.mit.edu/starlogo or for the new 3D version, go to http://education.mit.edu/starlogo-tng

move in a certain direction or complete a specific action, often tracing a shape with their path. Clements and Burns (1999) found that students using these tools experienced "spatial weaning" whereby they no longer needed to make physical gestures to determine what shape the turtle would make, with the assumption that the student has internalized the capacity to visualize these mental models, thereby influencing the development of their non-verbal processing systems.

Our Digital Brain

Our highly digital world presents an interesting scenario for learners, both young and old. It goes without saying that people interact with digital technologies exponentially more than they did five or 10 years ago. Digital participation has been on a steady rise. The 2008 Pew Internet and American Life Project study found that 97 percent of teenagers play some kind of video game and one in five teenagers play games three to five days a week; and on any given day, 50 percent of teenagers will be playing games, with one quarter of those individuals playing for two hours or more. We are near digital-saturation in our society, with just 6% of the overall American adult internet population have yet to become an internet user (Pew Internet and American Life Project 2008). If we then consider the difference between the types of activities of the youth of just a decade ago and of the youth today, how do they differ? And what implications does this have for the structure and function of their brains?

As each new generation displays more and more digital behavior and activity, we will be able to gather more information on these effects. Like any muscle or region in the brain, that which is used and stimulated becomes further developed than those that are not. Some assert that video games, by their very nature and design, develop spatial skills (Smith, Morey and Tjoe 2007). According to Small and Vorgan, with emerging research showing increased visual acuity, today's learners are developing and utilizing their imaginal processing systems in ways never imagined (2008). If Small and Vorgan are right, does that mean that today's youth fundamentally and structurally think differently than previous generations? In what ways are today's learners inclined to use their verbal and imaginal processing systems?

A Brain Conflicted

Classroom instruction is still largely verbal-based, particularly in our current climate of curriculum narrowing as a result of high-stakes testing. Despite the obvious capacities of both systems, each has not been emphasized equally in instructional practices in education. This is evidenced in the course of a typical school day. Children are given textbooks for their classes, asked to write essays and papers for their final projects, and take notes with pens and notebooks. Students are constantly employing their verbal information processing abilities to make sense of the abstract. While visual props and digital media are increasingly making their way into the classroom, verbal-based instruction (through lecture, note-taking and traditional textbooks) is still a dominant form of instruction in many schools. Although some educators do make an effort to include more images and visualization in the presentation of information, they are used much less frequently as problem-solving tools—where some of their greatest capacity lies (Rieber 1995). Educators have long known that multimedia in instruction is engaging, but what if the students' complaints about "boring instruction" and lack of digital media use go beyond their general preference for multimedia—what if they cognitively (structurally and functionally) are less able to engage with written text and lecture? This disconnect can be a challenge not only when attempting to learn new information, but also when trying to apply it or demonstrate mastery during assessment.

And thus the conflict: the two areas of students' lives are going in diverging directions—students spend their personal time interacting with a rich world, of both verbal and non-verbal stimuli, with a dramatic increase in how their imaginal system is shaped through digital media; yet they spend the other part of their lives in the classroom, where instruction and cognitive tasks are increasingly becoming language- and logic-based. How can we bridge this gap?

Diversifying Pedagogies

Stakeholders across and beyond the educational system already feel that the status quo of schools cannot continue (Levine 2009; Groff 2009). Yet this illuminating interdisciplinary research on cognitive styles and new digital media only adds fuel to the fire. Some researchers believe that the verbal dominance of schools can have serious implications for cognitive development. According to Robert McKim (1972), it causes "Visual Atrophy"—where the imaginal processing system is left behind, and visual cognition is underdeveloped. He goes on to argue that schools do not help students understand their own ability for mental imagery, and provides little opportunity to develop this capacity. Students differ vastly in their capacity and efficiency to employ these both systems (Bell 2008). Helping to identify the learner's aptitude in both systems, and developing instructional experiences and opportunities to develop both is of critical importance[7].

The two processing systems are the foundation for our engagement with the world. Helping learners to develop these, and more critically, understand how to *use* and *leverage* these processing systems as tools through which to engage with the world is central to healthy, balanced, robust cognitive development and whole-mindedness. Educators elicit the verbal system—teaching learners how to properly annunciate, spell, communicate complex thoughts, and so on. Yet how much time is spent covering visual-spatial processing, and teaching students how leverage their capacity in this area, as McKim suggests?

While digital media certainly is an appealing tool here, it would be irresponsible to advocate for schools to jump to a full-time digital regime—there is not enough sound research to understand the effects of this type of long-term exposure on cognitive development, as well as the already cited negative effects associated with extensive video-game play. How do we leverage the benefits of these tools for all students, while avoiding the unhealthy affects documented as well? The research suggests that it's a manner of *balance*—being just one component of an array of cognitive stimuli with which young minds engage.

This is where the visual arts play a critical role, bridging the gap in the diversity of learning experiences and opportunities for developing minds and young learners. The verbal processing system already gets significant attention and development, both in and out of school. The non-verbal or imaginal processing system only gets partial

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[7] For a deeper examination of the reasoning behind the critical need for developing skills in visualization and guided imagery in education, see Drake (1996) who offers an extensive review of the discourse in psychology, philosophy, and education.

development—in general, minimally in school, but partially (in varying degrees for each student) outside of school. But in greatest contrast to the verbal processing system, the non-verbal gets *very* little if any instruction on how to be leveraged as one of our dominant cognitive processing systems. Like language and linguistic ability, so too much images, image manipulation and visualization be leveraged. This skill set lies at the heart of visual arts instruction. Traditional visual arts training focuses intensively on training the eye to 'see' shape, form, positive and negative space, and so on. This correlates to the functions of the object visualization cognitive style. This discipline is a vital part of the critical array of learning experiences, which must include a diverse range of modalities, needed for all learners' healthy cognitive development. Not only to provide opportunities to engage with the learner's dominant cognitive style, but develop all of their processing systems.

Whereas digital technologies may help meet the needs of spatial visualizers, visual arts education often speaks more directly to the object visualizers. Autism research is shedding further light on this learning style. While Autism is a spectrum disorder, many diagnosed strongly align with visual thinking, where some describe that they "think in pictures" (Grandin 1995). Some autistic individuals have shown far advanced drawing abilities, able to render natural scenes with near flawless perspective from memory at a very young age (Snyder and Thomas 1997). Research in this area has also shown that rapid shifting of attention and stimuli is difficult for those with autism—suggesting that digital media and video games may be negative experiences for these learners. While Autistic learners may represent a small subset of the population, they embody an exaggerated view of a style of cognition—one that may be still existent but less extreme for other parts of the population that have not been identified or labeled as such. They demonstrate for us how certain ways of engaging with and processing information may be effective, while other detrimental.

Of course, not all students will have such sensitivities to certain modalities, and this will vary with each individual student—but this demonstrates the need for students to become aware of their dominant cognitive styles and master them, knowing when to leverage one for appropriate problem-solving and communicate and when to spend time trying to grow and build another. This, indeed, is *whole-mindedness.* And this is where education plays the critical role. It starts by ensuring that all learners have the *opportunity* to engage with their dominant, as well as non-dominant, learning style.

With our new understanding of cognitive styles, processing systems and how they relate to different media present in our world, schools must not ignore this understanding by embrace it. It demonstrates the need for a rich array of learning experiences required for robust cognitive development must include multiple media that engages with all processing systems. Figure 2 presents a framework for finding that desired balance of instructional modalities targeting specific cognitive styles, so that learners may verge towards whole-mindedness.

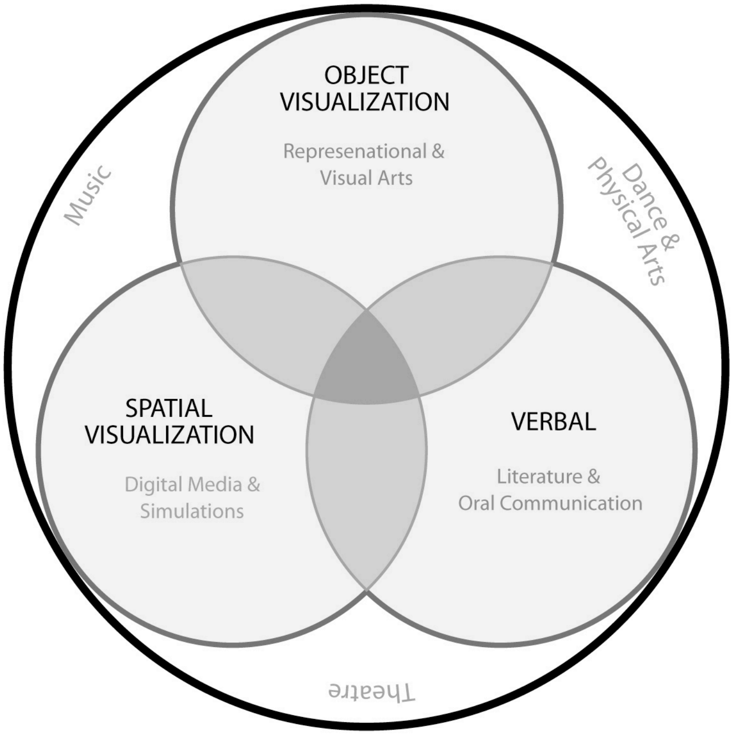

Figure 2. Framework for whole-mindedness, targeting the three central cognitive styles creating a spectrum of instructional modalities, augmented by additional modalities.

The digital revolution has already begun to pave the way for such an approach. The sub-set of the education community focused on the impact and leverage of digital media advocates for multiple forms of media being integrated into instruction, commonly referred to as 'multimodal learning.' This discourse and study of multi-modal learning supports the whole-mindedness approach, asserting that,

> *"all modes are partial. Each contributes to the production of knowledge in distinct ways and therefore no one mode stands alone in the process of making meaning, rather each plays a discrete role in the whole: hence the need to attend to all."*
> (Jewitt 2008, 13)

This emerging body of research is showing that "significant increases in learning can be accomplished through the informed use of visual and verbal multimodal learning" (Fougnie and Marois 2006). Connecting this discourse more strongly with our new developing understanding of the cognitive processing systems of the brain will help focus creating instructional materials, curricula and policy directly to the individual cognitive abilities, strengths and challenges of each learner. While multimodality efforts tend to focus on digital media, this push for multimodal learning has also advocated for other modalities and learning experiences less present in cognitive psychology literature, such as movement, dance and theatre. As cognitive psychology and neuroscience continue to evolve, it's likely that these too will become more integrated in our understanding of how people think and learn.

In practical terms, a whole-mindedness doesn't necessarily mean visual arts and non-verbal modalities in learning have to be a separate add-on (or in many cases an "add-back-in") component to the curriculum. And for some, it may appear that we're just talking about 'visual literacy' strategies. However, robust instruction producing robust cognitive development comes from the integration of disciplines and cognitive systems—not just from stand-alone instruction on visual literacy development. Within the past few years, several intrigued models have emerged that integrate these learning modalities together. Since 2004, Harvard Medical School has been offering the course "Training the Eye: The Art of Physical Diagnosis" seeking to improve the examination and diagnosis skills of their soon-to-be doctors. The curriculum for the course includes training on formal art observation strategies and drawing techniques, through weekly visits to the Museum of Fine Arts in Boston, which are then connected to traditional medical school classroom instruction on various medical diagnostic exams. Evaluators of the course found that by the end of the semester, students had increased sophistication in their descriptions of artistic and clinical imagery and improved capacity to make accurate observations of art and physical findings (Naghshineh et al 2008). Splitting time equally between the art museum and the medical school can seem disparate to the average eye, but it is beautifully integrated as a result of a collaboration of medical school instructors with museum educators, leveraging a pedagogy known as VTS (Visual Thinking Strategies). VTS is an approach developed by Philip Yenawine, Director of Education at the New York Museum of Modern Art, based on Abigail Housen's Aesthetic Development theory. Together, Yenawine and Housen have found that VTS catalyzes aesthetic development and develops critical thinking and cognitive abilities in people of all ages, and has been shown to transfer to problem-solving in other fields, such as reading, writing, and mathematics (Housen 2002; Housen 1992; Yenawine 1997). Their findings reinforce the research we've discussed thus far, explaining that these processing systems work in concert, and mutually reinforce one another over time. The Harvard Medical School class has been hugely popular and getting considerable attention for its results.

Outcomes such as this are impressive and underscore that we need to rethinking learning experiences in light of evidence from neuroscience, and that education needs to be critically concerned about the cognitive structuring of learning experiences. An excellent example of an alternative approach to instructional strategy in younger students is the work conducted by the organization Artis Education—a UK-based organization that helps schools achieve their core curriculum aims through a blend of the arts, including music, drama and movement. Through their intensive training program, Artis prepares professional artists to deliver these learning experiences in the school with which they are collaborating, and it is their belief that through the integration of these disciplines students not only learn more deeply, but further generate the critical capacity for creativity[8]. Programs like Artis are supported by the growing support of multimodality and multimodal learning design, which seeks to "interconnect the modes in dynamic relationships and involves the whole body in making meaning"[9] (Mills 2008).

Conclusion

Education is entering a critical period where current policy must, and is, being reconsidered—in light of the serendipitous paralleling of research from multiple fields and innovative models of teaching and learning. This confluence of factors means that the argument must go beyond the need to "teach the basics," to integrate technology, or to keep art education alive. This confluence paints a picture for a framework of how cognition occurs and develops, and how the spectrum of media and modalities must be leveraged synergistically in education to create the capable and developed learners we desire. As neuroscience and cognitive psychology progress in their research in the areas of cognitive processing and the impact of digital technologies on cognition, educators must be working in tandem with them to produce effective pedagogies that leverage old and new media and disciplines for all learners.

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[8] To learn more about Artis, go to http://www.artiseducation.com

[9] For more on this, see Kress, G., and van Leeuwen, T. (2001). *Multimodal Discourses: The Modes and Media of Contemporary Communication.* New York: Oxford University Press.

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