© Serie de Comunicación Social 2024-2026. ISBN: 978-959-7174-42-4
Centro de Lingüística Aplicada, Santiago de Cuba, 2026

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Beyond the Brain Buzz: Unpacking Neuromyths in Education

Introduction

Neuroscience is an emerging interdisciplinary field that integrates neurology, psychology, and biology. Major technological advances over the past four decades have significantly deepened our understanding of brain structure and function, including the complex processes underlying human speech, thinking, and reasoning. Consequently, neuroscience holds considerable potential to address diverse educational needs and evaluate the efficacy of various educational interventions. The translation of this research into family and educational contexts has been motivated by commitment to supporting children's development and enabling them to reach their full potential. However, well-intentioned efforts to promote scientific knowledge can sometimes have unintended consequences. The widespread availability of the Internet, social media, and popular science magazines has also facilitated the dissemination of various misconceptions and misleading information, commonly referred to as *neuromyths*. The OECD defines a *neuromyth* as "a misconception generated by a misunderstanding, a misreading or a misquoting of facts scientifically established (by brain research) to make a case for the use of brain research in education and other contexts" (OECD, 2002, p. 111). While cultural differences influence which misconceptions are more widely accepted in different regions, neuromyths are present across all cultures, with certain myths enjoying near-universal acceptance. The purpose of this paper is to introduce some of the most common neuromyths and explore the underlying reasons for their persistence. It is hoped that the findings of this review will encourage parents, policymakers, and especially teachers to critically re-evaluate their beliefs and educational practices.

Myth 1: Most brain development occurs before the age of three

The idea that the first three years of life are critical for a child's cognitive development has become deeply embedded in popular discourse and educational policy. Media headlines, parenting books, and early childhood initiatives often assert that brain development is largely complete by age three, implying that missed opportunities during this period are irreversible. Parents and educators often feel pressure to provide the "right" stimulation as early as possible, as any delay could result in allegedly permanent cognitive loss. This urgency has been commercially exploited, fuelling a lucrative market for toys and products marketed as brain-enhancing tools (Howard-Jones, 2014).

Neuroscience research confirms that the brain undergoes rapid growth during the early years of life. Synaptogenesis—the formation of synaptic connections—occurs at an extraordinary rate in infancy, peaking between the ages of two and three (Shonkoff & Phillips, 2000). In certain brain regions, such as the visual and auditory cortices, peak synaptic density is reached during the first year of infancy (Goswami, 2004). Myelination, which enhances the speed of neural transmission, also progresses rapidly, particularly in regions responsible for sensory and motor processing (Nelson, 2000). These early years are characterised by high plasticity, making the brain especially responsive to environmental input. As such, enriched and nurturing environments during early childhood are important. Responsive caregiving, language exposure, social interaction, and physical activity can positively influence early brain architecture. On the other hand, an impoverished rearing environment can impair child development (Center on the Developing Child, 2007).

However, the notion that brain development is largely complete by age three is misleading. Synaptic pruning—the brain's process of eliminating excess connections—reflects increased neural efficiency rather than causing cognitive decline (Giedd, 2004). Plasticity continues throughout childhood, adolescence, and even into adulthood—though at a slower pace (Blakemore & Choudhury, 2006). Although there are sensitive periods for specific skills like vision and phonetic discrimination, most aspects of cognitive and emotional development unfold over a much longer time span. For instance, while young children are especially attuned to language sounds, people can learn new languages and complex skills well beyond early childhood (Goswami, 2004; Kuhl, 2010). Furthermore, research has shown that specific experiences in adulthood can induce localized plasticity in the brain. For instance, experienced London taxi drivers have been found to exhibit enlarged hippocampal formations—an area associated with spatial representation and navigation (Maguire et al., 2000). In summary, sensitive periods are distinct from critical periods, and their existence does not preclude the acquisition of knowledge and competencies later in life.

In family contexts, misconceptions about early development may result in premature formal instruction during infancy—often replacing developmentally appropriate experiences such as unstructured play, emotional bonding, and social exploration—and contribute to the neglect of the ongoing developmental needs of older children (Bruer, 1999; Goswami, 2006). In policy contexts, the myth that brain development is largely complete by age three has influenced educational investment strategies by promoting the belief that returns on investment are highest in the preschool years and decline significantly thereafter. This perspective has, in some cases, led to a disproportionate allocation of resources toward early childhood programmes, while being used to justify reductions in funding for higher education (OECD, 2002). However, empirical evidence indicates that early intervention yields the most significant benefits primarily for disadvantaged children. In contrast, intensive enrichment of the rearing environment for normally developing children does not appear to produce comparable improvements in brain development (Howard-Jones, 2014).

In short, oversimplified portrayals of neuroscience in media and public discourse have led to well-meaning but flawed parental decisions and initiatives that prioritise early childhood at the expense of a more nuanced, lifelong understanding of brain development. Neuroscience can offer valuable insights for educational research and pedagogical practice, but decisions about educational interventions and policies should be guided by a balanced interpretation of the evidence, rather than influenced by popularised misconceptions.

Myth 2: We use only 10% of our brain

The idea of unlocking untapped brain potential is certainly appealing. We like to believe that we are using only a small portion of our brain power, and that if we could only harness our full cognitive potential, we would be much smarter and achieve much more. The origin of this myth is attributed to Harvard psychologist William James, who said that “men habitually use only a small part of the powers which they actually possess and which they might use under appropriate conditions” (James, 1914, p. 14). However, the statement was made as a philosophical observation, not a neuroscientific claim. Furthermore, it should be noted that James himself never gave any specific figure regarding the presumed brain usage. One of the earliest sources where the figure of 10% appears is in Thomas Lowell’s preface to Dale Carnegie’s book *How to Win Friends and Influence People*. Lowell paraphrased James, stating that “The average person develops only 10 percent of his latent mental ability” (1936, p. 14). The immense popularity of Carnegie’s book helped spread Lowell’s 10% figure, even though it was not supported by empirical evidence.

The myth has persisted into the present day. The Organisation for Economic Co-operation and Development (OECD, 2002) identifies it as the most widespread misconception about the brain among the general public. This misconception has been significantly reinforced by popular science magazines and the media. For example, in the 2014 Hollywood thriller *Lucy*, Morgan Freeman portrays a professor engaged in theoretical research on the brain’s untapped potential, who claims that humans use only ten percent of their cognitive capacity. Empirical research supports the idea that such portrayals contribute to the endurance of the myth. In a large-scale study involving over 2,000 respondents, conducted in Brazil by Herculano-Houzel (2002), the belief was found to be widely accepted—particularly among university students, among whom the incidence of incorrect responses reached as high as 59%. Notably, reading popular science magazines did not help dispel the misconception; rather, it appeared to reinforce it. The rate of incorrect acceptance was 33% among non-readers and 67% among readers, representing a relative increase of 97%. This trend is echoed in other studies (e.g., Weisberg, 2007; McCabe & Castel, 2008) showing that texts accompanied by brain images and scientific-sounding language are more likely to be accepted as true, even when the information is inaccurate or when neuroscience is irrelevant to the claim.

Even more concerning than misconceptions in popular culture is the proliferation of this myth in education. Sanne Dekker and her colleagues investigated the prevalence and predictors of neuromyths in the United Kingdom and the Netherlands. Their study revealed that teachers most interested in applying neuroscience findings in the classroom were also the most susceptible to misconceptions and pseudoscientific beliefs (Dekker et al., 2012). Howard-Jones and his colleagues (2009) examined the beliefs about brain development and function among 158 graduate trainee teachers. They found that one in three trainees surveyed agreed with the statement that people mostly use 10% of their brains, while only ten respondents (6.3%) explicitly rejected it.

Despite the endurance of the myth, modern neuroscience provides robust evidence that we use literally every part of our brain during various cognitive and physiological tasks. In other words, the idea that humans use only 10 percent of the brain is 100 percent a myth. Imaging techniques developed in the last 30 years such as Positron Emission Tomography (PET) and functional Magnetic Resonance Imaging (fMRI) have allowed doctors and scientists to map and watch brain activity in real time, revolutionizing our understanding of brain functions. It is now clear that the entire brain is playing its part. There is no region of the brain that is ever completely inactive, even during sleep (CERI & OECD, 2007). Even individuals suffering from degenerative neural disorders such as Alzheimer’s and Parkinson’s disease use more than 10% of their brains (Chew, 2018).

Different regions of the brain perform specialized functions. For example, the frontal lobe controls higher cognitive functions such as decision making and reasoning, the parietal lobe processes sensory information, the temporal lobe handles auditory processing, while the spinal cord is a communication channel between the brain and the body for motor and sensory functions. Even small damage to any area of the brain can result in a significant loss of some of a person’s capabilities (Hammond, 2012). However, it is important to remember that different parts of the brain do not function in isolation. For example, while reading this paper, your occipital lobe processes visual input (written text) and recognizes written words and letters as familiar patterns; the parietal lobe integrates visual information with other sensory input (i.e. links visual word forms with meaning and sounds), the temporal lobe facilitates comprehension of the meaning, and so on.

Another piece of evidence for brain activity discrediting the 10% myth is its exceptionally high energy consumption, even during routine activities. In a TED-Ed lecture Richard Cytowic, reminds us that compared to other species, the human brain is remarkably energy-intensive: rodent and canine brains consume about 5% of total body energy, monkey brains around 10%, while the adult human brain—despite making up only 2% of body mass—uses approximately 20% of the body’s daily glucose. These demands are even greater during early development, rising to 50% in children and up to 60% in infants (TED, 2014). Evolutionarily, it would make no sense to have such high energy consumption for an organ that is largely unused.

While the brain is always active, in order to cope with such intense energy requirements, it relies on a strategy known as *sparse coding*. The human brain is estimated to contain approximately 86 billion neurons; however, only a small proportion—typically between 1% and 16%—are active at any given time (TED, 2014). This selective activation minimises energy expenditure while maximising the efficiency of information processing. Most of this neural activity occurs unconsciously, reflecting the brain's constant engagement and its need to balance functionality with metabolic cost. Despite the limited number of neurons firing simultaneously, cognitive functions remain uninterrupted, supported by dynamic neural networks that adapt to changing demands (TED, 2014).

In conclusion, the claim that humans use only a small fraction of their brains is a persistent myth. Scientific evidence clearly shows that the brain is always active, energetically demanding, and remarkably efficient—an organ evolved to maintain continuous function while operating within strict metabolic limits.

Myth 3: Multitasking makes us more efficient

Multitasking can be broadly defined as a condition in which the cognitive processes involved in performing multiple tasks overlap in time (Koch et al., 2018). This practice has become an integral part of daily life and a common workplace norm, where the ability to multitask is often regarded as an asset. The necessity to manage multiple projects under tight deadlines, deal with frequent interruptions from colleagues, emails, and phone calls, and continuously juggle professional and family responsibilities demands constant shifts in attention. In response to these demands, the market has seen a surge in guidebooks with catchy titles and high-priced courses that claim to reveal the secrets of mastering the art of multitasking.

However, empirical research data urge caution. To begin with, the term *multitasking* is a misnomer. What is commonly referred to as multitasking is, in fact, *task switching*. As Stanford professor Anthony Wagner explains in an interview with Sofie Bates, the human brain can focus on only one task at a time. This means that what appears to be multitasking actually involves rapidly shifting attention between tasks (Bates, 2018).

One reason for task switching instead of multitasking is the presence of physiological constraints. The human brain lacks the energy capacity required to carry out multiple cognitive tasks at once (Cytowic, 2025). Cognitive tasks such as thinking, focusing, decision-making, and remembering are energy-intensive activities. They require glucose and oxygen, which the brain uses to fuel neural activity. As a result, multitasking comes at a metabolic cost. Switching between cognitive tasks burns significantly more oxygenated glucose, which not only slows performance but also leads to mental fatigue because the brain does not have the energy to run multiple complex processes simultaneously at full capacity (Goldhill, 2016; Levitin, 2014).

Physiological constraints are compounded by cognitive limitations. A substantial body of empirical evidence indicates that human cognition is ill-suited to processing multiple streams of information or performing several tasks simultaneously. Ophir, Nass, and Wagner (2009) examined differences in information-processing styles between chronically heavy and light media multitaskers. Heavy multitaskers, defined as individuals who tend to use many types of media simultaneously, were found to be more susceptible to interference from irrelevant stimuli, to exert less top-down attentional control, to perform significantly worse on simple memory tasks, and to have lower task-switching ability. Cal Newport, a professor of computer science at Georgetown University, warns that even minor switching from one task to another is "productivity poison" (Cytowic, 2025). Switching cognitive contexts requires the replacement of contents in working memory. When returning to the original task, the brain must reload the previous information. The repetition of this process slows performance and potentially causes stress, which also negatively affects the efficiency and effectiveness of working memory.

In short, there is currently no empirical evidence supporting a positive relationship between working memory capacity and multitasking. On the contrary, engaging in multitasking has been shown to reduce efficiency and lead to poorer outcomes. Of particular concern is the high frequency of habitual multitasking among the student population. As Liu (2022) observes, students—who represent the future workforce—often struggle to disconnect from digital media, which may negatively affect their professional performance. Rather than attempting to train students and employees to become "expert multitaskers," efforts should focus on helping them limit digital distractions, establish boundaries for screen time, and adopt structured approaches to checking messages (Levitin, 2014). Introducing time-management strategies such as Francesco Cirillo's Pomodoro Technique—which promotes a 25-minute period of focused work followed by a short break—can enhance sustained attention and productivity. These interventions collectively offer a more sustainable and cognitively sound alternative to multitasking in both academic and professional contexts.

Myth 4: Students learn most effectively when they are taught in their preferred learning style

The notion of learning styles encompasses a wide range of theories that seek to explain individual differences in how people learn. At its core, the theory posits that each person has a preferred learning style through which they learn most effectively, and that aligning instruction with this style enhances performance. Learning style typologies were originally developed for use in remedial education, but since the 1970s they have been more broadly adopted and applied to all students across various subjects in general education (Fallace, 2023). They remain popular in both educational discourse and practice. The concept of learning styles is frequently included in teacher training programmes. Following a review of twenty widely used introductory education and educational psychology textbooks, Steven Wininger and his colleagues reported that approximately 80% introduced the idea of learning styles, and around a quarter recommended matching instructional methods to individual learning styles (Wininger et al., 2019). In another study, Howard-Jones et al. (2009) found that as many as 82% of teacher trainees agreed with the statement that receiving information in the preferred learning style enhances learning. Dekker et al. (2012) reported that 93% of teachers in the UK and 96% in the Netherlands endorsed the concept of learning styles. Learning style courses continue to be organised by schools and educational authorities (Lethaby & Harris, 2016; Kim & Sankey, 2017).

There is something intuitively appealing about the idea that people learn in different ways and that accommodating these differences will optimise learning. However, research in educational psychology has questioned the effectiveness of learning style-based pedagogies since their inception (Fallace, 2023). Following an extensive literature review of research on learning styles, Pashler and his colleagues concluded that “at present, there is no adequate evidence base to justify incorporating learning styles assessments into general educational practice” (Pashler et al., 2008, p. 108). This argument is echoed in more recent studies by Willingham, Hughes, and Doboly (2015), and Nancekivell, Shah, and Gelman (2019). Empirical research consistently shows that the idea of matching instructional methods to individual learning styles is fundamentally flawed.

One of the problems is that the definition of learning style itself is unclear. Learning style inventories encompass a variety of dimensions on which humans may differ—from learning modalities to preferences, from cognitive styles to personality types. Terminological inconsistencies and the complexity of typologies make it extremely difficult to compare findings across studies, draw reliable conclusions, or transfer research results to practice.

Some of the studies supporting learning style theory are potentially biased. For example, much of the evidence in favour of the influential Dunn and Dunn (1975; 1978) Learning Style Model comes from PhD dissertations supervised by faculty members with a vested interest in substantiating a particular conceptualisation of learning styles (Curry, 1990). In some cases, interpretations of results appear to go beyond what the data justify. A case in point is a meta-study conducted by Dunn et al. (1995), which claims to validate the Dunn and Dunn model. Although the authors take the studies reviewed as evidence in support of matching learning style preferences with educational interventions, the studies were not evaluations of the matching hypothesis but rather correlational studies linking styles and achievement (Hattie & O’Leary, 2025). Commenting on the Dunn et al. (1995) meta-analysis, Kavale, Hirshoren, and Forness (1998) shrewdly remarked that the “weak rationale, curious procedures, significant omissions, and circumscribed interpretation should all serve as cautions” (p. 79) and argued that the study bore “all the hallmarks of a desperate attempt to rescue a failed model of learning style” (p. 79) (Kavale et al., 1998, qtd. in Hattie & O’Leary, 2025). Hattie and O’Leary (2025) also highlight several additional issues, including studies based on very small sample sizes, research comparing different teaching methods rather than testing the matching hypothesis directly, and conclusions that conflate attitudinal and achievement outcomes or are simply overstated. They note that the limited number of meta-analyses examining the matching hypothesis report a negligible effect size ($d = 0.04$), further undermining its credibility.

A large body of recent neuroscientific evidence suggests that the brain is naturally wired to process information through multiple senses. In his comprehensive review of research on the effects of input modality on the brain, Rousseau (2024) reports the results of many recent neuroimaging studies, which reveal that traditional “unisensory” brain regions receive input from different modalities from the early stages of information processing. Auditory brain regions were found to receive visual and somatosensory inputs, and visual regions were found to receive auditory and tactile inputs. Unimodal stimulation creates an impoverished learning environment for the brain. By contrast, exposure to two or more semantically congruent and synchronised stimuli presented in different modalities has a positive effect on information encoding (Rousseau, 2024). Depriving learners of multisensory input removes valuable pedagogical tools that support enriched learning.

Hattie and O’Leary (2025) identified several factors that contribute to the persistence of the learning styles myth, despite substantial scientific evidence challenging its validity. Among these, they highlight the conflation of learning styles with learning strategies, the emphasis on personalised education, and the influence of commercial and institutional interests. Hattie et al. (2024) note that research on learning strategies shows learners typically employ a range of techniques throughout the learning process, and that their effectiveness often depends on the specific phase of the learning cycle in which they are used. However, many learners tend to rely on a limited set of strategies, which are not always the most effective. The problem is further compounded by the fact that much of the research on learning styles is based on self-reports. Yet what learners describe often reflects their preferences rather than their actual learning behaviours. Strong and biased beliefs about how learning works can reinforce suboptimal approaches and perpetuate widely held misconceptions.

Another contributing factor is the growing emphasis on the individualisation of education. However, as Hattie and O’Leary (2025) point out, while individuals undoubtedly differ in their behaviours and personal characteristics, there are also many commonalities, and there is no robust evidence to support the existence of distinct learning styles. The ever-growing pressure to excel academically has further fuelled the myth that, with the right instruction, all students can become high achievers (Touloumakos, Vlachou, & Papadatou-Pastou, 2023). In reality, while every student is capable of improvement, it is unrealistic to expect all students to excel in all areas. Nonetheless, commercial ventures and some educational institutions continue to exploit this misconception by aggressively marketing learning style-based tools, educational software, brain training programmes, and learning style-based curricula—often with little regard for scientific validity.

To summarise, learning style-based education represents a persistent and potentially harmful myth that involves the arbitrary labelling of learners and may deprive them of meaningful learning opportunities. As Hattie and O'Leary (2025) advise, instead of wasting human and financial resources aligning instruction with learning preferences, educators should direct their attention to approaches that have been empirically proven to enhance learning, such as strategy training, the development of critical thinking skills, and the cultivation of self-regulated learning—all of which contribute to deeper understanding and long-term academic success.

Conclusion

The paper has reviewed four common neuromyths that are widespread globally and deeply entrenched in both public perception and educational discourse. However, this is far from an exhaustive list. Myths such as the existence of left- and right-brain learners, the theory of multiple intelligences, the notion that teenagers are "all gas and no breaks", the belief that sugary drinks and snacks negatively impact attention, and the claim that the brain shrinks if one consumes fewer than six glasses of water a day are all examples of scientifically unsupported ideas.

Of particular concern is the acceptance of these misconceptions among educators. Although there is no definitive evidence demonstrating a direct negative impact of neuromyths on teaching practices or learning outcomes (Hughes, Sullivan, & Gilmore, 2021), the influence of teachers' beliefs on their instructional practices is well established (Buehl & Beck, 2014; Plutzer et al., 2016; Rosenthal & Jacobson, 1968; Rubie-Davies, 2006). Therefore, it is reasonable to infer that the persistence of erroneous beliefs may interfere with the learning process, while interventions directed at dispelling educational neuromyths could positively affect the classroom environment. For example, teachers who believe in genetic predisposition and biologically determined brain development may be more sceptical about the effects of educational intervention on learning outcomes. This, in turn, may reduce teachers' agency and deprive learners of opportunities to develop their potential. On the other hand, teachers who view intelligence and ability as malleable are more likely to believe in the power of education to make a difference, which can lead to more teacher engagement and greater support for student growth.

Many neuromyths are rooted in valid scientific findings, but they have been distorted through misrepresentation, oversimplification, or misinterpretation of the original research (Dekker et al., 2012; Howard-Jones, 2014). The complexity of scientific concepts, along with variations in professional language and conceptual frameworks across disciplines, makes it especially challenging for individuals without specialised training to accurately interpret neuroscience research or detect inaccuracies in media coverage of brain studies. For example, concepts such as "paying attention" or "motivation" carry different meanings in neuroscience than they do in everyday contexts, including classroom settings (Howard-Jones, 2014). Therefore, scientists should take an active role in educating the general public—and teachers in particular—about the meaning and limitations of their findings. They should clearly communicate the boundaries of their research and monitor how it is represented in the popular media to curb the spread of modern folk neuropsychology (Beck, 2010). Writers and editors of popular science magazines and educational textbooks, for their part, should make a clear distinction between well-established, evidence-based concepts and those for which the evidence remains inconclusive.

Teachers do not need to be neuroscientists, but they should be familiar with current educational research. Therefore, neuroscience should be included in teacher education and professional development programmes. Howard-Jones and colleagues (2009) found that general knowledge about the brain was positively correlated with the ability to identify common educational neuromyths and the ineffective practices associated with them. Similar results were obtained by Ruiz-Martin et al. (2022), who reported a reduction in neuromyth acceptance even after a short, 15-hour training programme.

The nature of educational interventions is also important. Neuromyths have shown remarkable resilience in the face of scientific counterevidence (Rousseau, 2024). Exposure to correct information does not automatically lead to the rejection of neuromyths. Some teachers may perceive corrective interventions as a challenge to their professional judgement. Teachers who have invested significant time and effort in developing "brain-based" educational practices may be reluctant to abandon these methods, even when confronted with debunking evidence (Newton & Salvi, 2020). Dersch, Renkl, and Eitel (2022) found that interventions were more effective when they included personalised refutation texts that explicitly informed teachers that their beliefs were not in line with current scientific knowledge. However, behavioural change was sometimes accompanied by negative emotions such as shame and guilt about having adopted misguided practices, raising ethical concerns about the use of such methods in professional development (Rousseau, 2024).

Yet, personalised feedback on erroneous beliefs does not necessarily lead to feelings of guilt, shame, or self-blame if teachers have a clear understanding of the nature of scientific progress. Scientific knowledge evolves, and what is accepted as fact today may be revised or replaced tomorrow. Teachers who are genuinely committed to evidence-based practice must remain open to updating their knowledge throughout their careers. Professional growth in education, as in science, requires intellectual humility and a willingness to revise one's beliefs in light of new evidence.

Finally, as Mila Hargen of MIT reminds us, while it is important to embrace new discoveries about the brain, we should also remember that—like any other organ—the brain functions best when supported by adequate sleep, regular physical activity, effective stress management, and a balanced diet. These lifestyle factors are essential for maintaining brain health and enhancing cognitive performance (Veerakone, 2024). Educators who combine scientific curiosity with critical reflection and self-care are better equipped to make informed decisions in the classroom. Dispelling neuromyths is not simply a matter of replacing false beliefs with correct ones—it is about fostering a mindset that values accuracy, ongoing learning, and the ethical application of science in education.

References

Bates, S. (2018, October 28). *A decade of data reveals that heavy multitaskers have reduced memory, Stanford psychologist says*. Stanford Report. https://news.stanford.edu/stories/2018/10/decade-data-reveals-heavy-multitaskers-reduced-memory-psychologist-says

Beck, D. M. (2010). The appeal of the brain in the popular press. *Perspectives on Psychological Science, 5*(6), 762–766.

Blakemore, S. J., & Choudhury, S. (2006). Development of the adolescent brain: Implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry, 47*(3–4), 296–312.

Bruer, J. T. (1999). *The myth of the first three years: A new understanding of early brain development and lifelong learning*. New York, NY: Free Press.

Buehl, M. M., & Beck, J. S. (2014). The relationship between teachers' beliefs and teachers' practices. In H. Fives & M. G. Gill (Eds.), *International handbook of research on teachers' beliefs* (pp. 66–84). New York, NY: Routledge.

Carnegie, D. (1936). *How to win friends and influence people.* New York. Simon & Shuster. https://archive.org/details/howtowinfriendsinfluencepeople_202004/page/n1/mode/2up?q=average

Center on the Developing Child. (2007). *The science of early childhood development: Closing the gap between what we know and what we do*. Cambridge, MA: Harvard University.

CERI (Centre for Educational Research and Innovation) & OECD (Organization for Economic Co-operation and Development) (2007). *Understanding the brain: The birth of a learning science*. Paris: OECD Publishing.

Chew, S. L. (2018, August 29). *Myth: We only use 10% of our brains.* Association for Psychological Science. https://www.psychologicalscience.org/uncategorized/myth-we-only-use-10-of-our-brains.html

Curry, L. (1990). A critique of the research on learning styles. *Educational Leadership, 48*(2), 50–52, 54–56.

Cytowic, R. (2025, January 7). *How multitasking drains your brain.* The MIT Press Reader. https://thereader.mitpress.mit.edu/how-multitasking-drains-your-brain/

Dekker, S., Lee, N. C., Howard-Jones, P., & Jolles, J. (2012). Neuromyths in education: Prevalence and predictors of misconceptions among teachers. *Frontiers in Psychology, 3*, 6-13.

Dersch, A.-S., Renkl, A., & Eitel, A. (2022). Personalized refutation texts best stimulate teachers' conceptual change about multimedia learning. *Journal of Computer Assisted Learning, 38*(4), 977–992.

Dunn, R. S., & Dunn, K. J. (1975). *Educator's self-teaching guide to individualizing instructional programs*. Parker Publishing Company.

Dunn, R., & Dunn, K. (1978). *Teaching students through their individual learning styles: A practical approach*. Reston, VA: Reston Publishing Company.

Dunn, R., Griggs, S. A., Olson, J., Beasley, M., & Gorman, B. S. (1995). A meta-analytic validation of the Dunn and Dunn model of learning-style preferences. *The Journal of Educational Research, 88*(6), 353–362.

Fallace, T. D. (2023). The long origins of the visual, auditory, and kinesthetic learning style typology, 1921–2001. *History of Psychology, 26*(4), 334–354.

Giedd, J. N. (2004). Structural magnetic resonance imaging of the adolescent brain. *Annals of the New York Academy of Sciences, 1021*(1), 77–85.

Goldhill, O. (2016, July 3). *Neuroscientists say multitasking literally drains the energy reserves of your brain.* Quartz. https://qz.com/722661/neuroscientists-say-multitasking-literally-drains-the-energy-reserves-of-your-brain?utm_source=chatgpt.com

Goswami, U. (2004). Neuroscience and education. *British Journal of Educational Psychology, 74*(1), 1–14.

Goswami, U. (2006). Neuroscience and education: From research to practice? *Nature Reviews Neuroscience, 7*(5), 406–413.

Hammond, C. (2012, November 13). *Do we only use 10% of our brains?* BBC.com https://www.bbc.com/future/article/20121112-do-we-only-use-10-of-our-brains

Hattie, J., O'Leary, T. O., Hattie, K., & Donoghue, G. (2024). *Great learners by design: Principles and practices to supercharge learners*. Thousand Oaks, CA: Corwin Press.

Hattie, J., & O'Leary, T. (2025). Learning styles, preferences, or strategies? An explanation for the resurgence of styles across many meta-analyses. *Educational Psychology Review, 37*(31).

Herculano-Houzel, S. (2002). Do you know your brain? A survey on public neuroscience literacy at the closing of the decade of the brain. *Neuroscientist, 8,* 98-110.

Howard-Jones, P. A. (2014). Neuroscience and education: Myths and messages. *Nature Reviews Neuroscience, 15*(12), 817–824.

Howard-Jones, P. A., Franey, L., Mashmoushi, R., and Liao, Y.-C. (2009). The neuroscience literacy of trainee teachers. Paper presented at British Educational Research Association Annual Conference, Manchester.

Hughes, B., Sullivan, K. A., & Gilmore, L. (2022). Neuromyths about learning: Future directions from a critical review of a decade of research in school education. *Prospects, 52*(2), 189–207.

James, W. (1914). *The energies of men.* New York: Moffat, Yard & Company. https://dn790003.ca.archive.org/0/items/energiesofmen00jameiala/energiesofmen00jameiala.pdf

Kavale, K. A., Hirshoren, A., & Forness, S. R**.** (1998). Meta-analytic validation of the Dunn and Dunn model of learning-style preferences: A critique of what was Dunn. *Learning Disabilities Research & Practice, 13*(2), 75–80.

Kim, M., & Sankey, D. (2018). Philosophy, neuroscience and pre-service teachers' beliefs in neuromyths: A call for remedial action. *Educational Philosophy and Theory, 50*(13), 1214–1227.

Koch, I., Poljac, E., Muller, H., & Kiesel, A. (2018). Cognitive structure, flexibility, and plasticity in human multitasking-An integrative review of dual-task and task switching research. *Psychological Bulletin, 144*(6),557–583.

Kuhl, P. K. (2010). Brain mechanisms in early language acquisition. *Neuron, 67*(5), 713–727.

Lethaby, C., & Harries, P. (2016). Learning styles and teacher training: Are we perpetuating neuromyths? *ELT Journal, 70*(1), 16–27.

Levitin, D. J. (2014). *The organized mind: Thinking straight in the age of information overload*. New York, NY: Dutton.

Liu, Z. (2022). Reading in the age of digital distraction. *Journal of Documentation*, *78*(6), 1201-1212.

Lucy. (2014). [Film]. EuropaCorp.

Maguire, E. A., Gadian, D. S., Johnsrude, I. S., Good, C. D., Ashburner, J., Frackowiak, R. S., & Frith, C. D. (2000). Navigation-related structural change in the hippocampi of taxi drivers. *Proceedings of the National Academy of Sciences of the United States of America, 97*(8), 4398–4403.

McCabe, D. P., & Castel, A. D. (2008). Seeing is believing: the effect of brain images on judgments of scientific reasoning. *Cognition, 107*(1), 343–352.

Nancekivell, S. E., Shah, P., & Gelman, S. A. (2020). Maybe they're born with it, or maybe it's experience: Toward a deeper understanding of the learning style myth. *Journal of Educational Psychology, 112*(2), 221–235.

Nelson, C. A. (2000). The neurobiological bases of early intervention. In J. P. Shonkoff & S. J. Meisels (Eds.), *Handbook of early childhood intervention* (pp. 204–228). Cambridge: Cambridge University Press.

Newton, P. M., & Salvi, A. (2020). How common is belief in the learning styles neuromyth, and does it matter? A pragmatic systematic review. *Frontiers in Education, 5*, 602451.

OECD (Organization for Economic Co-operation and Development) (2002). *Understanding the brain: Towards a new Learning science*, OECD Publishing, Paris, https://doi.org/10.1787/9789264174986-en Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in medial multitaskers. *PNAS,*106(37), 15583– 15587.

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest, 9*(3), 105–119.

Plutzer, E., McCaffrey, M., Hannah, A. L., Rosenau, J., Berbeco, M., & Reid, A. H. (2016). Climate confusion among U.S. teachers: Teachers' knowledge and values can conflict with their teaching about climate change. *Science, 351*(6274), 664–665.

Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the classroom: Teacher expectation and pupils' intellectual development*. New York, NY: Holt, Rinehart & Winston.

Rousseau, L. (2024). Dispelling educational neuromyths: A review of in-service teacher professional development interventions. *Mind, Brain, and Education*, *18*(3), 147–157.

Rubie-Davies, C. M. (2006). Teacher expectations and student self-perceptions: Exploring relationships. *Psychology in the Schools, 43*(5), 537–552.

Ruiz-Martin, H., Portero-Tresserra, M., Martínez-Molina, A., & Ferrero, M. (2022). Tenacious educational neuromyths: Prevalence among teachers and an intervention. *Trends in Neuroscience and Education, 29*, 100192.

Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academies Press.

TED. (2014, January 30). *What percentage of your brain do you use? | Richard E. Cytowic* [Video]. YouTube. https://www.youtube.com/watch?v=5NubJ2ThK_U

Touloumakos, A. K., Vlachou, E., & Papadatou-Pastou, M. (2023). "Visual type? Not my type": A systematic study on the learning styles neuromyth employing frequentist and Bayesian statistics. *Mind, Brain, and Education, 17*(3), 197–208.

Veerakone, R. (2024, January 26). *Do we use only 10 percent of our brain?* McGovern Institute, MIT. https://mcgovern.mit.edu/2024/01/26/do-we-use-only-10-percent-of-our-brain/

Weisberg, D. S., Keil, F. C., Goodstein, J., Rawson, E., and Gray, J. R. (2007). The seductive allure of neuroscience explanations. *J. Cogn. Neurosci, 20*(3), 470-477.

Willingham, D. T., Hughes, E. M., & Dobolyi, D. G. (2015). The scientific status of learning styles theories. *Teaching of Psychology, 42*(3), 266–271.

Wininger, S. R., Redifer, J. L., Norman, A. D., & Ryle, M. K. (2019). Prevalence of learning styles in educational psychology and introduction to education textbooks: A content analysis. *Psychology Learning & Teaching, 18*(3), 221–243.

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