

# Learning Styles: Academic Fact or Urban Myth? A Recent Review of the Literature

Theresa René LeBlanc, *Texas State University*

## ABSTRACT

While advocates of learning styles have suggested postsecondary educators and learning support programs match instruction to students' learning styles to enhance learning, past decades of research criticize educator's co-option of and disprove researchers' efforts to prove learning styles' existence and worth as a valid construct. The author examines numerous research articles that have challenged the efficacy of learning styles based on empirically provable evidence. The author also cites how the learning styles paradigm continues to be used in the field of postsecondary learning assistance. The author concludes that instead of promoting learning styles, educators should instruct learners on the intentional use of learning strategies.

The attempt to classify people by types is a pervasive human behavior. Early manifestations include the ancient yin and yang system of the Chinese, Hindu ideas of personality types that are reflective, emotional, active, or experimental, and the early Greco-Roman idea of the four humors—phlegmatic, choleric, melancholic, and sanguine. The twentieth century has seen its own attempts at classifications. These include the Stanford-Binet intelligence test, which classifies people according to their performance on five categories of thinking. Also, Jung's ideas about personality (influenced by Hindu ideas), and their more recent realization in the Myers-Brigg Type indicator (Garner, 2000) remain popular.

Two perspectives of personality emerged during the mid- to latter-half of the twentieth century. The cognitive perspective found its roots in psychoanalytic study and is based on the belief that thought, while not observable, is a valid construct because it can be rationally understood (Schunk, 2016). Along other theoretical lines, empiricism, centered in observable phenomenon, led to behaviorism, which found its start in the theory of Watson and continued most famously through Skinner. The behavioral perspective of learning operated under the theory that only observable behavior was verifiable (Schunk, 2016). From the convergence of these two lines of theory came the controversial classification system of learning styles. This system spawned a great number of classification systems that found their use in multiple fields.

In looking at personalities and learning modalities and understanding them, one sees that two important areas are cognitive and learning style classifications. In psychology, cognitive style refers to

the way people think and process information about others and the world. These styles are intrinsic to personalities and are shaped through interactions with other personalities. Generally, psychologists and educators have seen these cognitive styles as stable traits (Jonassen & Grabowski, 1993; Kozhevnikov, 2007). However, learning styles have been viewed as either trait or state, while elements like cognitive style and personality remain constant over time (and are structural, as with trait). The implication powering the learning style movement is that learners and teachers can change from using a learning style purposively, as with a state, to using these styles without thinking about them, as with a trait (Cassidy, 2004). The important part of this distinction, however, is that states are, unlike traits, more malleable. Therefore, states are open to being modified and expanded.

While cognitive style describes how learners process and think and is viewed as a valid construct, *learning styles*, which rely upon learners' perceptions about how they best learn, have come to be seen as nebulous and frequently inaccurate. Researchers based their conclusions on a lack of credible, well-designed, or replicated studies.

### Learning Styles in the Recent History of Education

Cassidy (2004) listed and described 23 learning style models with the purpose of showing similarities between those with overlapping qualities and hinting at ones that needed further empirical research into their claims and worth as instruments that could gauge both traits and states. Of these, the ones cited most were Gregorc's (2017) Style Delineator; Kolb's (1984) Experiential Learning Model (ELM) and Kolb's (1985) Learning Styles Inventory (LSI); Honey and

Mumford's (1992) Learning Style Questionnaire (LSQ) in *The Manual of Learning Styles: Revised Version*; Entwistle and Tait's (1995) *Approaches to Study Inventory (ASI)*; and Dunn, Dunn, and Price's (1989) *Learning Styles Inventory (LSI)*.

Cassidy (2004) noted that the connection between ability (again, more of a trait) and performance was directly observable, while the effects of learning style upon performance were contingent upon the task being done. For example, those good at gathering meaning auditorily would do well in a lecture-based class (as cited by in Cassidy, 2004). He theorized that characteristics, rather than ability, had led to the formation of learning styles. As a result, Cassidy examined learning styles used in specific fields where learning styles' effect on performance again would be contingent on tasks, here academia, medical school, career development, and police training. He then concluded that, because of their limitations and the lack of evidence on the reliability and validity of each model, learning styles needed to be carefully matched with the tasks their teaching would aid. He also cautioned that much more empirical research needed to be done regarding the reliability of current learning style measures, and advised those interested less in research and more in practice do more rationalization and integration of their reasons for using particular style measurements.

In major literature published at the same time in the U.K., Coffield, Moseley, Hall, and Eccleston (2004) listed 13 primary forms of learning styles based on a total of 71 types and identified three reasons for the complexity of examining the field: the loose links between its theory, pedagogy (including that of psychology, sociology, business, and education), and commercialism. He first divided these 13 styles amongst five main types of learning styles. The first deals with styles described as based upon one's intrinsic make-up, which he then tied to the four modalities found in the Visual, Auditory, Kinesthetic, and Tactile Learning Style Inventory (VAKT). Among these styles he highlighted Dunn, Dunn, & Price's (1989) and Gregorc's (1982) models of learning styles. The second group of learning styles he tied to deep-rooted cognitive structures such as patterns of ability. Within this group he identified as most important Riding's (1991) model, Cognitive Styles Analysis (CSA). The third group of styles were one part of what he defined as a stable type of personality. Here, he located Myers's (2018) Myers-Briggs (1962) type indicator. He linked flexibly stable preferences

for learning to styles in the fourth group: the Allinson and Hayes (1996), Honey and Mumford (1992), and Kolb (1985) tests of learning styles preferences. Finally, in the fifth group, Coffield et al. (2004) placed types that move from styles to approaches, orientations, strategies, and conceptions. In this body, he located learning styles indicators from Entwistle (1995) and Vermunt (1994).

After analyzing each of the 13 major types of learning theories, Coffield et al. (2004) concluded by dissenting with Cassidy's (2004) call that learning styles be organized and conjoined into more carefully reasoned and fewer groups by saying that study of learning styles stood against this because of their development within pedagogically independent fields such as business, law, psychology, and education.

Coffield et al. (2004) also pointed to the lack of a governing body to oversee this reorganization and to develop independent instruments for gauging learning preferences and propensities. Coffield et al. also addressed the problem caused by the commercialization of style testing instruments, their marketing, and the resultant defensiveness and territorialism this has reinforced within their makers. Also, because of the ease technology has given to such tests' administration by professors and members of different industries and the fact that they can give these tests for so many reasons, often the desire to prove some random hypothesis not grounded in an overall body of empirical investigation, Coffield et al. called for external monitoring of the tests. But this is monitoring which, no doubt, will not come. Finally, Coffield et al. called for more ethically driven use of these tests and, in this way, sounded, unfortunately, like wishful thinkers

rather than practical scholars.

Pashler, McDaniel, Rohrer, and Bjork, (2009) distinguished their work from Coffield et al.'s (2004) by claiming that the work of Coffield et al. was more of literature review (and an exhaustive one at that) than that of Pashler et al. (2009). Indeed, Pashler et al. took pains to point out that theirs was a study commissioned by the respected, peer-reviewed journal *Psychological Science in the Public Interest* to examine what sort of experimental requirements should be required for a learning style to be identified as valid and useful. But before proposing their experimental requirements, Pashler et al. pointed to two respected organizations that validated the commercial industry behind learning styles. First identified was a study commissioned by the National Association of Secondary Schools by Keefe (1988), which

“Gardner (2013) advocated that lessons need not be designed in different ways as per learners' intelligences, but that different experiences offered students access to learning at points across a topic.”

was distributed widely. Then they called attention to Yale's explicit propagation of learning style theory through a website maintained by the Yale Graduate School of Arts and Sciences in 2009. Since 2009, it is worth noting that Yale still offers a link under their Center for Teaching and Learning (2017), titled in its left column, "Teaching Students with Different Learning Styles and Levels of Preparation" (<https://ctl.yale.edu/teaching/ideas-teaching/teaching-students-different-levels-preparation>). However, when followed, this link now leads to an article titled, "Teaching Students with Different Levels of Preparation" (2017).

Pashler et al. (2009) then discussed the widespread use of learning style theory in general education teacher preparation textbooks and noted it was not much covered in educational psychology textbooks. As exemplars of the trend toward marketing learning styles, Pashler et al. also discussed Dunn and Dunn's learning-styles model (Dunn & Dunn, 1994), Kolb's (1984, 1985) Learning Styles Inventory (LSI), and Honey and Mumford's (1992) Learning Styles Questionnaire (LSQ). In particular, Pashler et al. (2009) examined the extensive marketing of Dunn and Dunn's work (still available under International Styles Network) and Kolb's LSI as distributed by the Hay Group. Both were revealed to be tremendous money makers and educational "empires," in effect.

Pashler et al. (2009) then isolated experimentation needed to prove learning styles theory worked. Learners divided into groups would have to be randomly assigned learning methods and take the same achievement test at the experiment's end. Results would have to show that a learning method that increased the test scores of one type of learner was different than the style that helped learners from another style. Pashler et al. stressed that such a result was evidence of a crossover interaction only if the learning styles and methods crossed on a horizontal axis when the styles were plotted there. To provide criterion for learning styles' existence and usefulness, the hypothesis only required the crossover interaction, not just the meshing hypothesis, which required that each group's performance be matched to instruction within that group's style. Only one study satisfied their requirements for a crossover reaction, and that study, the *Sternberg Triarchic Abilities Test* by Sternberg, Grigorenko, Ferrarri, and Clinkenbeard (1999) was still not stringent enough.

Cuevas (2015) took Pashler et al.'s (2009) call for more research and a credible research model and investigated what has happened since. Cuevas (2015) took a dim view of the way general teacher education textbooks presented learning styles and ignored their lack of proof, sharing the conclusion Pashler et al. (2009) reached earlier and other scholars have confirmed since. Cuevas (2015) clearly consolidated the matching hypothesis and interaction effect of Pashler et al. (2009) and used them as a formula for evaluating

research. But first, like Pashler et al., Cuevas (2015) linked the need for more research to a strangely unchanged educational landscape considering Pashler et al.'s (2009) findings and their prominence. Cuevas (2015) found more growth of learning styles' industry not only in education but also in business, medicine, and technology. Like Pashler et al. (2009), Cuevas (2015) discussed the Myers-Briggs in relation to business' selection of employees by typing them. Cuevas also cited Allcock and Hulme (2010) and Fridley and Fridley (2010), who advanced the idea that Gardner's multiple intelligences theory (1983) had contributed egregiously to learning styles theory.

The problem with both articles' claims is that they did not pay enough attention to Gardner's own claims, which he reasserted in 2013, that his theory was about permanent traits, not states, which are more malleable and less easily corroborated (Strauss 2013). At least Allcock and Hulme (2010) allowed that Gardner (1983) meant his theory to be applied to individuals, not classrooms. In an article he did with Moran and Kornhaber (as cited in Allcock and Hulme, 2010), Gardner (2013) advocated that lessons need not be designed in different ways as per learners' intelligences, but that different experiences offered students access to learning at points across a topic. In this way, the intervention that Gardner himself suggested sounds more like advocacy for the use of multiple learning strategies—not styles.

Cuevas (2015), like Pashler et al. (2009), looked for reasons for learning styles' continued proliferation in general education textbooks and in business and educational technology. Mainly, Cuevas (2015) criticized business people, educational administrators, and teachers for not having enough familiarity with psychometric means and thus the tools to recognize that learning styles have been discredited. Like Pashler et al. (2009), Cuevas (2015) blamed also the commercialization of learning styles and their growth into self-sustaining empires determined to ignore criticism. He pointed out empires that have huge financial investment in them, singling out Dunn, of St. John's University, and her successors.

Most important in this work, Cuevas (2015) clarified the template that Pashler et al. (2009) gave for ascertaining that a learning style and its implementation were valid. He also showed that learners' own designations of their learning styles were usually inaccurate, rarely matching with the way they actually learned according to studies of metacognition.

Cuevas (2015) concluded that the research, sparse as it was, provided empirical evidence that showed weaker support for learning styles in recent years. In his attempt to weaken if not conflate learning style theory with Gardner's (1996) multiple intelligences, Cuevas also discussed Bishka's (2010) article on how recent research based on neuroimaging shows that during any given activity, widely different parts of

the brain light up, suggesting that even during a task that was presumed to be operated by one part of the brain, the whole brain is involved—a fact that Gardner (2013) does not reject.

Cuevas (2015) also discussed the hope of those like Sankey et al., (as cited in Cuevas, 2015) whose own research from 2011 refuted the existence and worth of learning styles, that if nothing else, learning styles theory could garner feedback from learners that at the least increased their self-awareness and their motivation to learn and this way aid achievement. Regrettably for Sankey, Cuevas reiterated that the field of metacognition was finding that learners were often wrong in judging their learning needs and academic progress.

Though Cuevas's criticism of research in the learning styles field was fierce, perhaps the strongest critic of learning styles theory was Willingham (Reiner and Willingham, 2010; Willingham, Hughes, & Dobolyi, 2015). In an article from 2010, Reiner and Willingham both asserted bluntly that there was no proof of learning styles' existence and expressed their feeling that lack of knowledge of this could damage students and their educators. Though they acknowledged the worth of learning styles theory for stressing that individuals learn in different ways, Reiner and Willingham quickly qualified this observation by attributing these differences to ability and genetic background, in keeping with Cassidy's (2004) assertion that intelligence is a trait not a state. Reiner and Willingham (2010) also stated that learners are deeply affected by their backgrounds, subsequent prior knowledge, and learning disabilities.

Next, Reiner and Willingham (2010) argued against those who claim that learners' self-asserted learning styles need to be considered by showing that, when tested, these preferred styles have no effect on students' ability to learn different subjects. They also underscored the idea Cuevas (2015) and Pashler et al. (2009) supported that learning styles have not been successfully matched to teaching styles in terms of producing higher achievement in students.

Willingham et al. (2015) examined Pashler et al.'s (2009) requirements for judging whether or not a learning style was provable, including examining the matching or crossover effect. Willingham et al. (2015) reaffirmed the basically unsupported nature of learning styles after, again, discussing the differences between styles and abilities. They also examined the reasons for learning styles' continued popularity, finding their sources in confirmation bias

wherein something becomes so rooted in cultural common knowledge that it predisposes teachers to see its proof in situations that could be unproven. A teacher could be unsuccessful at helping a student understand a problem until using a graph to help that student and having success, then conclude that the student is visually oriented when, instead, the student might be understanding the material as result of the number of times it has been presented. They also broached Gardner's (2013) claims that researchers misunderstood him, once again evidencing researchers' confusing intelligence with style and trait with state.

In a different approach, Griffiths and İnceçay (2016) introduced learning style stretching, a concept that sounds close to simple strategic teaching. Even

though their study did not adequately address evidence in the ways that Pashler et al. (2009) and Cuevas (2015) claimed were necessary for proving a learning styles' existence, Griffiths and İnceçay's (2016) work was of value simply because it supported the idea that learners can increase their learning and achievement when they step out of their style comfort zone and try to employ different styles with which to learn material. This idea was congruent with Gardner's (2013) and Willingham et al.'s (2015) belief that learning different material requires the use of different learning methods and strategies that can be nourished and grown. Though Griffiths and İnceçay (2016) termed this style stretching, with only slight semantic alteration this could apply to abilities and traits. Also, Griffiths and İnceçay saw an increase in learning as per learners' willingness to style stretch as well as noted that more successful learners employed this method more often, thus giving

educators more incentive to support the growth of style (or abilities) stretching in learners.

What Cuevas (2015) as many researchers have done was forget Gardner's (2013) own beliefs that many parts of the brain are involved in any activity. In his discussion on Good Works, linked to Harvard's Graduate Teaching College in 2017 in their still extant Ground Zero Project, Gardner (2013) described intelligences as abilities, not styles, and was careful to elaborate that each individual possesses many abilities in different areas that, combined, make an intellectual toolkit. Gardner's (2013) assertion underscores that many parts of the brain are involved in learning, including parts that he was not privy to in the 1980s when he conceived of multiple intelligences. Even Willingham et al. (2015), amongst the strongest critics of learning styles, supported this understanding of learning

“What Cuevas (2015) as many researchers have done was forget Gardner's (2013) own beliefs that many parts of the brain are involved in any activity. ”

abilities when they addressed the ongoing confusion of ability with style and countered those who looked at Gardner's multiple intelligences as a support for learning styles, claiming that Gardner himself found this confusion inaccurate (as cited in Willingham, et al., 2015). Gardner claimed that his multiple intelligences theory, which is truly an ability theory, could not be used as support for learning styles' existence and use because one cannot use one intelligence to understand another. To do math problems, for example, one must use math, not got through another form of cognition such as kinesthetic or musical ability. Or in another example, one could not use Microsoft Word to perform Excel functions (as cited in Willingham, et al., 2015).

### Learning Styles Still Promoted

As an educational tool, learning styles are still promoted in numerous venues. For example, Stahl (1999) questioned learning styles as a valid construct and the general acceptance of it by educators in the K-12 setting in teaching reading, citing multiple studies ranging from 1978-1992 disproving the usefulness of teaching to learners' preferred learning styles, the validity of the construct, and interventions based on learning style's existence. In the field of postsecondary learning assistance, Dembo and Howard (2007) discouraged student success textbooks authors from their continued promotion of this construct, claiming no research-based benefit existed. Yet, learning styles topics are still pervasive within many of these textbooks and publisher-sponsored Internet support sites and learning labs.

The organization that certifies postsecondary tutoring training programs, the College Reading and Learning Association (CRLA), still includes training in learning styles and how to accommodate learners by using their learning styles when working with them. For the CRLA's International Tutor Training Program Certification (ITTPC), the fourth certification element on the first level is "Adult learners, learning theory, and/or learning styles" (Schotka, Bennet-Bealer, Sheets, Stedje-Larsen, & Van Loon, 2014). Specifically, tutors are required to be familiar with different learning styles, especially those based in the visual, tactile/concrete, auditory learning domains and with tutoring strategies that are appropriate to use with students with different learning styles or preferences (Schotka, Bennet-Bealer, Sheets, Stedje-Larsen, & Van Loon, 2014). This requirement is still held though the effectiveness of tailoring tutoring and teaching to learning style preferences has been disproven (Pashler, 2009).

While the University of Missouri at Kansas City (UMKC), which officially grants International Certification of Supplemental Instruction (SI) programs, no longer stipulates that learning styles must be covered as part of certification, some certified SI programs still provide access to learning styles mate-

rials. Louisiana State University, whose SI program is UMKC certified, offers links to several learning styles tests at its School of Nursing in New Orleans (<https://nursing.lsuhsu.edu/AcademicSuccessProgram/LearningStyles.html>). In another SI program certified by UMKC, Purdue University, Swartzendruber (2014) discussed reaching students' learning styles in a PowerPoint still housed at UMKC's website. Finally, in the *Journal of Supplemental Instruction* of UMKC, Carlsen-Landy, Falley, Wheeler, and Edwards (2014) explained the importance SI leaders found in discovering students' learning styles, also on UMKC's website. Some SI programs which may not be currently certified with UMKC, such as Fayetteville State University, still require that the SI accommodate the students' different learning styles (<https://www.uncfsu.edu/documents/learning-center/si/Leader-Handbook.pdf>).

Last, universities themselves offer and promote links to learning styles inventories. Duquesne University provides direct access to Fleming's (2018) Visual, Auditory, Read/write, and Kinesthetic (VARK) through its Center for Teaching Excellence (<http://www.duq.edu/about/centers-and-institutes/center-for-teaching-excellence/teaching-and-learning/discover-your-learning-style>). North Carolina State University hosts Felder and Solomon's (n.d.) Index of Learning Styles Questionnaire (<http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSpage.html>), and Texas Tech's Teaching, Learning, and Professional Development Center includes a well-developed page and link on using learning styles, including the Myers-Briggs, Kolb and McCarthy—now the Kolb Learning Style Inventory (2013)—and provides online links to other styles ([https://www.depts.ttu.edu/tlpdc/Resources/Teaching\\_resources/TLPDC\\_teaching\\_resources/LearningStyles.php](https://www.depts.ttu.edu/tlpdc/Resources/Teaching_resources/TLPDC_teaching_resources/LearningStyles.php)) prepared by Forrest (n.d.). These are only few examples out of many. From these and others, it is clear that the propagation of learning styles in higher education is a continuing issue.

### Conclusion

My hope at the onset of this review was that somehow the knowledge gained from understanding one's preferred way of learning could be used to make learners more self-aware and thus self-efficacious. Yet, the literature continues to disclaim learning styles as a valuable educational construct. There continues to be a lack of evidence to any benefit in matching instruction to learners' preferred learning style or that understanding one's learning style improves learning. Researches also continue to question the reliability and validity of learning style assessments.

However, as educators continue to seek ways to improve academic achievement of their students, they should not completely discredit the power of helping students understand their own strategies and abilities to add to their sense of power as learners.

Teaching students the cognitive processes and skills involved in learning—those strategies that help learners think, solve problems, and create meaning—can similarly empower students, not with a false sense that one can learn only one or two ways, but with an understanding that learning is multifaceted, reflecting different combinations of learning abilities that make us effective in different ways.

### References

- Allcock, S. J., & Hulme, J. A. (2010). Learning styles in the classroom: Education benefit or planning exercise? *Psychology Teaching Review, 16*(2), 67-79.
- Allinson, J., & Hayes, C. (1996). The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management Studies, 33*, 119-135.
- Bishka, A. (2010). Learning styles fray: Brilliant or batty? *Canadian Learning Journal, 14*(2), 37-39.
- Cassidy, S. (2004). Learning styles: An overview of theories, models, and measures. *Educational Psychology, 24*(4), 419-444.
- Carlsen-Landy, B., Falley, B., Wheeler, A., & Edwards, D. (2014). Adaptations of supplemental instruction: Our course assistants wear many hats. *Supplemental Instruction Journal, 1*(1), 7-21.
- Coffield, F., Moseley, D., Hall, E., & Eccleston, K. (2004). *Learning styles and pedagogy in post-16 learning: A systematic and critical review*. Learning and Skills Research Centre. Retrieved from [https://www.mbtionline.com/?utm\\_source=MBF&utm\\_medium=link&utm\\_campaign=online](https://www.mbtionline.com/?utm_source=MBF&utm_medium=link&utm_campaign=online)
- Cuevas, J. (2015). Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles. *Theory and Research in Education, 13*(3), 308-333.
- Dembo, M. H., & Howard, K. (2007). Advice about the use of learning styles: A major myth in education. *Journal of College Reading and Learning, 37*(2), 101-109.
- Dunn, R. (1990). Bias over substance: A critical analysis of Kavale and Forness' report on modality-based instruction. *Exceptional Children, 56*(4), 352-356.
- Dunn, R., Dunn, K., & Price, G. E. (1989). *Learning Styles Inventory*. Lawrence, KS: Price Systems.
- Dunn, R., & Dunn, K. (1994). *Dunn and Dunn Learning Style Model*. Retrieved from <http://www.ilsa-learning-styles.com/Learning+Styles/The+Dunn+and+Dunn+Learning+Styles+Model.html>
- Entwistle, N. J., & Tait, H. (1995). *The Revised Approaches to Studying Inventory*. [Measurement instrument]. Centre for Research on Learning and Instruction, Edinburgh, Scotland: University of Edinburgh.
- Felder, R. M., & Solomon, L. K. (n.d.) Index of Learning Styles Questionnaire [Measurement instrument]. Retrieved from <http://educationdesignsinc.com/index-of-learning-styles/>
- Fleming, N. D. (2018). The VARK Questionnaire: Visual, Aural, Read/write, Kinesthetic, [Measurement instrument]. Retrieved from <http://vark-learn.com/the-vark-questionnaire/>
- Forrest, D. (n.d.). *How do I address learning styles in my course?* Retrieved from [https://www.depts.ttu.edu/tlpdc/Resources/Teaching\\_resources/TLPDC\\_teaching\\_resources/Documents/HowDoIAddressLearningStylesinMyCoursewhitepaper.pdf](https://www.depts.ttu.edu/tlpdc/Resources/Teaching_resources/TLPDC_teaching_resources/Documents/HowDoIAddressLearningStylesinMyCoursewhitepaper.pdf)
- Fridley, W. L., & Fridley, C. A. (2010). Some problems and peculiarities with the learning styles rhetoric and practice. *Journal of Philosophy & History of Education, 60*, 21-27.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York, NY: Basic Books.
- Gardner, H. (1996). Multiple intelligences: Myths and messages. *International Schools Journal, 15*(2), 8-22.
- Gardner, H. (2013). *Frequently asked questions: Multiple Intelligences and related educational topics*. <http://multipleintelligencesoasis.org/wp-content/uploads/2013/06/faq.pdf>
- Garner, I. (2000). Problems and inconsistencies with Kolb's learning styles. *Educational Psychology, 20*, 341-348.
- Gregorc, A. F. (2017). *Gregorc Style Delineator* [Measurement instrument]. Retrieved from <http://gregorc.com/instrume.html>
- Griffiths, C., & İnceçay (2016). Styles and style-stretching: How are they related to successful learning? *Journal of Psycholinguist Research, 45*, 599-613. doi: 10.1007/s10936=015-9355-2
- Honey, P., & Mumford, A. (1992). *The manual of learning styles: Revised version*. London, UK: PeterHoney.
- Jonassen, D. H., & Grabowski, B. L. (1993). *Handbook of individual differences, learning, and instruction*. Hillsdale, NJ: Erlbaum.
- Keefe, J. W. (1988). *Profiling and utilizing learning style*. NASSP learning style series. Reston, VA: National Association of Secondary School Principals.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.
- Kolb, D. A. (1985). *Learning Styles Inventory and Technical Manual*. [Measurement instrument]. Boston, MA: McBer.
- Kolb, D. A. (2013). *The Kolb Learning Style Inventory, Versions 3.1 and 3.2* [Measurement instrument]. Retrieved from [https://learningfromexperience.com/research-library/kl-si-3\\_1-3\\_2-technical-specifications/](https://learningfromexperience.com/research-library/kl-si-3_1-3_2-technical-specifications/)

- Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin*, 133(3), 464-481. doi: 10.1037/0033-2909.133.3.464
- Myers-Briggs Type Instrument (2018). [Measurement instrument]. Retrieved from [https://www.mbtionline.com/?utm\\_source=MBF&utm\\_medium=link&utm\\_campaign=online](https://www.mbtionline.com/?utm_source=MBF&utm_medium=link&utm_campaign=online)
- Myers, I. B. (1962). *The Myers-Briggs type indicator manual*. Princeton, NJ: The Educational Testing Service.
- Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2009). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest*, 9(3), 105-119.
- Reiner, C., & Willingham, D. (2010). The myth of learning styles, *Change: The magazine of higher learning*, 45(5), 32-35. doi: 10.1080/000911383.2010.503139
- Riding, R. J. (1991). *Cognitive styles analysis*. Birmingham: Learning and Training Technology.
- Schotka, R., Bennet-Bealer, N., Sheets, R., Stedje-Larsen, L., & Van Loon, P. (2014). *Standards, outcomes, and possible assessments for ITTPC certification*. Retrieved from [https://www.crla.net/images/ITTPC/ITTPC\\_Standards\\_Outcomes\\_Assessments\\_Level\\_1.pdf](https://www.crla.net/images/ITTPC/ITTPC_Standards_Outcomes_Assessments_Level_1.pdf)
- Schunk, D. H. (2016). *Learning theories: An educational perspective* (7th ed.). Boston, MA: Pearson.
- Stahl, S. A. (1999). Different strokes for different folks: A critique of learning styles. *American Educator*, 23(3), 27-31.
- Sternberg, M. S., Grigorenko, E. L., Ferrarri, M., & Clinkenbeard, P. (1999). A triarchic analysis of an aptitude-treatment interaction. *European Journal of Psychological Assessment*, 15, 1-11.
- Strauss, V. (2013, October 16). Howard Gardner: Multiple intelligences are not 'learning styles' *The Washington Post*. Retrieved from [https://www.washingtonpost.com/news/answer-sheet/wp/2013/10/16/howard-gardner-multiple-intelligences-are-not-learning-styles/?utm\\_term=.a4d2c14ddc35](https://www.washingtonpost.com/news/answer-sheet/wp/2013/10/16/howard-gardner-multiple-intelligences-are-not-learning-styles/?utm_term=.a4d2c14ddc35)
- Swartzendruber, E. (2014). Creating and growing a [sic] SI program [PowerPoint]. Retrieved from [https://info.umkc.edu/si/wp-content/uploads/2015/09/Swartzendruber\\_Program.pdf](https://info.umkc.edu/si/wp-content/uploads/2015/09/Swartzendruber_Program.pdf)
- Vermunt, J. D. H. M. (1994). *Inventory of Learning Styles in Higher Education: Scoring key for the Inventory of Learning Styles in Higher Education*. Tilburg, Netherlands: Tilburg University, Department of Educational Psychology.
- Willingham, D. T., Hughes, E. M., & Dobolyi, D. G. (2015). The scientific status of learning styles theories. *Teaching of Psychology*, 42(3), 266-271.
- Yale Center of Teaching and Learning. (2017). Teaching students with different learning styles and levels of preparation: Teaching students with different levels of preparation. Retrieved from <http://ctl.yale.edu/teaching/ideas-teaching/teaching-students-different-levels-preparation>