Learning Styles: Implications for Instructional Design

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Abstract

This paper explores the applicability and efficacy of learning styles and their effect, if any, on learning outcomes. Specifically, this paper addresses the subtleties between learning styles and learning modalities, as well as differentiating between learning styles and cognitive styles. A background on reliability and validity of instruments used to identify specific learning styles and their psychometric properties is discussed, as well as a brief summary on learning style research. Additionally, a critical view of learning styles and their effect on learning outcomes is introduced and analyzed.

Keywords: learning styles, learning modalities, cognitive styles, learner preferences, learner characteristics, instructional design
Research on Learning Styles

The recurring debate concerning the efficacy of learning styles and their impact on learning outcomes has been reflected in the literature for the past 50 years. The research, however, has not overwhelmingly supported the premise that learning styles are useful variables when designing instruction for adult learners. That said, the majority of research does not support a statistically significant relationship between learning styles and learning outcomes. Since the goal of designing instruction is to attain desired learning outcomes and ultimately improve human performance, the question an instructional designer must address is: Should learning styles be considered as variables when designing instruction?

A recent article in the Chronicle of Higher Education entitled *Matching Teaching Style to Learning Style May Not Help Students* (2009) addressed the aforementioned question. The article summarized a comprehensive meta-analysis on learning styles that revealed that there is not a compelling argument to support the predictive validity of measures of learning styles on learning outcomes (Pashler, McDaniel, Rohrer, & Bjork, 2008). A decade earlier, a similar conclusion was reached when Stahl (1999) found that research failed to demonstrate that assessing children’s learning styles and matching them to instructional methods had any effect on their learning.

Nevertheless, there is a strong intuitive appeal to the notion that individual preferences and styles of learning must play a significant part in learning outcomes. Indeed, those who teach and those who learn notice the variability in the speed and manner with which their students acquire new information and ideas, and it seems reasonable that planning instruction to adapt to individual learning should yield improved learner outcomes (Coffield, Moseley, Hall, & Ecclestone, 2004).
Reliability and Validity

Whereas the discussion on learning styles focuses on individual differences in learning, it should focus on the whether learning styles can be used to predict performance. Despite the commonly held belief that learning styles—most notably the visual, aural, and kinesthetic (VAK) models (Sharp, Byrne, & Bowker, 2008)—affect performance, there is a debate about whether learning styles even exist, and that perhaps the only current evidence of their existence are the tests used to identify them. Any discussion concerning the research on learning styles, therefore, must address the reliability and validity of the instruments used to identify learning styles.

Simply stated, validity refers to whether a test appears to be measuring what it purports to measure, and reliability questions whether a test will consistently produce the same or similar results over repeated measures. That said, if the instruments used to identify learning styles do not meet the criteria for robust reliability and validity, then the results of those tests could not be used with confidence to establish relationships between variables. This conclusion was similarly reiterated by Cassidy (2004) where the twenty-four most common instruments used to identify learning or cognitive styles were analyzed. Cassidy concluded there were many overlaps and similarities between the different instruments resulting in a lack of explicit information needed to draw any conclusions about the effects of such styles on learning—the absence of reliability and validity data notwithstanding.

Myron Dembo, an esteemed educational psychologist and Emeritus Professor of Educational Psychology, stated “any usefulness that might be derived from applying learning styles must be substantiated by valid and reliable instruments” (Dembo & Howard, 2007, p. 103). He concludes, furthermore, that “there is no benefit to matching instruction to preferred
learning style, and there is no evidence that understanding one’s learning style improves learning and its related outcomes” (p.107).

Although the visual, aural, and kinesthetic (VAK) learning styles are unquestionably the most familiar, research has identified over 71 different types of learning styles which have been categorized into 13 models and families (Learning Styles and Pedagogy in Post-16 Learning: A Systematic and Critical Review, 2004). Due to the low validity and reliability scores of the instruments used to identify specific learning styles, however, there are serious doubts about their psychometric properties (Coffield, Moseley, Hall, & Ecclestone, 2004; Liu, Ginther, & Ginther, 1999; Penger, Tekavčič, & Dimovski, 2008). This lack of reliability and validity of the instruments used to identify learning styles has been supported by Curry (1990). He claims that there are three basic problems associated with the use of instruments used to identify learning styles: (1) confusion in definitions of learning styles, (2) weaknesses in reliability and validity, and (3) the identification of relevant characteristics in instructional settings, or aptitude-treatment interactions.

Curry’s conclusion has also been echoed in a comprehensive literature review conducted by Professor Thomas Reeves, of the University of Georgia, entitled Do Generational Differences Matter in Instructional Design? (Reeves, 2006). In his literature review, Reeves stated that the weaknesses found in learning styles research throws grave doubt on the validity and utility of employing learning styles as a basis for accommodating students of any generation (Coffield, et al., 2004).

**Learning Styles versus Learning Modalities**

There is substantial confusion between the terms learning modalities and learning styles; these are often used interchangeably. Learning or cognitive styles are habitual ways of
processing information to memory. They are the ways one senses, thinks, solves problems, and remembers information. In contrast, learning modalities, refer to one’s senses: visual, auditory, and tactile (including kinesthetic). Neuroscience, however, has revealed that “ninety percent of learning is visual with eighty-five percent of the brain wired for visual processing” (Lucas, 2004, pp 8, as cited in Clemons, 2005); one’s primary learning modality, therefore, is visual.

The most significant variable in terms of one’s retention of learning is one’s attachment of meaning to what is learned. Retention is generally independent of the modality used to acquire whatever is learned (Willingham, 2005). Nevertheless, it should be noted that retention can be reinforced to some degree when learning occurs through a combination of text and images rather than through text alone (Mayer & Moreno, 2003). Furthermore, adding images to verbal (textual or auditory) learning can result in significant gains in basic and higher-order learning (Multimodal Learning Through Media…, 2008).

Unquestionably, some individuals excel over others at aural, visual, or kinesthetichic tasks. But our brain does not work in a way that differentiates types of information received through the senses. The brain seeks for meaning, pattern interconnectedness, relevance, and usefulness of applications (Greenleaf, 2003). It does this by storing information into memory collectively, not separately. With respect to working memory, verbal/text memory and visual/spatial memory work together, without interference, into a framework (or schema) of understanding. Consequently, the development of schemata requires students to learn topics in ways that are relevant and meaningful to them, regardless of the modality (Multimodal Learning Through Media: What the Research Says, 2008). This is supported by Clark and Mayer (2008) where they state, according to the cognitive theory of multimedia learning, that “all people have separate channels for processing verbal and pictorial material”, and “learners actively attempt to
build pictorial and verbal models from the presented material and build connections between them” (p. 121).

**Differentiation Between Learning Styles and Cognitive Styles**

Research has revealed a wide disparity in the definition of *learning styles* and their relationship to *cognitive styles*. The term *cognitive style* has been introduced and reintroduced into psychological literature since the writings of the German psychologists at the turn of the century. The term has been used most recently to denote consistencies in individual modes of functioning in a variety of behavioral situations. Specifically, cognitive style refers to the preferred way one processes information (Kagan, Moss, & Sigel, 1963). It is viewed as a bipolar dimension representing one’s typical or *habitual* mode of problem-solving, thinking, perceiving, and remembering; it is considered stable over time, and is related to theoretical or academic research (Cognitive/Learning Styles, n.d.).

Although there are numerous definitions of *learning styles*, the more common ones see these styles as being “multidimensional.” They are generally not “either-or” extremes. They are characterized by how information is preferentially perceived (sensory or intuitive), organized (inductive or deductive), processed (active or reflective), and received (visual, aural, or kinesthetic). In other words, a learning style or modality describes how information enters the brain: visually, aurally, or tactically, whereas cognitive style refers to how the information is processed once the information gets to the brain. Perhaps the most cited definition is by Keefe (1979) who defines "learning styles [as] the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment" (as cited in Merrill, 2000).
Conclusion

The human dynamics of learning are a complex, multi-dimensional process, with cognitive science revealing that learners differ in their abilities with different modalities. Teaching to a learner’s best modality, however, does not affect his or her educational achievement. What does matter is whether the learner is taught in the content's best modality (Willingham, 2005); learning is facilitated when content drives the choice of modality.

If a focus on learning styles does not work, what does work? Through the systematic design of instruction, integrating cognitive learning strategies that help learners link new information to prior knowledge should be a fundamental consideration. Myron Dembo, Emeritus Professor of Educational Psychology, may have summed it up best when he stated that educational research supports the teaching of learning strategies that contain scaffolding features and tailored instruction for different levels of prior knowledge (Dembo & Howard, 2007). This focus on instructional strategies is also supported by David M. Merrill (2000), who concludes that “learning style is secondary in selecting the fundamental components of instructional strategy appropriate for and consistent with a given learning goal” (p. 4).

On a final note, the research on how we learn has generally ignored the our agility in adapting to different learning environments. We have an intrinsic desire and ability to learn, although some of us are more adept than others. Learning style research, regrettably, has exhibited a tendency to “profile” learners into specific categories, and consequently has understated our individual potential to employ multiple learning “preferences” in our endeavor to learn. Consequently, we, as educators, must never underestimate the learning variable that “trumps” all other variables …the will to learn.
References


About the Authors

Jolly T. Holden, Ed.D.  Dr. Jolly T. Holden is an Associate Professor, School of Education, American InterContinental University’s online Master’s of Education degree program.  In that capacity, he has facilitated over 176 graduate courses in subject matter areas such instructional technology, instructional design, cognitive science, learning theory, online learning—theory and practice, educational research, cognitive approaches to learning, and computer-mediate learning.  For the past 20 years, he has been actively involved in researching and promoting distance learning throughout the federal government and corporate community.  During the last 15 years, he has keynoted, chaired, and presented at over 50 prominent national distance learning and training conferences.  He currently serves on the Board of Directors of the Federal Government Distance Learning Association (www.FGDLA.us), as well as the Board of Directors and the Executive Committee of the United States Distance Learning Association (www.USDLA.org), where he has served continuously since.

He has been listed in the Who’s Who in Teleconferencing, and in 2002 was recognized by Learning & Training Magazine as one of the top 10 e-learning champions in the U.S.  In 2001, he was inducted into the USDLA Hall of Fame, and based on his contributions in promoting distance learning in the Federal Government, was also inducted into the FGDLA Hall of Fame the same year.  In 2009, he was the first recipient of the FGDLA Eagle award for lifelong contributions in promoting distance learning in the Federal Government.

Philip J. L. Westfall, Ph.D.  Over the past 20 years, Dr. Phil Westfall has been a leader in distance learning within the Air Force.  Phil began government service in as an Air Force officer where he served as an aviator of fighter aircraft, and served on the faculty of the United States Air Force Academy.  While assigned to the Air Force Institute of Technology, Phil established a worldwide interactive television (ITV) network, the Air Technology Network (ATN).  His pioneering efforts led to the establishment of an interagency ITV network, known as the Government Education & Training Network (GETN), a network used by 17 government agencies reaching over 2,300 distance learning classrooms.

Phil is Chairman Emeritus of the Board and formerly President of the United States Distance Learning Association.  He is president of the Federal Government Distance Learning Association, a chapter of the USDLA.  Phil is on the Editorial Board of the American Journal of Distance Education, and on the Board of Advisors of Satellite Application Conference & Expo.

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