LEARNING STYLES AND GENERATIONAL DIFFERENCES: DO THEY MATTER?

Evaluating the Impact and Variability of Learning/Cognitive Styles and Generational Differences

Jolly T. Holden, Ed.D
Philip Westfall, Ph.D.

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INTRODUCTION

The recurring debate concerning the efficacy of learning styles and their impact on learning outcomes has been reflected in the literature for the past 60 years. However, the research has not overwhelming supported the premise that learning styles are useful in determining the most appropriate instructional media or teaching strategy to deliver content. To that end, the categorical labeling of generational differences (digital natives vis-à-vis digital immigrants) and their perceived effect on how they learn may not be an appropriate variability to consider in media selection. Consequently, this paper will explore the applicability of generational differences and learning styles pertinent to the instructional media selection process.

RESEARCH ON LEARNING STYLES

Overall, the majority of research does not support a significant statistical relationship between learning/cognitive styles and learning outcomes. These findings were highlighted in a recent article in the Chronicle of Higher Education entitled Matching Teaching Style to Learning Style May Not Help Students\(^1\). Simply stated, the research has not revealed a compelling argument as to the impact of learning styles and their effect on predicting learning outcomes\(^2\). However, there is a strong intuitive appeal to the notion there is individual preferences and styles of learning. Further evidence of the concept of learning styles is apparent when teachers notice the variability in the speed and manner with which their students acquire new information and ideas\(^3\). Consequently, the concept of learning/cognitive styles is one of the most misunderstood and overused reference confronting educational and training communities today. One of the reasons is the complexity of how the human brain functions as it relates to one’s modalities in receiving information (visual, aural, kinesthetic) and how the brain processes that information (cognition). Continued research into neuroscience is discovering how the brain processes information acquired through our primary learning modalities: visual, aural, and kinesthetic.

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One important finding from that research is that memory is usually stored independent of any modality. You typically store memories in terms of meaning—not in terms of whether you saw (visual), heard (aural), or physically (tactile/kinesthetic) interacted with the information\(^4\). To that end, retention is improved through words and pictures rather than through words alone\(^5\).

**Reliability and Validity**

Any discussion concerning the research on learning styles 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, where reliability questions whether the test will consistently produce the same or similar results when reapplied over time. Myron Dembo, a highly respected educational psychologist, stated that "any usefulness that might be derived from applying learning styles must be substantiated by valid and reliable instruments, and concludes "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."\(^6\)

To that end, research has identified over 71 different types of learning styles (Table 1) summarized into the 13 most influential models (Table 2) and families (Table 3), and due to low validity and reliability scores of the instruments used to identify specific learning styles raise serious doubts about their psychometric properties\(^7\),\(^8\),\(^9\). The lack of reliability and validity of the instruments used to identify learning styles have been supported by Curry\(^10\) in that three basic problems associated with the use of learning style inventories: (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

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interactions. Furthermore, research has indicated learning/cognitive styles have less than a 5% effect on the variability in learning.

**Learning Styles vis-à-vis Learning Modalities**

There is substantial confusion between learning modalities and learning styles where the terms are often used interchangeably. Learning/cognitive styles are *habitual ways of processing information to memory*, per se, they are ways one senses, thinks, solves problems, and remembers information. On the other hand, learning, or perceptual modalities, are sensory based and refer to the primary way our bodies take in information though our senses: *visual* (seeing), *auditory* (hearing), *kinesthetic* (moving), and *tactile* (touching). Note: Neuroscience has revealed “ninety percent of learning is visual with eighty-five percent of the brain wired for visual processing”\(^\text{11}\).

While there is a commonly held belief learning styles affect performance, most notably the visual, aural, and kinesthetic (VAK) models\(^\text{12}\), there is continued debate as to whether learning styles even exist, and the only current evidence of their existence are the tests used to identify them.

**Learning Styles vis-a-vis Cognitive Styles**

Research has revealed a wide disparity in the definition of learning styles and their relationship to cognitive styles. Cognitive styles refer to individual differences in modes of cognitive functioning, or the preferred way individuals’ process information. Generally speaking, they are viewed as a bipolar dimension representing a person’s typical or *habitual* mode of problem solving, thinking, perceiving and remembering, and considered stable over time\(^\text{13}\). Learning styles, on the other hand, are defined as multidimensional and usually not “either-or” extremes and characterized by how information is preferentially perceived (sensory or intuitive), organized (inductive or deductive), processed (active or reflective), and modality preference (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.

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\(^{13}\) Cognitive/Learning Styles (n.d.). Retrieved from [http://tip.psychology.org/styles.html](http://tip.psychology.org/styles.html)
Beginning in the early 60's, Lee Cronbach and Richard Snow searched "fruitlessly for interactions of abilities" by looking for aptitudes (characteristics that affects responses to the treatment) that explained how to instruct students one way and not another, i.e., evidence that showed regression slopes that differed from treatment to treatment. Continuing through the 70’s and mid 80’s, Cronbach and Snow continued their research by advocating closer scrutiny of cognitive processes by focusing on Aptitude Treatment Interactions\textsuperscript{14}.

The concept of ATI is that some instructional strategies (treatments) are more or less effective for particular individuals depending upon their specific abilities. As a theoretical framework, ATI suggests that optimal learning results when the instruction is matched to the aptitudes of the learner. It is consistent with theories of intelligence that suggest a multidimensional view of ability. The aim of ATI research is to predict educational outcomes from combinations of aptitudes and treatments. However, the lack of attention to the social aspects of learning is a serious deficiency of ATI research\textsuperscript{15}.

Cronbach’s research emphasized the important relationship between cognitive aptitudes and treatment interactions, but was continually thwarted by inconsistent findings from similar inquiries. Successive studies employing the same treatment variable found different outcome-on-aptitude slopes. Cronbach concluded the inconsistency came from unidentified interactions and that "an understanding of cognitive abilities considered alone would not be sufficient to explain learning, individual differences in learning, and aptitude treatment interactions\textsuperscript{13}.\textsuperscript{Ibid.}

In the early eighties, the cognitive process analysis of aptitudes processes continued with variations focusing on individual differences in learning and cognition. Although Cronbach and Snow were looking for a "whole-person view" of learning, they believed it was primarily the cognitive processes that should be considered in the design and development of adaptive instructional systems. Eventually the new aptitudes evolved into cognitive styles to represent the predominant modes of information processing, although can very within individuals as a function of task and situation variables \textsuperscript{14}.\textsuperscript{Ibid.}


ATI critics argued that student performance was too dynamic to be supported by the permanence and pervasiveness of primarily cognitive ATI and that students, e.g., without learner control, would become system dependent on prescribed solutions. However, based upon Cronbach and Snow’s pioneering research, they concluded that ultimately design treatments should not focus on the individual but groups of students with particular aptitude patterns.

**GENERATIONAL DIFFERENCES**

In a similar way that the concept of “learning styles” has led many instructional designers to select media based largely on a misperceived relationship with learning outcomes, the more recent focus on *The Digital Generation*, is also proving itself to be misleading. In a recent issue of Chronicle of Higher Education (CHE), in its *The Millennial Muddle* article, Palmer Muntz, director of admissions at Lincoln Christian University is said to have asserted that “To accept generational thinking, one must find a way to swallow two large assumptions. That tens of millions of people, born over about 20 years, are fundamentally different from people of other age groups—and that those tens of millions of people are similar to each other in meaningful ways.” The same article reports that the University of California at Los Angeles’ Cooperative Institutional Research Program, which has conducted annual surveys since 1966, shows changes are small and gradual—and differences are not significant between generations, but only over multiple generations. Some disturbing trends that were over multiple generations were noted, however: an increasing sense of entitlement, decreasing literacy, and general factual knowledge.

In its September 2008 issue, The CHE published an article entitled *Generational Myth*. Its author, Professor Siva Vaidhyanathan, claimed that there is no “Digital Generation.’ Today’s young people—including college students—are just more complicated than any analysis of imaginary generations can ever reveal.” The article went on to say those focusing on those “born digital” ignore “the vast range of skills, knowledge, and experience of many segments of society, and ignores the needs of the those who are not socially or financially privileged.” Professor Vaidhyanathan claims that familiarity with, understanding of, and dexterity with technology varies greatly within the 18-23 age group. A few have amazing skills, but a large number can’t deal with computers. We must avoid

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overestimating the digital skills of young people in general. Thinking in generations is too simplistic. The article goes on to state that “Once we assume that all young people love certain forms of interaction and hate others, we forge policies and design systems and devices that match those predispositions. By doing so, we either pander to some marketing cliché or force otherwise diverse group of potential users into a one size-fits-all system might not meet their needs.”

In another CHE article, Bauerlein claims that “The greatest disappointment of our time is that huge investments made in technology (beginning with Telecommunications Act of 1996) in public schools have met with negative results. In fact, he reports, reading proficiency dropped from 40% to 35% from 1992 to 2005”. Addressing the use of the new popular technologies and applications, Bauerlein claims that leisure-time technical skills did not translate to educational and training use of technology. Intellectual habits such as deep reflection decrease with increase time spent on browsing, blogging, IMing, Twittering, and Facebooking. Fast scanning does not translate into academic reading. So it appears that the learner’s familiarity with technology does not indicate how well he or she will perform in a distance learning environment. Our main point for designers is that they should not be distracted by whether their learners are part of a so-called Digital Generation, but instead should focus on designing instruction based on sound cognitive learning strategies.

The above 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? In his literature review, Reeves addressed whether generational difference is a variable important enough to be considered during the design of instruction or the use of different educational technologies. Reeves concluded the weight of the evidence is negative. Although generational differences are evident in the workplace, they are not salient enough to warrant the specification of different instructional designs or the use of different learning technologies. Reeves also stated research conducted on generational differences suffers from many of the same weaknesses found in learning styles research and throws grave doubt on the validity and utility of employing learning styles as a basis for accommodating students of any generation.

In his conclusion, Reeves stated in the light of the weak nature of generational differences as a measurable construct, that any quasi-experimental studies aimed at determining the effectiveness of different instructional designs or educational technologies across generations are not needed. Instead of worrying about whether Boomers, GenXers or Millennials will learn more from direct instruction or virtual reality games, instructional designers and educational technology researchers working closely with practitioners and subject matter experts should begin by identifying the needs of any given set of learners, design the best possible prototype learning environments *in situ*, and then conduct iterative cycles of formative evaluation and refinement to optimize the solution and reveal robust design principles.\textsuperscript{15.Ibid.}

### SUMMARY

The human dynamics of learning is a complex, multi-dimensional process with cognitive science revealing that learners differ in their abilities with different modalities. However, teaching to a learner’s best modality doesn't affect their educational achievement, but what does matter is whether the learner is taught in the content's best modality...people learn better when content drives the choice of modality.\textsuperscript{4.Ibid.} If a focus on learning styles doesn’t work, what does work? Esteemed Professor Myron Dembo may have summed it up best when he stated “educational research supports the teaching of learning strategies, systematically designed instruction that contains scaffolding features and tailoring instruction for different levels of prior knowledge.”\textsuperscript{6.Ibid.}
### Table 1: Types of Learning/Cognitive Styles

- Convergers vs. Divergers
- Verbalisers vs. Imagers
- Holists vs. Serialists
- Deep vs. Surface Learning
- Activists vs. Reflectors
- Pragmatists vs. Theorists
- Adaptors vs. Innovators
- Assimilators vs. Explorers
- Field Dependent vs. Field Independent
- Globalists vs. Analysts
- Assimilators vs. Accommodators
- Imaginative vs. Analytic Learners
- Intuitionists vs. Analysts
- Extroverts vs. Introverts
- Seeing vs. Hearing
- Sensing vs. Intuition
- Thinking vs. Feeling
- Non-committers vs. Plungers
- Common-sense vs. Dynamic Learners
- Concrete vs. Abstract Learners
- Random vs. Sequential Learners
- Initiators vs. Reasoners
- Judging vs. Perceiving
- Left Brainers vs. Right Brainers
- Meaning-directed vs. Undirected
- Theorists vs. Humanitarians
- Activists vs. Theorists
- Pragmatists vs. Reflectors
- Organisers vs. Innovators
- Lefts/Analytics/Inductives/Successive Processors vs. Rights/Globals/Deductives/Simultaneous Processors
- Executive, Hierarchic, Conservative vs. Legislative, Anarchic, Liberal

### Table 2: Most Influential Models of Learning/Cognitive Styles

- Allinson and Hayes’ Cognitive Styles Index (CSI)
- Apter’s Motivational Style Profile (MSP)
- Dunn and Dunn model and instruments of learning styles
- Entwistle’s Approaches and Study Skills Inventory for Students (ASSIST)
- Gregorc’s Mind Styles Model and Style Delineator (GSD)
- Herrmann’s Brain Dominance Instrument (HBDI)
- Honey and Mumford’s Learning Styles Questionnaire (LSQ)
- Jackson’s Learning Styles Profiler (LSP)
- Kolb’s Learning Style Inventory (LSI)
- Myers-Briggs Type Indicator (MBTI)
- Riding’s Cognitive Styles Analysis (CSA)
- Sternberg’s Thinking Styles Inventory (TSI)
- Vermunt’s Inventory of Learning Styles (ILS)
Learning styles are largely continuously based, including 3 modalities: visual, auditory, kinesthetic (VAK model).

Learning styles reflect deep-seated features of the cognitive structure.

Learning styles are one component of a relatively stable personality type.

Learning styles are flexibly stable learning preferences.

Move on from learning styles to learning approaches, strategies, orientations and conceptions of learning.

<table>
<thead>
<tr>
<th>Betts (1909)</th>
<th>Betts Inventory</th>
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<tr>
<td>Bartlett (1932)</td>
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<td>Gordon (1949)</td>
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<td>Torrance (1990)</td>
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<td>Guilford (1950)</td>
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<td>Harrison-Branson (1998)</td>
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<td>Jackson (2002)</td>
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<td>Schmeck (1977)</td>
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<td>Honey and Mumford (1982)</td>
<td>Learning Style Questionnaire (LSQ)</td>
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<td>Felder and Silverman (1989)</td>
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<td>Kaufmann (1989)</td>
<td>The A-E Inventory</td>
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<td>Allinson and Hayes (1996)</td>
<td>Cognitive Style Index (CSI)</td>
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<td>Herrmann (1995)</td>
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<td>Entwistle (1979, 2000)</td>
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<td>Study Process</td>
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<td>Conti &amp; Kolody (1990)</td>
<td>Self Knowledge Inventory of Lifelong Learning Skills (SKILLS)</td>
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**Table 3: Families of Learning/Cognitive Styles**

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