

The Difference Between Bigfoot and Learning Styles:

There May Better Evidence to Support the Existence of Bigfoot.

Abstract

This article is a review of the literature that is critical of learning style theories and theorists. The learning style theory holds that students learning in unique ways, usually auditory, visual and kinesthetic modes. To enhance student performance all an educator has to do is first identify the learning style of the student and then match their mode of teaching to each style. Although the matching hypothesis sounds credible there is no independent research that supports it as will be reported in this article.

Key words: Cognitive Styles, Learning Styles, Matching Hypothesis

Introduction

The learning style theories and theorists claim that students have their own unique way of learning typically through auditory, visual and kinesthetic means. To enhance student performance, all an educator has to do is first identify the learning style of the student and then match their mode of teaching to each style. And there are thousands of articles and dozens and dozens of theorists to support this claim. Although the theory sounds as though it may be true, there is little if any credible independent research to support the claim that matching teaching to student learning styles leads to an increase in student learning. This sentiment was best summed up by Riener and Willingham (2010) who stated “students differ in their abilities, interests, and background knowledge, but not in their learning styles...students may have preferences about how to learn, but no evidence suggests that catering to those preferences will lead to better learning” (p. 35). Clark was even more to the point when starting off her article (2012) by saying, “perhaps one of the more charismatic and unproductive investments made by the education community over the past 20 or so years has been learning styles” (p. 1). Even when looking up the term “learning styles” in Wikipedia, one finds that “proponents for the use of learning styles in education say that teachers assess the learning styles of their students and adapt their classroom methods to best fit each student’s learning style...although there is ample evidence for differences in individual thinking and ways of processing various types of information, few studies have reliably tested the validity of using learning styles in education” (http://en.wikipedia.org/wiki/Learning_styles). Although one might have trepidations concerning the information provided by Wikipedia, the purpose of this paper is to summarize the key literature that shows there is no credible research that supports the idea that catering one’s teaching to the students’ learning styles is a viable strategy for enhancing student learning.

Literature Review

It is important to define learning styles before reviewing the literature that is critical of it. The notion of learning styles has evolved out of the research into cognitive styles conducted by researchers such as American psychologist, Herman Witkin, who is widely cited in the literature. Witkin et al. (1971) defined cognitive styles as “the characteristic, self-consistent modes of functioning which individuals show in their perceptual and intellectual activities” (p. 3). According to Desmedt and Valcke (2004), Kolb defined learning styles as “distinctive individual differences in the learning process that arise from consistent patterns of transaction between the individual and his or her environment... learners program themselves to grasp reality through a particular pattern of emphasis on the four modes of learning: concrete experience, reflective observation, abstract conceptualization, and active experimentation” (p. 457). As a result of a citation analysis to determine leading researchers in cognitive and learning styles, Desmedt and Valcke (2004) found most “cognitive models are developed in laboratory or clinical settings to explain individual differences in cognitive processing where the recurrent features of the concept seem to be stability, pervasiveness, bipolarity and a strong interdependence with personality” (p. 459). As a result of their citation analysis, Desmedt and Valcke (2004) also found that:

“...learning style models are developed and used in various educational contexts to explain and accommodate individual differences in learning. Learning styles are generally defined as relatively stable and consistent. It is however acknowledged that the characteristics of the learning environment and learning experiences influence their development. The results also highlight the similarities between learning styles and cognitive styles. There is a strong relationship between them: the citation analysis showed that Witkin’s work is fundamental to both study specialties. The conceptual confusion between learning styles and cognitive styles probably arises from the work of authors who have investigated the application of cognitive styles in an educational context” (p. 459).

Mirrored by others in this literature review, McLoughlin (1999) indicated that the learning style literature consists of a confusing array of terms that are both similar and distinct. Both cognitive styles and learning styles can be assessed using a questionnaire and some of those will be explored later in this paper. McLoughlin did provide some useful definitions to distinguish the different terms that appear in this literature, namely:

“A learning preference is defined as favoring one method of teaching over another. A learning strategy is defined as adopting a plan of action in the acquisition of knowledge, skills or attitudes. A learning style is defined as adopting a habitual and distinct mode of acquiring knowledge. A cognitive strategy is defined as adopting a plan of action in the

process of organizing and processing information. A cognitive style is defined as a systematic and habitual mode of organizing and processing information” (p. 223).

Kozhevnikov (2007) provided some of the best definitions for cognitive styles, one being a “psychological dimension representing consistencies in an individual’s manner of cognitive functioning, particularly with respect to acquiring and processing information...as well as individual differences in the way people perceive, think, solve problems, learn, and relate to others” (p. 464). The author also described the typical research design used to test learning styles which is to give subjects a simple task that had two ways to solve it and the one that was selected by the subject indicated a preference, not a particular ability, per se. What often was the case, however was that “although ‘the motto’ of research on cognitive styles was that bipolar dimensions represented two equally efficient ways of solving a task, in reality, one strategy was usually more effective than the other” (p. 466). In other words, the matching hypothesis is again called into question due to the subject doing a task the most effective, or right way, instead of a preferred way. Kozhevnikov (2007), also commented on the application of cognitive styles in the field of education research that is aimed at understanding individual differences in learning as a function of a students’ decision-making style, learning style, or personality style leading to the conclusion that:

“...the main problem with these studies is...the explosion of style dimensions: The number of styles was defined by the number of fields in which styles were studied. As a consequence, the cognitive style construct multiplied to include decision-making styles, learning styles, and personality styles, without clear definitions of what they were or how they differed from the ‘basic’ cognitive styles identified previously. The set of theoretical questions regarding the mechanisms of cognitive styles, their origins, and their relation to other psychological constructs remained open.” (p. 470).

Cassidy (2004) also did a rather comprehensive review of the learning style theories, models and measures that included an overview of each, the instruments used to identify the styles and a critique as to reliability and validity. Much of the research on learning styles began decades ago by those doing psychological research on learning. The amount of research done in this area has produced a wide variety of definitions, theories, models, interpretations and measures of the construct. However, there are three key terms that emerge from the literature, namely “learning style”, “cognitive style” and “learning strategy.” Cognitive style is defined as “an individual’s typical or habitual mode of problem solving, thinking, perceiving, and remembering, while the term learning style is adopted to reflect a concern with the application of cognitive style in a learning situation...It is also likely that cognitive styles – at the very least – can be regarded as one significant component of learning style” (Cassidy, 2004, p. 421). Cassidy (2004) also made mention of learning “preferences” which suggests that students do prefer one teaching method over another and embedded in some of the theories, models and measures covered in the review of literature. There are also learning style frameworks that are personality-centered, cognitive-centered, and learning-centered. Cognitive-centered frameworks depend on the individual’s

difference in cognitive and perceptual functioning; learning-centered frameworks examine the impact of style in an educational setting, while personality-centered frameworks consist of one learning model derived from the Myers Briggs personality test, for example.

To give one an idea of the overwhelming number of different modes, styles and measures that have emerged just from the general categories a list is provided below that is based on the Wholist-Analytic Style Family, Cognitive-Centered Approach, Cognitive Personality Style, Learning-Centered Process-based Approach, Learning Preference, and Information Processing research reviewed by Cassidy (2004), namely:

...a) Witkins Field-Dependence versus Field-Independence, b) Kagan's Impulsivity-Reflexivity, c) Convergent-Divergent Styles, d) Holzman and Klein's Leveller-Sharpener Styles, e) Park's Holist-Serialist Style, f) Pavio's Verbaliser-Visualisar Cognitive Style, g) Gregorc's Style Delineator which produces the four distinct and observable behaviors of Abstract, Concrete, Random, Sequential tendencies, h) Kaufmann's Assimilator-Explorer Cognitive Style, i) Kirton's Adaption-Innovation Style, j) Allinson and Hayes' Intuition-Analysis Style based on the left and right hemispheres of the brain, k) Kolb's Experiential Learning Model and Learning Styles Inventory consisting of a four stage learning model starting with the concrete experience, then abstract conceptualization, active experimentation, and reflective observation, l) Honey and Mumford's Learning Styles Questionnaire which produces the four learning styles of activist, reflector, theorist, and pragmatist, m) Verman's Learning Styles Inventory which derives four learning styles of undirected, reproduction, application directed, and meaning directed learning, n) Entwistle et al.'s Approaches to Study Inventory which centers around four modes of orientation for the learner in the form of meaning orientation, reproduction orientation, achieving orientation, and holistic orientation, o) Biggs' Study Process Questionnaire which produces a motivational dimension defined as intrinsic, extrinsic, and achievement orientation, p) Schmecl's Inventory of Learning Processes which has four subscales of synthesis-analysis, elaborative processing, fact retention, and study methods, q) Hunt et al.'s Conceptual Level Model which proposes students are either a low conceptual level of high conceptual level, r) Dunn et al.'s Learning Styles Inventory has students relate to the environmental, sociological, physical, and psychological aspects of learning to guide construction of the learning situation, s) Riechmann and Grasha's Style of Learning Interaction Model which focuses on learner preferences such as avoidant-participant, competitive-collaborative, and dependent independent, t) Ramirez and Castenada's Child Rating Form which focuses on cultural differences and minority groups with respect to the cognitive style dimension field-dependence/field independence, u) The Edmunds Learning Style Identification Exercise which focuses on students' preferred mode of responding to learning stimuli, v) Hill's Cognitive Style Interest Inventory which uses cognitive style mapping to establish the students' perceptual modality, modalities of inference, and cultural determinants in order to match

learning style with curriculum design, w) Letteri's Learner Types which establishes Type 1, Type 2 and Type 3 learners, and x) Keefe and Monk's Learning Style Profile which assesses the students' cognitive skills, perceptual response to visual and auditory stimuli and instructional preferences (pp. 425-438)

Cassidy (2004) concludes that "the researcher or practitioner entering the area of learning style may well do so with some sense of trepidation given the volume, diversity and apparent association of writing, theory and empiricism in the field" (p. 440). Reason being, there exists almost as many definitions as there are theorists in the area. And for the "academic concerned with pure theory this may offer an exciting challenge...those working within an educational setting wishing to utilize learning style to promote more effective learning, whether through individual or group profiling, design of instructional methods, or identifying learning preferences, operationalizing learning style is a necessary but highly problematic endeavor" (p. 440). Especially when one considers that the modes, styles and measures reviewed by Cassidy (2004) barely scratched the surface of those that are in existence making selection and application in one's classroom challenging, particularly when there is no research to indicate one is superior to another.

So concludes some of the definitions relevant to learning styles. The rest of this paper will summarize key studies that have called into question the reliability of those measures that have been used to assess a student's learning style, and the validity of the theories themselves.

One of the first articles that led to skepticism of the existence of student learning styles was that published by Arter and Jenkins (1979) which pertained to those teaching in special education but had implications for all educators. In the study, the authors refer to the "term 'differential diagnosis' which refers to the process of assessing the learning characteristics of a child so that instruction can be matched to individual learning needs" (Arter & Jenkins, 1979, p. 517). The general psychological processes at play with regard to learning styles has to do with a child's strengths and weaknesses when it comes to auditory, visual, cross-sensory, and psycholinguistic abilities. To accommodate the learner the instructor can employ "diagnostic-prescriptive teaching" or "differential diagnosis" to formulate instructional approaches based on the child's strengths and weaknesses. There are two basic forms of diagnosis. In the first case, instructional strategies are developed to overcome a child's weak abilities while in the second case weak abilities are not remediated; the focus is on finding instructional modalities that will enable the child to perform well on academic targets, such as reading or mathematics, that tap into the child's strengths and weaknesses. The overarching term used in this article to describe both approaches was Differential Diagnosis-Prescriptive Teaching (DD-PT), which refers to the "psychometric practice of assessing underlying abilities and devising subsequent instruction in accord with ability strengths and weaknesses" (Arter & Jenkins, 1979, p. 517).

Arter and Jenkins (1979) proposed several reasons learning styles theories exist in spite of the lack of evidence to support DD-PT. One reason may be that it resembles task analysis where

students first complete simple tasks and then build on those to eventually perform complex tasks. Of course, the big difference between the two is that a task-analytic model is designed to teach a student specific tasks while the DD-PT model is a way to teach general abilities. A second reason for the popularity of DD-PT is the pressure on those teaching special education to come up with effective and innovative remediation techniques, especially when efficacy studies do not show improvement in student performance. The need to validate early childhood educational programs, like Head Start, has been another reason research has tried to show positive results from DD-PT. Another factor may be the desire on the part of those who teach special education to justify their teaching strategies from those who are regular educators. Finally, and perhaps the most troublesome, is the fact that “publishers of educational materials have found it lucrative to develop and market an array of ability assessment instruments and related instructional materials...new tests and training materials appear on the market almost daily...and school systems invest heavily to purchase DD-PT materials for their special education programs” (p. 520).

In their substantive article, Arter and Jenkins (1979), examined seven key assumptions that underlie the learning styles theory, one of which being that “prescriptions can be generated from ability profiles to improve academic performance, with no direct training of weak abilities” (p. 542). This assumption is based on the belief that not all children learn best under a single instructional approach and the best approach for maximizing a child’s educational progress is to first identify their ability strengths and weaknesses through DD-PT. In other words, the instructor must match the instructional materials and methodologies to the child’s modality strengths (visual, auditory, kinesthetic), such that those diagnosed as an “auditory learner” should receive instruction delivered through the child’s auditory channel, a child diagnosed as a “visual learner” should receive instruction through the child’s visual channel, and so forth. Unfortunately, their review of 15 studies found that:

“...in 14 of the 15 studies, matching instruction with modality strength failed to produce differential improvement; children learned equally well whether or not instruction was matched to their strong modality. In no study involving elementary-aged students was the approach successful...The consistently negative nature of these results casts considerable doubt on the usefulness of ability assessments in planning academic instruction.” (p. 543).

Arter and Jenkins (1997) concluded that there is no research to support the assumption that DD-PT enables a teacher how to best teach each child and proposed five key reasons for the lack of evidence. The first may be that the ability-training method may be invalid. The second may be that underlying abilities may exist but have a very weak relationship to student achievement. The third reason may be that the prescribed training itself may be weak and therefore unable to enhance student achievement. The fourth reason may be that differing abilities may exist but surprisingly no test has been developed to detect them in a reliable and valid manner. Finally,

that the DD-PT model of teaching to the ability of the student has not been fairly tested. Leading Arter and Jenkins (1979) to the damning conclusion that:

“...the repeated failure to support the basic assumptions underlying DD-PT model casts doubt on the model’s validity. We do not intend to suggest that the model is theoretically untenable, or that it may one day be effectively implemented. Rather, we believe that with the current instructional programs and tests, this model is not useful. A number of authors have arrived at a similar conclusion...unfortunately this view does not represent that held by most authorities and practitioners in special education teachers. Unsupported expert opinion and teacher training programs ...appear to have a direct, deleterious effect on teacher behavior and an indirect effective on children’s learning. Not only are teachers adhering to an unvalidated model, but because they have been persuaded that the model is useful, they are less apt to create variations in instructional procedures which will result in improved learning. We believe that until a substantive research base for DD-PT model has been developed it is imperative to call for a moratorium on advocacy of DD-PT, on classification and placement of children according to differential ability tests, on the purchase of instructional materials and programs which claim to improve these abilities, and on coursework designed to train DD-PT teachers” (p. 549-550).

McLoughlin (1999) examined whether or not individual differences in learning styles can affect performance in learning settings. The result was that “much empirical research signals that learning styles can hinder academic performance in several aspects although little research has been done on the relationship between instructional design of learning materials and learning styles” (McLoughlin, 1999, 228). And the handful of research studies that suggest matching learning styles to teaching methods preferred by each style as a means to enhance student performance were not that compelling, such as one that found that giving “imagers” text only information would not be as effective as when it is presented in a text-plus picture mode but employed no control groups.

In another rather extensive article on learning styles, Pashler, McDaniel, Rohrer, and Bjork (2008) looked to find research that demonstrated that optimal learning occurred when students were given instruction that matched their learning style in which the experiment revealed a specific type of interaction between the learning style and the instructional method. In other words, those students who have a preferred learning style should achieve the best educational outcome when the instructional method matches their style and suffer when there is no match. They did find that adults and students do have preferences when it comes to how information is presented to them and vary in their aptitudes for different kinds of thinking and processing different types of information. Similar to the conclusions drawn by others critical of learning styles, Pashler et al. (2008) stated that:

“...we found virtually no evidence for the interaction pattern... which was judged to be a precondition for validating the educational applications of learning styles. Although the

literature on learning styles is enormous, very few studies have even used an experimental methodology capable of testing the validity of learning styles applied to education. Moreover, of those that did use an appropriate method, several found results that flatly contradict the popular meshing hypothesis. We conclude therefore, that at present, there is no adequate evidence base to justify incorporating learning styles assessments into general educational practice. Thus, limited education resources would better be devoted to adopting other educational practices that have a strong evidence base, of which there are an increasing number.” (p. 105).

Pashler et al. (2008) arrived at such a statement by first defining learning styles as “the view that different people learn information in different ways” (p. 106). The wide acceptance of the learning styles theories have been driven “by vendors offering many different tests, assessment devices, and other online technologies to help educators identify their student’s learning styles and adapt their instructional approaches accordingly” (p. 106). So they investigated the claims being made by test vendors and others to see if there was any support in the literature to validate it. The study included some of the more popular learning styles including the Dunn and Dunn learning-style model, Kolb’s Learning Style Inventory, and Honey and Mumford’s Learning Style Questionnaire. They found that what the learning taxonomies tended to have in common was they are “type” theories which first classify students into distinct groups and then maintain that those groups learn differently. But the assumption that people actually cluster into distinct groups as measured by tests (such as the Myers-Briggs), had not been shown to be true in objective studies. Indeed, in spite of the vast size of the literature that was reviewed on learning styles there was only one study that met their criteria as being able to validate learning styles theories, and that study had its flaws, too, leading Pashler et al. (2008) to state that:

“...basic research on human learning and memory, especially research on human metacognition, much of it carried out in the last 20 years or so, has demonstrated that our institutions and beliefs about how we learn are often wrong in serious ways...There is growing evidence that people hold beliefs about how they learn that are faulty in various ways, which frequently lead people to manage their own learning and teach others in non-optimal ways. This fact makes it clear that research – not intuition or standard practices – needs to be the foundation for upgrading teaching and learning...On the basis of our review, the belief that learning-styles assessments are useful in educational contexts appears to be just that – a belief...we feel that the widespread use of learning-style measures in educational settings is unwise and a wasteful use of limited resources...but the instruction that is optimal for a given student will often need to be guided by the attitude, prior knowledge, and cultural assumptions that student’s bring to the learning task” (p. 117).

In another extensive report on the acceptance and use of learning styles by the education community, Coffield, Moseley, Hall and Ecclestone (2004) sought to contribute to what was known about models of learning styles and how those models can benefit teachers and learners

as well as identify an agenda for further research to understand the strengths and weaknesses of existing learning style models. They noted that the learning styles concept is quite appealing to teachers due to the basic premise that if one knows the learning style of the student all one has to do is provide the teaching method preferred by that style and the student will learn the material better than if the style and teaching method were mismatched. The authors wanted to know if there was research to support it. They found that the learning styles field was segmented into three main categories, namely: theoretical, pedagogical and commercial. In their review of the theoretical category they identified 71 models of learning styles that included the 13 that have been considered to be the major ones based on theoretical importance, use by educators, and influence on other learning style models. Included in the list of the 13 most influential theoretical models examined by Coffield et al. (2004), were Gregorc's Mind Styles Model and Style Delineator, Hermann's Brain Dominance Instrument, Kolb's Learning Style Inventory, Meyers-Briggs Type Indicator, and Sternberg's Inventory of Learning Styles. The pedagogical category pertains to the abundance of research being conducted on teaching and learning by the different disciplines and the way each tends to interpret the findings for their purposes. The commercial aspect consists of the industry that has grown up to provide educators their inventory or instrument designed to assess student learning styles even though there may not be sufficient research to validate the claims being made by those making and selling the instruments.

What Coffield et al. (2004) found was the "field to be much more extensive, opaque, contradictory and controversial than thought it was at the start of the research process" (p. 2). For instance, Coffield et al. (2004) found Gregorc's model to be "theoretically and psychometrically flawed and not suitable for the assessment of individuals" (p. 27). Coffield et al., (2004) also said that although Kolb's Learning Style Inventory was one of the first learning styles, "problems with reliability, validity, and the learning cycle continue to dog this model" (p. 31). Although Coffield et al. (2004), did find potential use for Allison and Hayes' Cognitive Styles Index to be one of the most reliable and valid of the 13 models, they offered the following advice to educators considering their use to enhance the quality of one's teaching and student learning:

"In the current state of research-based knowledge about learning styles, there are real dangers in commending detailed strategies to practitioners, because there is no consensus about the recommendations for practice...A thriving commercial industry has also been built to offer advice to teachers, tutors, and managers on learning styles, and much of it consists of inflated claims and sweeping conclusions which go beyond the current knowledge base and the specific recommendations of particular theorists...Some of the leading learning theorists, moreover, make extravagant claims for their model, which reflect badly on the whole field of learning styles research...such as O'Neil claiming that within six weeks...kids who you think can't learn will learn better.... achieve better... like school better" (p. 36).

Coffield et al. (2004) also examined the literature to find research that supported the matching hypothesis and found it to be impractical for those who teach large lecture style classes and no research study to support it. No matter the lack of evidence to support the hypothesis, Coffield et al (2004) stated that it does not deter Rita Dunn, creator of the Dunn and Dunn's Model and Instruments of Learning Styles, from making the false claim that "many researchers have repeatedly documented that, when students are taught approaches that match their preference...they demonstrate statistically higher achievement and attitude test scores – even on standardized tests – than when they are taught with approaches that mismatch their preference" (p. 41). Never mind the research cited to support her claim is highly controversial and criticized for its poor scholarship and influence of those who may have had a vested interest in the results of the research.

As mentioned earlier, one of the objectives of the Coffield et al. (2004) study was to identify gaps in the knowledge of learning styles and recommend future research. As a result of their review, they found that "above all else, the research of learning styles needs independent, critical, longitudinal and large-scale studies with experimental and control groups to test the claims for pedagogy made by test developers" (p. 61). Especially when the bulk of the research consists of questionable small scale studies to provide evidence for the reliability, validity and utility of the existing learning theory models. Coffield et al. (2004) also recommend that "the investigators need to be independent – that is – without any commitment to a particular approach – so that they can test, for instance, the magnitude of the impact made by the innovation, how long the purported gains last, and employ research design which controls for the Hawthorne Effect" (p . 61).

Sternberg, Grigorenko, and Zhang (2008) published an article that supported the belief that there are two styles of learning and thinking: ability based and personality based. In this article, the authors defined the two different styles and supported the notion that those who teach according to the style of the student will maximize student performance. They also provided evidence to support this claim. The problem I had with this article was that half of the references were prior publications of the lead author (using his instruments and study designs) and references to the work of others to validate his own, such as Gregorc and Gardner, whose work has been highly questioned if not invalidated by the other researchers cited in this article. Nonetheless, they define styles as "individual differences in approaches to tasks that can make a difference in the way in which and, potentially, in the efficacy with which a person perceives, learns, or thinks" (Sternberg et al., 2008, p. 486). Their definition of styles is limited to those that identify the means by which student's process information that have consequences on cognition.

In the Sternberg et al. (2008) article, ability-based styles are based on the theory of successful intelligence which suggests that "students' failure to achieve at a level that matches their potential often results from teaching and assessment that are narrow in conceptualization and rigid implementation" (p. 487). Therefore all teaching and assessment should be balanced in terms of the ability-based styles they require. One of the studies cited to support this claim was

based on an instrument developed by the lead author as an early measure of successful intelligence that sorts students into analytical, creative and practical ability-based styles. When students were assigned to instructional conditions that matched their style the study findings supported the utility of the theory of successful intelligence because the ability test predicted course performance given, “there was an aptitude treatment interaction whereby students who were placed in instructional conditions that better matched their pattern of abilities outperformed students who were mismatched...In other words, when students are taught in a way that fits the way they think, they do better in school” (Sternberg et al., 2008, p. 489). Other studies to support the theory of teaching excellence were conducted by the lead author as well.

Personality-based styles are a function of self-government which also enables teachers to maximize student performance when matching the instruction to the style, according to Sternberg, et al. (2008). A personality-based style “of thought is a preference for using abilities in certain ways...it is not an ability itself, but rather, how one likes to use one’s abilities” (p. 498). Some of the general characteristics of personality-based styles spelled out by the authors are that they are a matter of preferences, neither good nor bad, that can vary across tasks and situations, can differ in strengths of preferences, can differ in flexibility of preferences, can vary across one’s life span, are modifiable, and what is valued in one time in place is not valued in another. The theory of mental self-government, on the other hand, “holds that personality-based styles can be understood in terms of constructs from our notions of government...the kinds of governments we have in the world are not merely coincidental, but rather are external reflections of mirrors of ways in which we govern ourselves...personality-based styles can be understood in terms of the functions, forms, levels, scope, and leanings of government” (Sternberg, et al., 2008, p. 499). According to Sternberg et al. (2008):

“...students can possess a legislative, executive and judicial style of learning... Legislatively oriented students, for example, likes to decide what to do and how to do it, rather than be told... The executively oriented student will often prefer to be told what to do and will then give it his or her best shot at doing it well...Traditional teaching may reward the executive style. Good students are often seen as those who do what they are told and do it well. Legislative students may have the same abilities, but the abilities may not manifest themselves, and such students may actually be viewed as ‘pains in the neck...The judicially oriented student tends to be evaluative of others, sometimes on the basis of minimal information” (p. 500).

Sternberg et al. (2008) even prescribed the predilection each style had for tasks, projects, and situations. For example, “the legislatively oriented student has a predilection of tasks, projects and situations that require creation, formulation, planning of ideas, strategies, products, and the like...and prefer creative writing, designing experiments, coming up with theories about things, creating original artistic compositions, or inventing new things” (p. 499). The executive and judicial also had their own predilections and preferred assignments. According to the self-government theory students can also be four different forms of mental self-government, namely:

monarchic, hierarchic, oligarchic, and anarchic. Each has its own predilections and learning preferences that the teacher should identify and accommodate to maximize the performance of the students with the various forms of self-government. There are also two levels of self-government – the local and global, two scopes of self-government – internal and external, and two leanings – liberal and conservative, which have their own predilections and learning preferences. The lead author then provides evidence of personality-based styles by citing his prior research using his own instrumentation (e.g. Sternberg Thinking Styles Inventory) and study design.

In lieu of the mind boggling number of proposed styles and limited research conducted by the lead author to support the important claim that student performance is maximized when teachers gear their instruction to each style, Sternberg et al. (2008), makes a conclusion that runs somewhat counter to his own argument when stating, oddly enough, that:

“...ability-based and personality-based style matter. In teaching, we need to take into account student’s styles of thinking if we hope to reach them. This means differentiating instruction in a way that that helps students capitalize, at least some of the time, on their style preferences. Students need to learn both how to capitalize on strengths and to compensate for weaknesses. We need to consider carefully how our practices in educational settings may deprive able people of opportunities, while giving opportunities to those who are less able... Ideally, we need to teach to and assess a variety of styles” (p. 504).

Another article that questions the validity or utility of learning styles is one recently published by Zhang (2004), who collaborates with Sternberg on learning style research. The study was conducted to investigate the role of thinking styles in university students’ preferences for teaching styles and their conceptions of effective teachers. Zhang (2004) indicated that “much research has suggested that teachers’ teaching styles and students’ learning styles interact to affect student learning.” (p. 233). However, the author did not elaborate at all on the actual affect being implied by that statement but used it to support the need for a study to address an apparent lack in the “literature on the relationship between learning styles and learning environment preferences as it pertains to the study of the relationship students’ learning styles and their preferred teaching styles” (Zhang, 2004, 234).

To that end, the study sought to investigate the role of university students’ thinking styles in their preferences for teachers’ thinking styles in teaching and their conceptions of the characteristics of an effective teacher. The study was based primarily on Sternberg’s (1988) theory of thinking styles termed as mental self-government (that was elaborated on in this article above) which produces 13 thinking styles measured with a revised version of his Thinking Styles Inventory and two others created for this study – the Preferred Thinking Styles in Teaching Inventory and the Effective Teacher Inventory. The alpha estimates for the scales used in this study ranged from .55 to .88, which the author deemed acceptable. The factor analysis used in the study to

establish the validity of the three self-report inventories each accounted for explained variance in the mid 60's. Aside from the specific study findings, Zhang (2004) concluded that the study findings were suggestive and not conclusive and that "the two newly constructed inventories...have demonstrated reasonably good psychometric properties, they need to be tested further in future studies as this is the first time that they have been used." (p. 247). But that did not prevent Zhang (2004) from proclaiming that the "present study pioneered the investigation of the role of students' thinking styles in their preferred teaching styles... this investigation is significant because no research has been documented in the literature that examines students' preferred teaching styles based on their own thinking styles" (p. 247-248). A startling proclamation no doubt to all those who have proposed their own models, measures, and theories that suggest students have different thinking or learning styles and those styles learn best when taught via a teaching mode preferred by that style, like many of those reviewed in this article. Zhang also makes the following conclusion that if read carefully calls in to question his own study findings and the reason the study was conducted in the first place, by stating that:

"...results of this study have also revealed that the traditional view of the 'matching hypothesis' is far too limited. Results of this study have shown that the 'matching hypothesis' could be interpreted in a much broader sense. I have clearly demonstrated that students prefer that their teachers teach in styles that exactly match their own learning styles but are open to teaching styles that are similar to, complimentary to, or even completely different from, their own learning styles. The result implies that although teachers should diversify their teaching styles so that students with different learning styles can benefit from their instruction, teachers do not need to be overly concerned about matching their teaching styles to every single style among their students" (p. 248).

Finally, Zhang (2004) makes no mention as to the specific benefits that would be gained from matching a students' style to their preferred teaching style, which is the hallmark of the matching hypothesis. Even after questioning the need for teachers to pay attention to a students' learning style in the first place when designing instruction. Something that others have claimed to do and now being called into question as reported in this literature review. And yet this study was published in a peer reviewed journal.

Hadfield (2006) wrote a paper that really did do a good job explaining some of the leading learning style theories. She also pointed to the inadequacies of the learning style theories with the first being that anyone attempting to find their way through the literature on learning styles is confronted with a huge number of theories all claiming to be the best. The other problems Hadfield (2006) identified were "it seems depressingly reductive to classify humanity into four (or thirteen) fixed types, the theorists are by no means agreed upon the polarities on how these should be combined to form types, many theories overlap and intersect in confusing ways, and there is much confusion over terminology...and if this Humpty Dumpty approach to terminology were not enough, some theorists invent their own words, it would seem unnecessarily" (p. 369-

370). She also makes it clear that the research aimed at supporting the notion that matching a teaching modality to the students' learning style is unproven so argued for an inclusive approach of mixed modalities to enhance student learning. As a result, Hadfield (2006) did not suggest that teachers attempt to match the teaching style and learning task to the students' preferred style; she instead recommended that teachers "provide a range of input styles and learning tasks so that the learners will sometimes get a task in their preferred style, sometimes in a style that they must adapt to meet" (p. 379). To that end, Hadfield (2006) proposed a framework that could be useful for those designing tasks in teacher education based on the learning styles literature but offers no research to validate the effectiveness of the approach.

Another recent study perpetuating the learning style myth was published by Xie, Gao, and King (2013) that investigated whether individual differences in thinking styles influence explicit and implicit learning among 87 Chinese students. It was based on Sternberg's theory of thinking styles mentioned earlier in this literature review. Xie et al. (2013) make the statement that "Sternberg's theory of thinking styles, also known as the theory of mental self-government, is one of the most recent and influential theories on styles" (p. 268). Apparently no reviewer had a problem with that statement especially when the citation analysis conducted by Desmedt and Valcke (2004) found Witkin's work on cognitive styles to have spawned learning and thinking styles research and be the most widely cited in the literature. Xie et al. (2013) also state that "the relationship between thinking styles and academic achievement has been widely investigated in Western and European countries...it was consistently found that thinking styles contribute to learning achievement beyond intelligence...and that thinking styles contribute to academic achievement varied as a function of subject matter" (p. 268). No surprise, the research cited to support these statements were those published by Zhang, who publishes with and apart of Sternberg. It is noteworthy that there were 87 students who completed the revised Thinking Styles Inventory that has 65 items with 13 scales corresponding to the 13 different thinking styles, which is hardly enough participants to have sufficient power to test the study hypotheses. Never mind the inventory was translated into Chinese and shown to have good psychometric properties, of course, according to published studies by Zhang.

To cast even more shadow of doubt upon the learning style theories and theorist, I will end this literature review with a study published by Manolis, Burns, Assudani, and Chinta (2013) who stated that "to understand experiential learning, many have reiterated the need to be able to identify students' learning styles" and that "Kolb's Learning Style Model is the most widely accepted learning style model and has received a substantial amount of empirical support" (p. 44). Yet, after proclaiming Kolb's Model to be the most widely used they note that Kolb's Learning Style Inventory (LSI) possesses serious measurement errors. Their study sought to revise the LSI to make it a more effective and efficient way to measure the individual learning styles proposed by Kolb so that instructors can structure (match) optimal experiential activities for each style. Manolis et al. (2013) note that support for the LSI scale, however, was far from unanimous when stating:

“In fact, most of the research that has examined the LSI has been far less affirming. Indeed, test-retest measurements indicate that the scale does not reliably measure learning style. Furthermore, serious questions exist concerning the scale’s validity and predictive ability. Regardless...the model cannot be abandoned due to problems in the measuring scale...an improved scale is required.

In other words, Manolis et al. (2013) are saying that there is nothing wrong with Kolb’s Learning Style Model. The real problem is that the LSI is not a reliable or valid measure of the model. As a result, they support the belief that learning styles exist and once one knows the style of the student their performance can be enhanced through targeted instruction is a powerful one that these authors. Yet, they contradict their own position when noting validity problems with the LSI when stating that:

“...to facilitate experiential learning in a fashion that acknowledges the unique learning styles of students, educators must be able to effectively and efficiently measure students’ learning styles...the scales that have been developed previously to accomplish this objective, however, have possessed limitations. Although the early versions of the LSI were concise and easy to use, the lack of test-retest reliability and the presence of significant validity problems severely restricted their applicability. Attempts by others to develop alternative measures to assess learning style tended to result in scales with similar problems. The revision of Kolb was able to overcome some of the problems in the previous scales, but significant problems remained” (p. 50).

Again, the problem is not Kolb’s Learning Style Model – it is not being properly measured by the LSI. But that does not deter Manolis et al. (2013) to proclaim the results of their study to design a more fluid measure of learning styles to have significant implications for education and pedagogy. Mainly because “the results of numerous studies suggest that teaching pedagogy that is oriented toward student learning styles tends to be more effective compared with pedagogy wherein teaching and learning styles conflict” (Manolis et al., 2013, p. 50). But to cover all the bases, Manolis, et al. (2013) state that “convergence of teaching and learning styles will not only increase the learning effectiveness of students, but will also increase student flexibility, permitting them to alter their learning styles in response to varying environments” (p. 50). Only to then do another about face in the very next sentence by stating those who use their revised scale “will possess the ability to more clearly assess student learning styles and, hence, design educational experiences that maximize learning” (Manolis et al., 2013, p. 50). Only to contradict themselves again and say that educators should not always seek to match the pedagogy to the style but also stretch students into less preferred styles, which cannot be done unless they know the learning styles of students in the first place. Reason being, Kolb himself held that individuals may have a dominant style but learn in each of the four styles. Which, to me, and according to the research cited in this article, begs the question, “Then why worry about learning styles in the first place?”

Riener and Willingham (2010) do recognize that learners are different and their difference affects their academic performance so teachers should account for those differences in their teaching. They also agree that students differ in their interests and background knowledge and indeed have specific learning disabilities. But those differences do not validate the learning styles theories by default. It is also true that some students prefer to study visually while others use the auditory channel, so those students who have a visual preference should learn better with visual presentations being made by the teacher and those who have an auditory preference should not perform as well, however there is no research to date that has proven such to be the case. So if learning styles do not exist, how do we explain the sustained belief in the theory? Riener and Willingham (2010) posit there are three reasons. The first is that the general claim that students are different is true but the most important thing to focus on may not be whether the student has a preference for auditory, visual, or kinesthetic teaching methods; the focus should be on the differences the students have on their background knowledge of what is being learned and their interest in learning it. Secondly, if one believes that all students have their own values and strengths then you must believe in learning styles, which is true for the most part, but learning style theories do not address that belief. Third, the theories on learning styles have become “common knowledge” and have widespread acceptance so those who think otherwise must be wrong, never mind there is no research to support it.

Riener and Willingham (2010) have some advice for educators to follow instead of succumb to the learning styles theorists. Teachers should realize that the use of visual, auditory and kinesthetic learning modes have a place in the classroom. The value of using video over audio should be driven by the content the teacher is trying to convey to students keeping in mind the background knowledge, interests, and abilities the students possess to engage them in the lesson. The bottom line being that:

“...students differ in their abilities, interests and background knowledge but not in their learning styles. Students may have preferences about how they learn, but no evidence suggests that catering to those preferences will lead to better learning. As college educators, we should apply this to the classroom by continuing to present information in the most appropriate manner for our content and for the level of prior knowledge, ability, and interests of that particular set of students” (p. 35).

Conclusion

There has been a widespread belief in the education community that students have unique learning styles. According to the “matching hypothesis” one can enhance student performance by identifying the learning style of the student(s) and teach them with their preferred teaching mode. There are thousands of articles and dozens and dozens of theorists to support this claim. The problem is that few if any independent research studies have shown the various learning style theories to be valid perhaps through a head-to-head comparison. The measures that have been developed by the learning style theorists to assess student learning styles have also been

shown to have moderate to severe reliability problems. It is hoped that after reading this article hospitality and culinary educators will come to the realization that learning styles is a myth and attempting to match one's teaching to the learning styles of students to improve performance in the classroom or laboratory is pure folly.

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