

Learning Styles, Instructional Strategies, and the Question of Matching: A Literature Review

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Abstract

The study of learning styles is one of interest and debate in current educational circles. The diversity of the field arises from various theoretical foundations and definitions and, therefore, presents some challenges to understanding and implementation. Despite these issues, however, learning styles do appear to have a definite influence on the educational process. Teachers' training and perceptions concerning learning styles play a role in their application of learning style concepts to both instruction and assessment. Students also are influenced by learning styles, having unique perceptions of their abilities and preferences for learning that may affect their motivation and lifelong learning patterns as well as academic performance levels. Significant questions remain about the issue of matching learning and teaching styles, with arguments supporting a range of approaches including unmatched, tailored, and varied instruction. Further, there is a methodological debate concerning the most appropriate and effective methods for conducting research and gaining accurate information applicable to authentic educational environments. Additional research is necessary to address the identified issues and areas of contention in the field of learning styles and to provide further information and support for implementation of effective teaching practices in the classroom.

Keywords: *learning styles, instructional strategies*

Learning Styles, Instructional Strategies, and the Question of Matching: A Literature Review

The study of learning styles has received significant attention in recent years, and in a time when academic achievement is under scrutiny, it is vital that educators know and utilize the best possible methods for helping students learn successfully. When Koch (2007) questioned renowned learning styles expert, Rita Dunn, about the No Child Left Behind Act (2001), she responded by stating that no research has indicated that increased testing leads to increased achievement. Although she acknowledged that testing is an important aspect, she declared that only changes in instruction would produce higher levels of achievement. Fortunately, the educational world is opening up to the importance of understanding the various ways students learn and recognizing the vital role this plays in attaining widespread academic success (Collinson, 2000). In fact, results of a recent study indicated teachers benefit from developing an understanding of how they and others learn as well as the effect this has on their teaching (Evans & Waring, 2006).

This does not mean, however, that all educators have come to an agreement on the definition, descriptions, or implications of learning styles. Instead, there are an ever-increasing number of theories and models being developed to address this issue. Potentially causing further confusion is the fact that many of these models have a similar theoretical base and share foundational components while they maintain significant variations. According to Collinson (2000), researchers building upon previous ideas and methodologies develop unique terms and definitions, expand (or contract) the base of included factors, and broaden (or narrow) the horizons of instructional approaches, all of which collectively conceal the overlapping qualities of their work. Perhaps one factor underlying this issue is the increasingly common view that learning styles are a combination of cognitive, affective, and physiological factors that merge to define each student's unique approach to effective learning (Collinson, 2000). Often, different researchers have chosen to focus exclusively on a certain set of factors, leaving educators with the need to study multiple theories and models in order to understand the needs and preferences of all the students they encounter in their classes.

An additional concern is that, while research and classroom experience confirms the existence of different learning styles, visits to schools throughout the world might convince one otherwise. Although Guild (2001) asserted that educators are cognizant of the diversity of the learners who populate their classrooms, he acknowledged that, regrettably, they typically maintain a singular approach to teaching. This uniformity in practice negates any benefits of the stated awareness (Guild, 2001). Moreover, educators who maintain a limited understanding of the differences among individual learners are likely to seek one paramount approach as the answer to all teaching and learning (Guild, 2001). Likewise, Evans and Waring (2006) discovered a majority of teachers involved in their study typically utilized an approach based upon transmitting information rather than one specifically geared toward the development of students' understanding. However, historical evidence has all but proven no single approach will ensure success for all learners. Thus, educators must abandon this singular mentality and realize the essential necessity of endeavoring to develop a true

understanding of learning differences and striving to provide instruction that is intentionally diverse (Guild, 2001).

1. Purpose

The purpose of this literature review is to examine various approaches to understanding learning styles, looking at the models developed in an attempt to define learning styles and explain their influence on acquiring knowledge. In addition, this literature review explores multiple teaching styles designed to address the issue of learning styles in an effort to meet students' needs more effectively. Finally, this literature review intends to provide an investigation of prior and current research concerning the influence of having both unmatched and matched teaching and learning styles.

2. Sources of Data

In order to achieve the goals of the literature review, the researcher gathered information from various sources, including scholarly journal articles, books, and pertinent organizational websites. From sources reviewed, the researcher also examined the reference lists for citations identifying further sources that might be relevant to the current review. Conduction of the vast majority of research used the EBSCOhost platform to search multiple databases for relevant theoretical and research articles. These databases included, but were not limited to Academic Search Complete, Education Research Complete, and ERIC. Keyword searches facilitated the finding of articles pertaining to the following terms: learning styles, learning style preferences, instructional strategies, teaching strategies, and academic achievement. Review of the attained results led to an organization of information by topic.

Articles selected for inclusion in this review fell into two basic categories, which led to the general outline of this review. The first category was comprised of scholarly publications of historical or theoretical significance in regards to broad learning style theory and specific learning style models. The second category of articles selected were research publications disseminating empirical evidence concerning the effects of learning and teaching styles on academic achievement. Several research studies were not included because they explicitly focused on instructional approaches tied to a particular learning style model or because they studied only students in secondary or higher education. Omission of these articles from the review resulted from a focus deemed too narrow or not particularly generalizable to typical classroom-based instruction.

3. Diversity within the Learning Styles Field

Although there is considerable interest in the subject of learning styles among educators and parents alike, there is a noted lack of unity within the field (Hall & Moseley, 2005; Pashler et al., 2009). Between 1902 and 2002, learning styles theory expanded significantly, with no fewer than 71 different models published during this 100-year period. While many of these models share some characteristics, each has a unique perspective, focusing uniquely on student preferences, abilities, and even preferences based on ability (Hall & Mosely). Researchers have made various attempts to classify the wide variety of learning style models

and thereby bring greater unity to the field (Felder & Brent, 2005; Hall & Moseley; Sternberg et al. 2008). However, in order to understand fully the relationships between the diverse models, it is necessary to recognize first the theoretical foundations underlying them. These include both Brain-Based Educational Theory and the Approaches to Learning Model.

3.1 Theoretical Foundations Underlying the Field of Learning Styles

Both the Brain-Based Educational Theory and The Approaches to Learning Model have relevance to the study of student achievement in relation to learning style preferences and instructional strategies. Further classification systems rely upon these basic theoretical differences as a basis for organizing the wide variety of specific models. For example, systems have been presented in which learning style models are classified as ability- or personality-based (Sternberg et al., 2008); as related to learning styles, approaches to learning, or intellectual development (Felder & Brent, 2005); and using a continuum from a focus on fixed traits to a greater emphasis on personal preferences and orientations (Hall & Moseley, 2005).

Brain-Based Educational Theory involves exploring the ways by which the brain works to facilitate learning. It takes into consideration the natural and physiological processes that occur during learning and uses this understanding to guide educational practice. Understanding the functions of the brain and incorporating this in designing learning experiences can significantly improve the effectiveness of student learning (Caine & Caine, 1991). Alternatively, one may view the Approaches to Learning Model in terms of learning styles or learning approaches. While some proponents argue they are two distinct schools of thought, one can also conceptualize them as an integrated construct (Cuthbert, 2005). Learning styles, and the related cognitive styles, typically refer to individual preferences for responding to situations and data and for comprehending experiences and developing knowledge from them. Learning approaches, on the other hand, deal more with the intentions students have for different learning tasks, which then result in different learning outcomes (Cuthbert). Considering the inclusion of both learning styles and approaches to learning, this model has numerous proponents, each with a unique twist on the same basic concept that individuals have preferences for the ways in which they learn.

3.2 Variations in Definitions and Exploration of Learning Styles

Much of the written work concerning learning styles is devoted to defining learning styles and providing evidence that differences exist in the inherited or preferred styles of individuals (Lovelace, 2005; Pashler et al., 2009). Some sources address specific approaches, identifying classification schemes and asserting the relevance of such for education (Collinson, 2000; Denig, 2004; Young, 2002). Others provide an overview of various models, attempting to provide a composite view of several approaches (Felder, 1996; Felder & Brent, 2005; Hall & Moseley, 2005). Not surprisingly, the multiplicity of learning style models is paralleled by an abundance of assessment instruments by which they may be identified (Dunn, Dunn, & Price, 1976; Keefe et al., 1986; Kolb, 1976). The wide variety of learning style models makes it impractical to address each one in this context. However, it is appropriate to note some of the most significant models include learning modalities,

multiple intelligences, the Dunn and Dunn learning styles model, the Myers-Briggs Type Indicator, and Kolb's learning style model.

3.3 Implications of a Lack of Unity

The previous discussion of learning style models and assessment instruments points to some of the negative consequences of the extreme diversity that exists in the field of learning styles. The variety and ambiguity of definitions, terms, and even underlying theories is perplexing (Cuthbert, 2005; Pashler et al., 2009). Hall and Moseley (2005) described it as a "confused and expanding field" (p. 247) and acknowledged a need for greater unity and order. The noted dearth of empirical evidence (Cuthbert, 2005; Hall & Moseley, 2005; Pashler et al., 2009) corresponds with the overwhelming majority of works that simply identify and promote a particular view or approach concerning learning styles. A further cause of confusion is evident in the fact that seven of the assessment instruments reviewed in the *Mental Measurements Yearbook* database contain "Learning Style(s) Inventory" as all or part of the title (Barsch & Creson, 1980; Brown & Cooper, 1993; Canfield, 1976; Dunn et al., 1976; Kolb, 1976; Piney Mountain Press, 1988; Renzulli et al., 1978).

While individual authors and organizations may be justified in promoting their unique view of learning styles, one could argue this diversity is hurting the field in general. The variety of models and approaches highlights and supports the inherent complexity of learning styles concepts; however, there is a need for further and more focused scientific study (Cano-Garcia & Hughes, 2000; Hall & Moseley, 2005). In addition, learning style assessment instruments seem to suffer the effects of diversity, as it is difficult to find a tool that encompasses the broad scope of the field and can boast widespread use as well as strong statistical data in terms of reliability and validity (Cano-Garcia & Hughes). The massive array of information and models available, combined with professional magazines' limited discussion of the theoretical and empirical basis underlying them (Hall & Moseley), increases the challenge for practitioners to develop a full understanding of the important concepts and practical implications relevant to the field of learning styles.

4. Influence of Learning Styles on Education

The field of learning styles research has implications for both teachers and students and is capable of influencing a variety of perceptions and outcomes. Many claim this influence is positive, bringing about increased understanding and improved performance (Cano-Garcia & Hughes, 2000; Evans & Waring, 2006; Hall & Moseley, 2005; Honigsfeld, & Schiering, 2004; Minotti, 2005; Noble, 2004; Rosenfeld & Rosenfeld, 2008). However, some questions remain about the most effective ways to obtain the greatest benefits from the current knowledge in the field.

4.1 Teachers

Education professionals have demonstrated an increasing interest in learning styles and related assessment instruments, instructional models and pedagogical techniques (Hall & Moseley, 2005; Pashler et al., 2009). This interest is spurred by a desire to personalize and improve student learning and is supported by a wide variety of models displayed and

promoted in professional magazines (Hall & Moseley, 2005). Some claim teachers who have a greater understanding of learning styles can increase their effectiveness in both instruction and assessment (Hall & Moseley; Honigsfeld & Schiering, 2004; Sternberg et al., 2008).

4.1.1 Teacher Training

Despite the interest in learning styles, there is a need for increased attention to this topic in teachers' professional development (Evans & Waring, 2006; Haar, Hall, Schoepp, & Smith, 2002; Rosenfeld & Rosenfeld, 2008). Evidence has indicated training can support teachers in altering their instructional methods and planning tools can assist teachers in implementing theoretical concepts in practice (Evans & Waring, 2006; Nasmith & Steinert, 2001; Noble, 2004). However, the need remains for pre-service and in-service training and mentoring to provide instruction and support for a greater understanding of learning styles theory as well as practical implementation of learning-styles based methods (Haar et al.; Tomlinson, 2004). Further study is warranted to promote the development of effective programs for staff advancement (Minotti, 2005). If teachers are expected to provide instruction responsive to students' learning style needs, it is essential they be provided with the training and experience necessary to do so (Evans & Waring; Honigsfeld & Schiering, 2004).

4.1.2 Perceptions

Teachers' beliefs about themselves and their students have a profound effect on their teaching (Rosenfeld & Rosenfeld, 2008). Thus, educators' understanding of learning style constructs can significantly influence their perception of students' learning differences and various instructional practices. Providing training and opportunities for teachers to develop an understanding of their own learning style preferences can result in greater comprehension and consideration of the unique learning needs of each individual under their tutelage (Evans & Waring, 2006; Rosenfeld & Rosenfeld, 2008). Without such understanding, it is common to uphold the traditional styles exhibited by many teachers and favored in the current educational establishment as the preferred characteristics of effective learners (Cano-Garcia & Hughes, 2000; Rosenfeld & Rosenfeld). Further, educators may also inappropriately perceive students with alternative learning styles as being weak or less capable than their more traditional counterparts (Evans & Waring, 2006; Noble, 2004).

While a knowledge of learning styles does not necessarily equate to informed practice, the provision of training and relevant tools will greatly increase the chances that teachers will feel more confident and choose to incorporate learning style-based instructional strategies in their classrooms (Cano-Garcia & Hughes, 2000; Noble, 2004). Understanding students' unique learning style preferences and instructional needs can assist teachers in developing a more favorable view of all students' abilities and thereby stimulate the development and implementation of differentiated instructional practices and the provision of intentional and personalized intervention (Evans & Waring, 2006; Honigsfeld & Schiering, 2004; Rosenfeld & Rosenfeld, 2008). Often, the resulting increased success of all students serves as further incentive for continued attention to individual learners' needs (Rosenfeld & Rosenfeld).

4.1.3 Instruction

Although some argue the “manner of instruction can be more important than the types of learning activities selected” (Morrison, Sweeney, & Hoffman, 2006, p. 66), it is essential that teachers develop a large repertoire of instructional strategies for use in varied settings with diverse students (Hall & Moseley, 2005; Honigsfeld & Schiering, 2004). Moral conviction for equal opportunity and fair treatment of every individual as well as current legislation, such as the No Child Left Behind Act (2001) and the reauthorization of the Individuals with Disabilities Education Act (2007), demand that educators meet the learning needs of all students. Thus, teachers must become proficient in differentiating instruction to accommodate those needs, make learning more meaningful, and enhance student success (Honigsfeld & Schiering; Noble, 2004). An understanding of learning styles can increase teachers’ confidence and ability to incorporate varied instructional practices in a way that provides for differing levels of ability and unique student learning preferences while maintaining an appropriate level of academic rigor (Noble). Further, research indicates that incorporating learning styles-based instructional strategies assists teachers in creating a comfortable learning environment, demonstrating true concern for their students, and promoting a love of learning (Honigsfeld & Schiering, 2004).

While many educators acknowledge the existence of learning styles, not all are capable or willing to implement learning style concepts in daily practice (Minotti, 2005; Noble, 2004). Thus, one can observe a broad range of instructional approaches in classrooms around the country. Some common designs influencing current practice include teacher-centered instruction, instructional model approaches, constructivism, experiential instruction, brain-based teaching, and differentiated instruction.

4.1.4 Assessment

When instruction allows for differences in students’ learning style preferences, it is also important for evaluation to vary similarly and provide an accurate assessment of student learning (Mooij, 2008; Tomlinson, 2007). As such, proponents of differentiated instruction have also advocated for multiple and authentic assessment methods that evaluate and reflect students’ mastery of essential learning (Tomlinson; Winger, 2005). Such assessment has been encouraged as a means to provide valuable feedback to both students and teachers that can guide the continued teaching and learning process (Tomlinson, 2005a; Tomlinson, 2007; Winger). Capitalizing on students’ interests and individual learning preferences and enabling students to utilize methods that work for them supports the goal of helping all students achieve and demonstrate such achievement to their fullest potential (Tomlinson, 2005a; Tomlinson, 2007). Far from being unfair because students may not all be required to perform identical tasks, this type of variance in assessment has been endorsed as a means of leveling the normal curve, promoting better engagement and increased learning, and achieving greater accuracy in reflecting true student learning (Tomlinson, 2005a; Tomlinson, 2007; Winger, 2005; Wormeli, 2005).

4.2 Students

Numerous studies have shown that learning style differences exist and that they affect students' attitudes toward learning as well as their performance in school (Cano-Garcia & Hughes, 2000; Collinson, 2000; Felder & Brent, 2005; Felder, 1996; Fine, 2003; Honigsfeld & Schiering, 2004; Kolb & Kolb, 2009; Lovelace, 2005; Minotti, 2005; Tseng, Chu, Hwang, & Tsai, 2008). This is a reasonable, though not uniformly accepted, explanation for the different results achieved by the same students under the instruction of different teachers (Felder & Brent, 2005). Other factors influencing student performance have certainly been identified and explored, including psychological threat, racial context, motivation, self-regulation of learning, socio-economic status, language proficiency, and student-teacher relationships (Bembenuddy, 2008; Helm, 2007; Herman, 2009; Walton & Spencer, 2009). Despite continued debate about the direct effects of learning styles on academic achievement, it appears there is strong evidence that learning styles influence students' attention to and perceptions of learning experiences (Kratzig & Arbuthnott, 2006). This, in turn, may influence achievement and success in school.

4.2.1 Perceptions

Some critics of learning styles theory have argued that orientation does not necessarily imply proficiency (Cuthbert, 2005) and claimed that learning approaches are flexible rather than fixed (Cuthbert, 2005; Felder & Brent, 2005; Hall & Moseley, 2005). However, many experts affirm the value of educating students about their individual learning preferences, noting the benefits of metacognition and empowerment resulting from such experiences (Felder & Brent, 2005; Honigsfeld & Schiering, 2004; Kolb & Kolb, 2009). Developing a greater understanding of the learning process and the ways by which they learn best improves students' perceptions of their ability to learn, encourages ownership of the learning process and outcomes, and provides increased motivation for doing learning and overcoming potential obstacles (Kolb & Kolb, 2009; Noble, 2004). Further, by learning to recognize effective methods for completing learning tasks and mastering new material, students may become more successful at learning how to learn and are more likely to become lifelong learners and maximize their true potential (Felder, 1996; Kolb & Kolb, 2009; Minotti, 2005).

In addition to increased perception of their ability as effective learners, students receiving learning-style based training also tend to demonstrate improved attitudes and behavior in school (Fine, 2003; Noble, 2004). Cultivating an understanding of students' individual learning style preferences and incorporating instructional practices that take these into consideration communicates a sense of caring, creates a comfortable learning environment, and promotes student self-esteem (Honigsfeld & Schiering, 2004; Noble). Even special populations, including at-risk students and those receiving special education services have demonstrated significant improvements in behavior, attendance, adjustment to class, and engagement in learning activities (Fine; Noble). Accommodating students' learning differences, including learning style preferences, is also one element in developing and implementing an effective program for gifted students (Mooij, 2008; Tomlinson, 2005b).

4.2.2 Motivation and Lifelong Learning

Motivation is an important factor in student learning, influencing learning in both directions. While engagement has been linked to learning, a lack of motivation has been identified as a threat to academic achievement (Bembenutty, 2008; Tomlinson, 2005a; Tomlinson, 2007). Similarly, there appears to be a connection between motivation and learning styles in educational practice as instructional activities that accommodate a variety of learning style preferences tend to increase student motivation (Fine, 2003; Tomlinson, 2005a). While it has been argued that teachers' and the overall educational system's focus on grades and standardized performance often stifles students' innate desire for learning, it has also been acknowledged that teachers can instill a love of learning through the teaching practices they choose to incorporate in the classroom (Honigsfeld & Schiering, 2004; Winger, 2005). Certainly, motivation is not simply a result of teacher influence; identified influential factors also include self-regulatory behaviors and prior achievement levels (Bembenutty, 2008; Reiff, 1992).

Regardless, students who are motivated by the sheer enjoyment of learning have been found "likely to be more effective learners over the long haul" than those who are motivated simply to achieve high grades (Tomlinson, 2005a, p. 267). This long-term motivation for learning, also referred to as a love of learning, is important in the development of lifelong learners. Lifelong learning, which involves the "continuous development and improvement of . . . knowledge and skills" (Lifelong learning, n.d.) demands that students know how to learn (Kolb & Kolb, 2009; McClanaghan, 2000). Thus, students who are motivated and have an understanding of the process of learning are likely to perform better on academic tasks and be more effective at learning in various circumstances than those who do not possess these characteristics (Kolb & Kolb; McClanaghan; Tomlinson, 2005a).

4.2.3 Performance

The importance of developing positive student perceptions of school and themselves as learners not only creates a better classroom environment, it also has implications for academic performance as indicated by Kolb & Kolb's (2009) assertion that "if a person does not believe that he or she can learn, he or she won't" (p. 304). Research has consistently provided results supporting the claim of a significant link between learning styles and academic achievement (Collinson, 2000; Felder & Brent, 2005; Honigsfeld & Schiering, 2004; Lovelace, 2005; Minotti, 2005; Tseng et al., 2008). The benefits of learning-styles based instruction span all academic disciplines, are experienced by students of all ages, and are not limited by gender, ethnicity, religion, or even intelligence levels (Collinson; Honigsfeld & Schiering; Minotti). Students have demonstrated gains in both short-term achievement and long-term retention as well as in their efficiency and levels of thinking throughout the learning process (Felder & Brent; Fine, 2003; Noble, 2004; Tseng et al.). Although one study found a 40% higher expected rate of student success when instruction was learning-styles based than with more traditional methods (Lovelace, 2005), the most effective means of incorporating learning-style concepts in teaching practice remains a contentious issue and will be discussed in the following paragraphs.

4.3 The Question of Matching

While most educators would agree there is no one best approach to teaching, there is a sense that some approaches are better for some learners than others. Some educators avow that unmatched educational styles cause inexcusable suffering and decreased learning on the part of students (Felder & Brent, 2005; Koch, 2007; Minotti, 2005) and advocate for tailoring instruction to students' learning style preferences (Dunn, Denig, & Lovelace, 2001; Lovelace, 2008; Minotti, 2005; Morison, Sweeney, & Heffernan, 2006; Pedrosa de Jesus, Almeida, Teixeira-Dias, & Watts, 2007). Others claim there is little or no solid empirical evidence supporting the benefits of matching (Barber 2007; Hall & Moseley, 2005; Karns, 2006; Kratzig & Arbuthnott, 2006; Loo, 2004; Olson, 2006; Pashler et al., 2009) or that mismatching is actually beneficial (Pedrosa de Jesus et al., 2007). Although there is no visible end to the debate, some have attempted to bridge the gap between the two sides. Rather than supporting either extreme unequivocally, they promote using a variety of instructional techniques to meet the individual needs of students while helping them develop areas of relative weakness in an effort to develop capable and successful learners (Felder, 1996; Karns, 2006; Kolb & Kolb, 2009; Loo, 2004; Morison, Sternberg et al., 2008; Sweeney, & Heffernan, 2006).

4.3.1 Unmatched Instruction

A lack of self-confidence and resentment toward school characterize students who experience repeated failure because educators consistently prohibit them from utilizing their preferred learning modalities (Reiff, 1992). Thus, students whose learning styles are not being matched may become confused and fall behind academically and simultaneously lack the confidence and interest to put forth the necessary effort to continue to attempt the learning process (Fine, 2003). Likewise, Felder (1996) noted that, if students are never exposed to instructional approaches that maximize their preferred learning style but are consistently required to utilize a less desirable style, their learning is likely to be compromised due to a significantly raised level of discomfort.

Honigsfeld and Schiering (2004) noted the significance of the results of a study that indicated teachers have a propensity for analytic processing with a particular demand for structure. This contrasts with the reality that many students entering the classrooms of these teachers are, in fact, more predisposed to global processing with a need for taking ownership of their learning (Honigsfeld & Schiering, 2004). Educators are also urged to consider that students typically retain less than 75 percent of what is verbally presented in a given class session because they are not auditory learners Dunn and Burke (2006). Because students are generally passive and not actively or directly involved in the learning process, lectures lack effectiveness in the development of higher-level skills (Nasmith & Steinert, 2001). Instruction that is focused on what the teacher is teaching rather than what the students are learning encourages students to passively accept information and then simply repeat what they were told instead of actively processing the material and making it meaningful (Petress, 2008; Winger, 2005; Wormeli, 2005). Unfortunately, students whose learning styles do not match the instructional style in use are often designated as learning disabled (Guild, 2001).

Typically, educators then provide these students with remediation for that particular learning method rather than acknowledging and utilizing the students' inherent ability to learn the required material in their own unique ways.

Some researchers claim there is no solid research base supporting the use of instructional methods that accommodate individual learning styles in order to attain higher levels of student achievement (Barber 2007; Hall & Moseley, 2005; Karns, 2006; Kratzig & Arbuthnott, 2006; Loo, 2004; Olson, 2006; Pashler et al., 2009). In fact, Olson (2006) reported that such tactics might actually lead to a lower performance level and a decline in the effort put forth by students. The findings of one study indicate similar effectiveness of transmitting information through lecture as through other teaching styles (Barber, 2007). However, Barber also asserted that educators must consider whether the goal is simply to transmit information to their students and noted that other research results have identified other educational objectives for which there is a discrepancy between the effectiveness of lecture and other instructional methodologies. Further arguments claim that, although students often display different modality strengths, simply utilizing these strengths does not equate to increased educational achievement (Pashler et al., 2009; Willingham, 2005). Instead, modality memory strengths may only apply to some types of memories, and educators typically seek for students to develop an understanding of the underlying meaning of information, an understanding not affected by the specific modality. Thus, some have suggested that, rather than differentiate instruction based on individual student's modality strengths, educators should consider the best modality for presenting various subject matters and specific types of information (Pashler et al., 2009; Sternberg et al., 2008; Willingham, 2005).

Furthermore, Kratzig and Arbuthnott (2006), presented research evidence suggesting learning styles may not be deeply ingrained or consistent, citing data in which two different learning styles assessments failed to yield a statistically significant correlation between the results produced by the same participants. A lack of data-driven results leads some researchers to claim that learning styles are more strongly linked to personal preferences, beliefs about self-efficacy, and perceptions of effectiveness than they are to actual performance levels (Karns, 2006; Kratzig & Arbuthnott). Thus, the argument remains that one should not expect the attempt to match teaching and learning styles to produce significant improvement in academic achievement or performance. These expectations should be limited to those which can be attributed to increased motivation for voluntary effort as a result of accommodating students' preferences by providing instruction in a manner that is popular and familiar (Karns; Kratzig & Arbuthnott; Pashler et al., 2009).

4.3.2 Tailored Instruction

On the other side of the argument, experts claim there is no single best approach that will work for everyone, no matter how good that approach may be (Felder & Brent, 2005; Koch, 2007; Sternberg et al., 2008). Collinson (2000) cited numerous researchers whose findings expose significant variations in learning preferences among students of all ability levels and which tend to display a link between these preferences and academic achievement.

One such example is that presented by researchers Tseng et al. (2008) who found that students achieved both greater learning and higher efficiency when provided with adaptive materials and presentation styles. Other research conducted with students across a wide range of demographics indicated a positive effect on both academic achievement and student attitudes when learning and teaching styles are compatible (Denig, 2004). In yet another study, although every lesson utilized a variety of teaching strategies matched to various learning styles, students had a tendency to demonstrate a preference for approaches more closely related to their unique learning styles (Pedrosa de Jesus et al., 2007). Taken together, these findings provide evidence of the value of ensuring a match between teaching and learning.

Indeed, many educational practices that have proven effective may actually have a link to learning styles (Guild, 2001). Not only does the use of preferred learning modes encourage higher levels of academic achievement and improved attitudes, it can have other widespread and long-lasting effects as well. For example, an awareness of individuals' unique learning styles encourages students not only to understand themselves more accurately, but also to more effectively understand and relate to their peers (Goby & Lewis, 2000; Minotti, 2005). The groundwork laid throughout the educational process, then, serves to support collaboration in all future personal and professional endeavors. Finally, by allowing students to utilize their preferred learning styles, teachers can increase the personal relevance of educational experiences which results in a higher level of mental and emotional engagement and, ultimately, serves to provide meaningful connections between what is learned in school and what goes on in real life (Noble, 2004; Young, 2002).

4.3.3 Varied Instruction

Despite the evidence for the benefits of matching teaching and learning styles, one should not view this approach alone as a guarantee for increased student achievement (Brown, 2003). Rather, it should lead to the understanding that the ability to learn is a process that most effectively begins with an individual's natural learning style (McClanaghan, 2008). These unique learning styles should neither lead to oversimplification and inappropriate generalization of research findings and group results (Collinson, 2000) nor to judgments that imply superiority and inferiority, but should rather simply be viewed as indications of variety that must be acknowledged (Felder & Brent, 2005; Honigsfeld & Schiering, 2004).

The effective utilization of learning styles assessment results can lead to the development of instructional lessons that are responsive to student needs (Dunn et al., 2009). Meeting the needs of students is essential if educators are to make substantial progress toward the goal of developing lifelong learners (Williamson & Watson, 2007). However, a singular approach to teaching and learning based on students' learning preferences may inhibit the overall development of those students, thus limiting their potential for future academic and professional achievement (Felder, 1996). As such, some argue teachers should design instructional strategies to ensure matching of students' learning preferences some, but not all, of the time. This enables teachers and students to maximize achievement levels, develop areas of relative weakness, and increase students' abilities to perform functionally in any

environment (Felder & Brent, 2005; Karns, 2006; Kolb & Kolb, 2009; Loo, 2004; Morison, Sternberg et al., 2008; Sweeney, & Heffernan, 2006). Research has shown that students receiving instruction incorporating a variety of instructional methods demonstrated greater performance levels overall (Felder & Brent, 2005; Sternberg et al., 2008). Therefore, students may obtain the universal benefits of intentional diversification of instructional methods and strategies through those activities specifically matching their particular preferences as well as through the cumulative effect of a wide variety of educational opportunities (Guild, 2001).

Learning style theories provide an effective means for helping teachers recognize the vast diversity in their students' individual learning needs as well as providing a framework from which to knowledgeably develop a variety of instructional methodologies to utilize in their teaching (Cano-Garcia & Hughes, 2000; Hall & Moseley, 2005; Honigsfeld & Schiering, 2004; Minotti, 2005; Rosenfeld & Rosenfeld, 2008; Sternberg et al., 2008; Williamson & Watson, 2007). In practical application, matching teaching and learning styles does not necessarily imply that specific learning activities must be utilized in relation to each learning style, but rather that the manner in which instruction is presented and developed should take into consideration the learning styles of the students involved (Morrison et al., 2006). Although some teachers are hesitant to modify their teaching style, Noble (2004) reported an increase in teacher's willingness to incorporate learning styles research in their instructional practices when provided a tool for practical application. These same teachers noticed greater levels of performance by students with and without disabilities when implementing educational strategies designed to match various learning styles. Thus, when given appropriate information and support, there is potential for enthusiastic acceptance of teachers in utilizing a variety of learning styles-based instructional strategies as a means of helping students achieve increased academic gains (Honigsfeld & Schiering, 2004; Noble, 2004; Rosenfeld & Rosenfeld, 2008).

5. Methodological Debate

Although the field of learning styles continues to garner significant attention and interest from educational professionals, some maintain there is a lack of strong empirical evidence for the influence of such models on improving academic achievement (Hall & Moseley, 2005; Pashler et al., 2009). A large majority of published resources, particularly those aimed at practitioners, promote various methods and tools for the application of learning style-based instruction in educational practice but do not present theoretical or empirical evidence in support of the effectiveness of such strategies (Hall & Moseley, 2005). Further, Pashler et al., (2009) argued that most resources claiming to provide such evidence relied upon less than desirable research designs, and they asserted that only those studies meeting stringent criteria, such as true experimental design with random assignment, multiple treatments, and controlled assessment, are deserving of attention as indicators of the influence of learning styles on teaching and learning. Of the published research studies that do exist, many involve limited samples or designs without experimental control. Those that utilize a more sophisticated research design, although still not necessarily involving researcher manipulation of variables, often address only particular aspects of learning styles or instructional practice

without exploring the complex relationships between both of these and academic achievement (Cano-Garcia, 2000; Collinson, 2000; Evans & Waring, 2006; Fine, 2003; Honigfeld & Shiering, 2004; Kratzig & Arbuthnott, 2006; Loo, 2004). While scientific rigor is desirable, it is also essential to conduct educational research in authentic settings (Hall & Moseley, 2005). Thus, the debate lies in where to draw the line between experimental control and pertinent application to the real world of teaching and learning in typical educational settings.

Even some researchers who acknowledge the potential relevance of learning styles for educational practice have questioned if there is sufficient evidence to warrant sustained use of assessment tools and related development programs and instructional strategies (Evans & Waring, 2006; Karns, 2006; Kratzig & Arbuthnott, 2006; Pashler et al., 2009). Others have echoed the sentiment concerning the lack of empirical evidence and yet presented a more forgiving review, claiming the theoretical foundations of learning style methods provided sufficient support for continued application (Hall & Moseley, 2005). Still others contended that a more thorough investigation of the work of prominent learning styles experts yields a comprehensive research base (Glenn, 2009). Sternberg et al. (2008) provide potential evidence for this claim in a single article in which they present several research studies evidencing the beneficial influence of learning styles on educational practice.

6. Future Research

While there is disagreement over the current state of learning styles research, the need for further study appears obvious. Empirical evidence must support claims for investing time and resources into the advancement of learning style-based strategies in educational practice. This evidence must exceed descriptive studies and those simply supporting the existence of various learning styles, the effectiveness of assessment tools to classify students, and the application of multiple specific approaches. Further, a means of more effectively defining and organizing the vast array of methods and approaches, such as the continuum of fixed versus fluid characteristics presented by Hall and Moseley (2005) and the dichotomous grouping of ability- and personality-based styles advocated by Sternberg et al. (2008) could help unify the field and make research findings more cohesive and understandable.

However, research design and selection of appropriate methodologies may remain an issue of contention. Some recommendations made by reviewers such as Pashler et al. (2009) are logical and practical, such as increasing the longitudinal span of studies. Indeed, rigorous design is important and to some schools of thought, imperative. However, true experimental research designs are not always feasible in the realm of education (Ary et al., 2006). Perhaps, the most compelling and reasonable argument is that learning styles research must be “reliably and validly measured” and “rigorously tested in authentic situations” (Hall & Moseley, 2005, p. 247). Regardless of the position one takes in the methodological debate, most agree about the need for further research concerning the practical implications for pedagogical practice and student performance outcomes (Evans & Waring, 2006; Hall & Moseley, 2005).

7. Conclusion

Helping students become lifelong learners should be the ultimate goal of education, and understanding students' various learning styles can help educators achieve that goal. Hanafin, Shevlin, and Flynn (2002) encouraged educators to embrace the diversity of their students and develop a classroom environment and a variety of instructional strategies that celebrate and support this diversity. Felder (1996) asserted that teachers must teach to students with all types of learning styles and noted that an instructional model is only effective to the extent that it is able to assist educators in meeting the needs of all students. Thus, the specific model utilized is not nearly as important as ensuring that teachers provide instruction around the cycle of all learning style preferences (Felder). Indeed, educators must make a commitment to understanding learning styles, recognizing the unique qualities of each student, and doing everything within their power to provide the tools and opportunities necessary for every individual to achieve success.

Although recent trends have increased educators' awareness of various learning styles, this has not yet translated into widespread use of appropriate practice (Barber, 2007; Guild, 2001; Hall & Moseley, 2005). Thus, simple awareness is not enough; neither is purchasing the latest tools and programs without proper training. A clear demonstration of the danger of such an approach is evident in the frequent mistake of teachers who plan every aspect of the curriculum, materials, and environment, only to discover that the students who enter their classrooms do not fit into their plan (Parker, n.d.). Educators must get educated! Only a deep and personal understanding of learning styles and cognitively appropriate practices will produce an effective learning environment for all students.

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