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LEARNING STYLES: A VIABLE APROACH TO INSTRUCTION?

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Learning Styles: A Viable Approach for Instruction?

Introduction

For years, educators have been taught that students learn in different ways. One common instructional practice in the classroom is to identify the learning style of the student and then teach to that preferred mode. The idea is that students learn in a certain way, and if teachers attend to that learning style, student performance will increase. There is a debate whether learning styles exist and whether teaching students according to the identified preferred learning style truly helps. This review will examine learning styles and implement a critical analysis in order to determine the effectiveness of learning styles for the classroom.

The purpose of the project is to research the concept of learning styles, a common theory used in education, through a critical lens, then take the information, and apply it to a classroom environment. Numerous sources of literature that address the background, research, and efficacy of learning styles will be critically analyzed in order to determine the effectiveness. The research and conclusion will discuss the implications for learning styles in the K-8 classroom.

Background/Historical Context of Cognitive Styles and Learning Styles

Over time, the ideas and definitions of cognitive styles and learning styles have transformed. According to Kozhevnikov, a former program director for the Science of Learning Centers Program at the United States National Science Foundation and author of one of the few (and most thorough) historical reviews of cognitive learning styles, found that cognitive style research took reign in the 1950s when psychological researchers began looking into how innate cognitive preferences affected personality and relationships (Kozhevnikov, 2007). However, cognitive style's growth and expansion lasted no more than 20 years due to problems that arose:

> In the 1970s, cognitive style research began to lose its appeal. The field was left fragmented and incomplete, without a coherent and practically useful theory and with no understanding of how cognitive styles were related to other psychological constructs and to cognitive science theories. (Kozhevnikov, p. 464)

The consensus of many cognitive researchers was that there were, without a doubt, differences in cognitive processing, but the variables from other outside factors that influence human development made it difficult to determine which cognitive styles were associated with other psychological theories (Kozhevnikov, 2007). According to Kozhevnikov (2007), "The main message of this research is that styles represent relatively stable individual differences in preferred ways of organizing and processing information that cut across the personality and cognitive characteristics of an individual" (p. 468). Kozhevnikov suggests cognitive styles are a consistent dynamic that are not necessarily influenced by other variables.

After cognitive researchers began drifting away from cognitive style, other domains began picking up the idea and translating it to their own field of study. Beginning in the late 1970s, other research fields started to combine the idea of innate

styles with other cognitive tasks, and new areas of study emerged. These areas included

problem solving styles, decision-making styles, learning styles, and personal styles

(Kozhevnikov, 2007).

Definitions: Cognitive Styles and Learning Styles

Peterson, Rayner, and Armstrong (2009) investigated the ideas and opinions of 94

style researchers about their thoughts on the topic of learning and cognitive styles.

Different style researchers have different ideas on what each concept means due to their

background. When researchers were asked to provide a definition for each term some

patterns began to emerge. Peterson, Rayner, and Armstrong found, for the most part, that

> …cognitive styles were seen as stable, innate and closely linked to underlying
> information processing mechanisms. Learning styles were seen as variable,
> environmentally dependent and were described in terms of their broader effects
> on learning behavior-- not their effects on cognitive processing. (p. 519)

One of the biggest differences between cognitive styles and learning styles that Peterson,

Rayner, and Armstrong found has to do with how consistent they may be across

situations. The second biggest difference involved looking at the context of the situation.

In cognitive styles, the focus is on how the brain is taking in, interpreting and making

sense of the information. In learning styles, the focus is more on how one comprehends

and responds to the information from a more global perspective.

Cognitive styles can be divided into various subcategories. One example of

cognitive style that is most researched is field dependence and independence. Meng et. al.

(2011) explained that field dependence can be described on a spectrum from severe field

dependence to severe field independence. For example, those who may fall into the

extreme field dependent category tend to understand information as a whole picture,

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while those closer to the field independent end of the spectrum tend to break down and isolate information into smaller chunks (Meng et. al., 2011). Cognitive style categories have patterns of behavior that students may use. Researchers have developed multiple teaching recommendations to match student cognitive style in order to create more effective teaching. In the case of field dependence and field independence, one strategy includes presenting information to field dependent students in a well-organized structure to make up for their lack of being able to break down information (Tinajero, Castelo, Guisande, & Páramo, 2011). Other suggestions for addressing field dependence and field independence highlight instruction, feedback, socialization, and assessment format (Tinajero et. al). When teachers apply cognitive style strategies to the classroom, student understanding and performance should increase. The same can be said about using student learning styles to modify instruction.

The Dunn Learning Style Model is one learning style theory that was developed in the 1960s and 1970s by Rita and Kenneth Dunn, and is still used today (*Learning Styles*, 2010). According to the homepage of the official site of the Dunn Learning Styles Model, learning styles can be defined as "an individual's unique approach to learning based on strengths and preferences" (*Learning Styles,* 2010, para. 3). Within the context of learning styles are various sub-categories for the many ways students may learn. These are also known as modalities. The most well-known set of modalities includes visual, auditory, and kinesthetic learning (Riener & Willingham, 2010). Visual-spatial learners are those who learn best through pictures and visual representations. Auditory learners are those who learn best through sound and by listening to information. Kinesthetic learners are those who learn best through doing, by using the body to understand the

information.

Teachers are often encouraged to identify the modality in which a student learns best through learning style assessments, inventories, or questionnaires. There is an abundant source of assessments teachers can purchase and use to help identify the preferred modality of an individual student. The list below includes example statements from the Memletics Learning Styles Questionnaire (2012) that teachers may use:

- You use a specific step-by-step process to work out problems

- You occasionally relies you are tapping in time to music, or you naturally start to hum or whistle a tune. Even after only hearing a tune a few times, you can remember it.
- You like getting out of the house and begin with others at parties and other social events.
- You like logic games and brainteasers. you like chess and other strategy games.

- You like crosswords, play scrabble and word games.

- You can play a musical instrument or you can sing on (or close to) key.

- You read self-help books, or have been to self-help workshops or done similar work to learn more about yourself.

- You like to think out ideas, problems, or issues while doing something physical.

- You like making puns, saying tongue-twisters, making rhymes.

- You have a good sense of color.

In this example, participants would rank how much they agree with the statement on a scale of zero (disagree) to two (agree). The scores would then be translated into a learning style that matches the participant. Similar to the example, the format of a majority of the tests that identify learners' preferences offer a question or statement about

the tester, and individuals select an answer depending on how much they feel they match the statement. The score the individual receives then determines what learning style he or she prefers and through which modality he or she will learn best.

In addition, there are a number of traits that belong to each set of learners. For example, in examining one of the modalities more closely, such as visual-spatial, Silverman, a psychologist with a doctorate in special education and author of *Upside-Down Brilliance: The Visual Spatial Learner* (2002), stated the traits that belong to the visual-spatial student include:

> …seeing the big picture, reading maps well, performing well at math reasoning, learning whole words easily, spelling by visualizing, keyboarding well, arriving at correct solutions intuitively, developing own methods of problem solving, liking problems with many possibly answers, and are creatively, technologically, mechanically, emotionally or spiritually talented. (2003, pp. 6-7)

According to the theory, each learning style has a set of similar traits that pertain to the individual who fits within the given learning style. Once teachers have identified the preferred modality of students, they are to use the information to meet the needs of the students by teaching in certain ways. Prashnig, author of *Learning Styles and Personalized Teaching* (2006) believes, "Teaching strategies need to allow for [student preference] by making students feel good the moment they enter [the classroom] and by presenting learning content in a way that makes sense to [students]" (p. 27). For instance, if students learn best visually, the information should be presented in a visual format, perhaps using a projector and visual presentation. According to the views these researchers share, teaching to the students' preferred learning styles is intended to increase the learning success of the students.

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<p style="text-align:center">Tensions of Learning Styles</p>

Ever since the idea of learning styles stemmed from cognitive styles, there have been conflicting views on how, and if, learning styles can be used effectively in the classroom to help students succeed. There have been numerous products, tools, and curriculum designs available for educators to identify and teach to a student's preferred modality. The question is: Does it work?

Two of the biggest theories in learning-styles research include Dunn's Learning Style Model and Kolb's Experiential Learning Theory. Numerous articles have been written back and forth in critique and rebuttal to these theories, questioning the validity, reliability, and effectiveness of using the assessment tools and models to help learners succeed. The battle has been long-going and unsettled.

Debate Over Dunn's Learning Style Model

The Dunn Learning Style Model (*Learning Styles,* 2010) mentioned earlier is based on the idea that by using the Learning Style Inventory, a set of statements and questions that students answer based on preference, an educator can identify a student learning-style preference and use the information to design an instructional plan that best suits an individual's biological and developmental characteristics (Dunn & Griggs, 1995). Accommodations for individual preferences can be made through environment, method, and resource changes. The Dunn Learning Style Model is made up of a set of stimuli that can affect a learner's performance. Environmental, emotional, sociological, physical, and psychological categories make up the set of stimuli (see Figure 1).
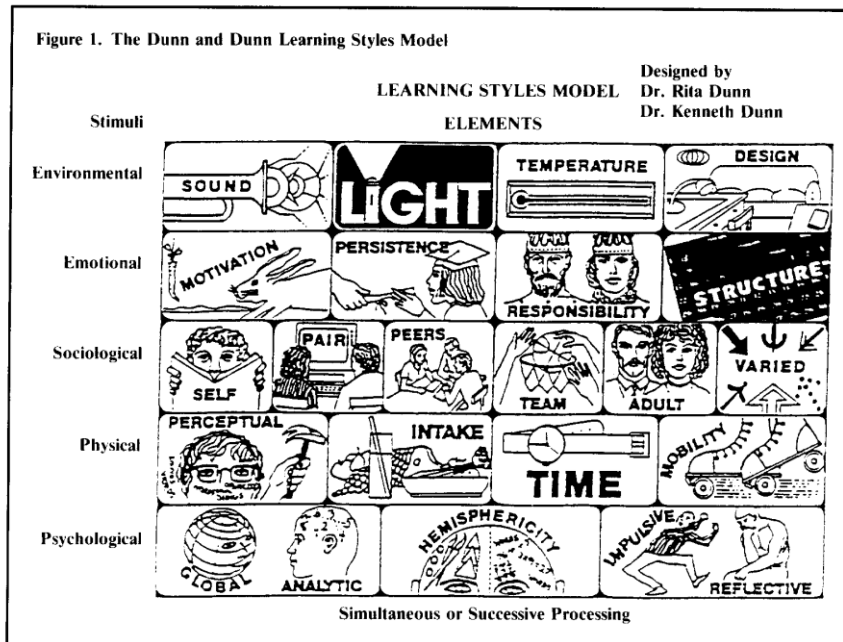
Figure 1. Dunn and Dunn Learning Styles Model (Dunn & Griggs, 1995, p. 356)

Dunn claimed the Learning Style Inventory (Dunn, Dunn, & Price, 1989), an assessment tool used to determine an individual's learning preferences, "is the most reliable, most valid, and most widely used learning style diagnostic instrument for school-aged children in the United States" (p. 16). When the Learning Style Inventory is used to match teaching approaches to student preference, "[the students] demonstrate statistically higher achievement and attitude test scores than when they are taught with approaches that mismatch their preferences" (p. 15). Dunn believes that not taking student learning preference into consideration for teaching can lead to failure. "Students can learn almost any subject matter when they are taught with methods and approaches responsive to their learning style strengths those same students fail when they are taught in an instructional style dissonant with their strengths" (Dunn, 1990). In other words, according to Dunn, ignoring student preference can be damaging to a student's success.

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In 1987, Kavale and Forness conducted a meta-analysis of 39 studies, including Dunn's Learning Style Model, testing modality instruction and the overall hypothesis: "matching instructional methods to individual modality preferences would enhance learning" (p. 235). Kavale and Forness's research found that, "[The] hypothesis was supported in 13 of the 39 studies (33%), while 67% did not offer support for the modality model" (p. 235). Kavale and Forness concluded that matching instruction to a student preference has appeal, but little quantitative support:

> Little (or no) gain in achievement was found when instructional methods were matched to preference learning modality. Only modest improvement was demonstrated for either auditory, visual, or kinesthetic teaching methods. These minimal levels of improvement were not related to the strength of assessment in terms of magnitude of group differentiation. A possible explanation is found in the classification of teaching methods and materials as either primarily auditory, visual, or kinesthetic. (p. 237)

Overall, Kavale and Forness did not find sufficient evidence to support the Dunn Learning Style Model as a necessary tool for the classroom.

In a second meta-analysis of studies on the Dunn Learning Style Model conducted by Rita Dunn (Dunn & Griggs, 1995), Dunn found that students who responded best to and succeeded with learning style preference interventions were college or adult learners, had been in smaller sample sizes, were of middle-class socioeconomic status, and/or had been in instructional interventions for over a year. In addition, the content area of mathematics was found to be most responsive to the learning-style preference interventions (Dunn & Griggs, 1995). Dunn and Grigg's (1995) meta-analysis also contradicted an earlier meta-analysis of the Dunn Model by Kavale and Forness (1987) for the following limitations:

> …inclusions of a majority of studies with serious design flaws; inclusions of, and no differentiations among, studies from extremely diverse models that used diverse identification assessments and student populations; omission of studies that focused on the specific variable they purposely investigated; misinterpretation of the increases of improved standardized test achievement for 55% to 59% of the special education pupils; and assumptions that specific terms were defined and treated similarly by the many investigators whose studies were included in the meta-analysis (pp. 353-354).|

Dunn questioned the meta-analysis done by Kavale and Forness on the basis of including studies with models different from her own and studies in question for validity and reliability. Dunn also questioned the interpretation of research analyzed by Kavale and Forness.

In 2005, a third meta-analysis was completed on the Dunn Learning Style Model by Lovelace. After reviewing 76 studies completed on the Dunn Model of Learning Style Preference, Lovelace concluded that the model had value.

> I strongly suggest that learning-style responsive instruction would increase the achievement of, and improve the attitudes toward; learning for all students…The data overwhelmingly supported the position that matching students' learning-style preferences with complementary instruction improved academic achievement and student attitudes toward learning. (2005, p. 181)

Lovelace's study contradicted the meta-analysis by Kavale and Forness and found sufficient evidence to support Dunn's theory on matching preference to instruction.

In response to the Dunn and Griggs (1995) meta-analysis and to the Lovelace (2005) meta-analysis, Kavale and LeFever (2007) criticized the model that reinforced the problems found in the original meta-analysis (Kavale & Forness, 1987). In response to the flaws noted by Dunn & Griggs (1995) regarding the initial meta-analysis conducted by Kavale and Forness, Kavale later responded with his colleague, LeFever (2007), and took particular exception to Dunn & Griggs' criticism of examining studies from diverse

models. Kavale and LaFever state, "Such criticisms are not warranted because they ignore the primary purpose of meta-analysis. As a research synthesis technique, meta-analysis combines studies that may vary across a number of dimensions to achieve generalizations across an entire research domain." (p. 94). Kavale and LeFever's definition of a meta-analysis encompassed the idea of including a diverse collection of studies, in order to come up with conclusions that could encompass the idea of learning styles as a whole.
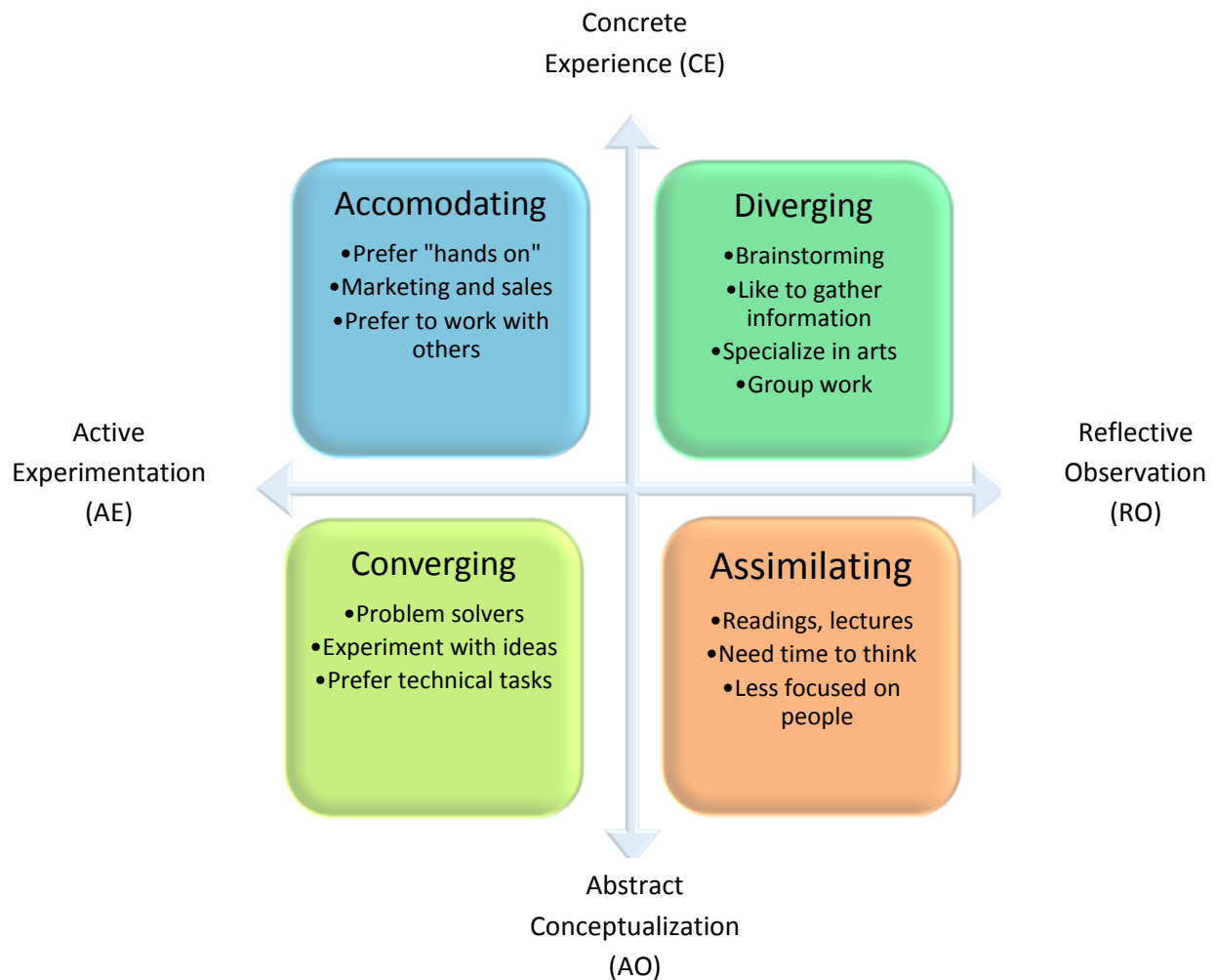
In response to the Lovelace (2005) meta-analysis, Kavale and LeFever (2007) argue the analysis did not feature any methodological flaws, but did have conceptual and practical problems that made the conclusions invalid. "Consequently, we do not believe that the Lovelace meta-analysis provides the intended level of support for the [Dunn Learning Style Model]. Instead, caution is necessary before one can accept the optimistic picture about the nature of the [Dunn Learning Style Model]" (p. 95). In addition, Kavale and LeFever believe the effect sizes of learning styles found by Lovelace (2005) were insignificant compared to other instructional strategies that could be used in the classroom. According to Kavale (2007), the practices of teaching content (including reinforcement, drill and practice, feedback, mnemonic instruction, strategy instruction, and direct instruction) demonstrated significantly higher effect sizes than assessing and matching instruction to preferred learning styles.

Criticisms of the Kolb Experiential Learning Theory

Kolb, a second leader in learning styles research and theory, developed the Experiential Learning Theory in the 1970s, which uses his Learning Style Inventory to

help determine which learning preference an individual may have based on innate traits, as and well as life experience (Kolb, Boyatzis & Mainemelis, 2001). Kolb (2005) defines learning style as "…individual differences in learning based on the learner's preference for employing different phases of the learning cycle" (p. 194). To help understand this definition, one must understand Kolb's Experiential Learning Theory (ELT). Within Kolb's ELT, an individual's learning preference lies within intersection of two different spectrums of experience (see Figure 2). Kolb (2005) explains, "The ELT model portrays two dialectically related modes of grasping experience—Concrete Experience (CE) and Abstract Conceptualization (AC)—and two dialectically related modes of transforming experience—Reflective Observation (RO) and Active Experimentation (AE)" (p. 194).

Figure 2. Kolb's Experiential Learning Model and Theory (Content taken from Kolb, Boyatzis & Mainemelis, 2001).

Concrete
Experience (CE)

Accomodating
- Prefer "hands on"
- Marketing and sales
- Prefer to work with others

Diverging
- Brainstorming
- Like to gather information
- Specialize in arts
- Group work

Active
Experimentation
(AE)

Reflective
Observation
(RO)

Converging
- Problem solvers
- Experiment with ideas
- Prefer technical tasks

Assimilating
- Readings, lectures
- Need time to think
- Less focused on people

Abstract
Conceptualization
(AO)

Different than the Dunn's Learning Style Inventory, Kolb has his own Learning Styles Inventory used to assess individuals in order to determine the location on the spectrums of grasping and transforming experience the individual prefers and identifies which of four learning styles is associated best with the individual's preferences. The four learning styles include: Diverging, Accommodating, Converging, and Assimilating. Individuals fit within each style have certain preferences and characteristics that help them learn best. For example, according to Kolb (2005), those who fall under the

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Diverging learning style "are interested in people, tend to be imaginative and emotional,

have broad cultural interest, and tend to specialize in the arts…diverging style

[individuals] prefer to work in groups, to listen with an open mind, and to receive

personalized feedback" (p. 196). Kolb (2005) explains his theory as

> …a process of constructing knowledge that involves a creative tension
> among the four learning modes that is responsive to contextual demands.
> This process is portrayed as an idealized learning cycle or spiral where the
> learner 'touches all the bases'—experiencing, reflecting, thinking, and
> acting—in a recursive process that is responsive to the learning situation
> and what is being learned (p. 194).

Kolb believes an individual should not stay within one quadrant, but rather rotate on a

cycle of all learning styles.

Critics, such as Freedman and Stumpf (1980), questioned the validity of Kolb's

theory in their article, *Learning Style Theory: Less than Meets the Eye*:

> The utility of Kolb's learning style theory should be evaluated in light of
> the available empirical evidence. Essentially, we have a theory whose
> supporting empirical evidence comes from an unreliable instrument
> designed in such a way that its results spuriously support the theory. One
> must conclude that the instrument is invalid and that little empirical
> evidence currently supports this theory of learning styles. (pp. 446-447)

Freedman and Stump's biggest criticism focused on biased research and design of the

Learning Style Inventory is used to support his theory.

In response to Freedman and Stumpf's (1980) argument about the Learning Style

Inventory as an unreliable instrument, Kolb (1981) believes "the public is quite naïve

about psychological tests and often gives test results more credibility than scientific data

merit" (p. 290). Kolb defends his Learning Style Inventory as useful for the layperson.

> … [The Learning Style Inventory] has a simple, straightforward format that does
> not lend itself to pseudo-scientific puffery. In its use, we always emphasize that

the inventory is nothing more than it appears to be—the person's own self-description of how he or she learns compared with similar self-descriptions of the normative sample. (p. 290)

Kolb acknowledges that the Learning Style Inventory is not perfect, and has limitations, but does not dismiss the instrument as a whole. In addition, misconceptions about individuals only matching to one learning style have been one of the strongest arguments against learning style theories. As a result, Kolb made modifications to his theory over time.

Individuals often refer to themselves and others as though learning style was a fixed characteristic: "I have trouble making decisions because I am a diverger." "He likes to work alone because he is an assimilator." To emphasize the dynamic nature of learning style, the latest version of the LSI has changed the style names from *diverger* to *diverging,* and so on. (p. 199)

He argues that learning style does not stem from fixed, innate beliefs, but rather the combination of biological traits and the experiences one faces throughout one's lifetime; therefore, the learning style preference of an individual does not remain fixed and stable throughout a lifetime of experiences.

Learning styles represent preferences for one mode of adaptation over the others, but these preferences do not operate to the exclusion of other adaptive modes and will vary from time to time and situation to situation. This idea of variability seems essential, since change and adaptation to environmental circumstances are central to any concept of learning. (Kolb, 1981, p. 290)

This highlights one of the biggest differences between the Dunn Learning Style Model and Kolb's Experiential Learning Theory; Kolb recognizes that learning preferences can change given the situation and environment of an individual, whereas Dunn sees learning styles as more consistent across situations.

Another learning style researcher, Bernice McCarth,y(1990) began developing

the 4MAT System in 1972, which was influenced by Kolb's research on Learning Style

Theory and Experiential Learning. Like Kolb's Theory, the 4MAT System is based on

two intersecting spectrums of Perception (thinking to sensing/feeling) and Process

(watching to doing). The quadrant in which an individual's preferences on the two

spectrums intersect determines the learning style of the individual. McCarthy's styles

include: Imaginative, Analytic, Common Sense, and Dynamic Learners. McCarthy

(1990) also believes that students should be engaged in all areas of the brain, or using all

learning styles, regardless if they match a student preference or not.

> If all four learning styles are taught to all learners in a cycle that alternates from
> right to left-mode information processing, and if in doing this, all styles are
> equally valued, this integration will allow learners to be comfortable some of the
> time and stretched and challenge at other times. (p. 33)

McCarthy sees the value in rotating instruction to match student preference at

least once within the rotation, but does not believe that mismatching student preference

with instruction every once in awhile creates significant damage towards the student's

academic success.

The Controversy Continues

While the controversy illuminated in the Dunn and Kolb approaches to learning

styles is often cited in the literature, others have stated conflicting views regarding

learning styles as well. A study conducted by She (2005) tested student performance

using four different instructional methods based on learning styles. While teaching the

concepts of buoyancy to 8th grade students, some students were matched up to their

preferences, while others were not. The instruction in each group (QA, QB, QC, QD) differed.

> Students in the QA-oriented instructional group learned these concepts by conventional methods, so a special booklet was written that contained the same buoyancy information taught by the unit. The booklet presented this information in a traditional textbook approach, providing students with all of the experiments in static pictures and short conclusions. In contrast, QB group students learned it by doing experiments, QC group students learned it by watching flash cartoons, and QD group students learned it by watching a videotape. The teacher who taught in this group primarily used the booklet to help students construct the concepts in a traditional way, and then asked students to solve problems relevant to what they had learned from textbook. The teachers also provided students with opportunities for questions and answers. (p. 615)

Within these groups, students were given a questionnaire prior to instruction, to determine their learning preference. Within each instructional group were students who were instructed in a way that matched their preference and others who were instructed in a way that did not match their preference.

> In general, the results indicate that students' post-test scores were affected significantly by the types of instruction they received and their learning preference styles; and students' retention test scores were only significantly affected by the types of instruction they received. These findings imply that the type of instruction is important to determining whether students can construct knowledge more efficiently and retain their knowledge more efficiently, and students' learning preference styles determine only whether they can construct knowledge more effectively. (p. 621)

She (2005) found there was some evidence that supported matching instruction to learning style preference for immediate comprehension; however looking at long-term retention, there was not as much evidence to support matching instruction to preference, but rather more evidence to support the success of the type of instruction (QB) used for

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the content. The QB-instructional style students, or the students who conducted hands-on experiments, who were also QB-preferences students had the most success and were able to improve retention scores, She did not believe there was sufficient evidence to declare that matching instruction to learning preference created significant results of improvement. She offered recommendations for how the study should affect classroom practice. "[It is] necessary to provide students with different ways of learning because it would make students learn in different ways in order to expand their four quadrants of brain capacity" (p. 622). In addition, She recommended teachers use more QB instruction by including more realistic experimentation through modeling or active participation of students.

Others believe that matching to student preferences is the best way to create successful students in the classroom. Green (1999) explains what effects teaching in a way that goes against the student preferences can have on an individual:

> …individuals do not all learn in the same way. If we require students to receive information in a way which does not correspond with their personal dominant learning modes, to perform under conditions which interfere with their learning, or to demonstrate their learning in a manner which does not allow them to use their strengths, artificial stress is created, motivation is reduced, and performance results are depressed. In contrast, we must take the responsibility for teaching diverse learners and break from the tradition that uniform practices are effective for all. (p. 686)

This is a real concern for Green, who believes that unmatched instruction can lead to detrimental effects for students in classroom. Teachers will be forced to look at both sides of the situation and make decisions in the classroom about how they want to instruct students. According to Green, student preference should not go ignored.

Yet, some researchers claim that the modality with which one learns best does not depend on the score they got on a learning style test, but rather on the context of the material to be learned. Willingham (2005), a professor of cognitive psychology at the University of Virginia, provides the example of studying the location of capitals. Would a teacher who believes in learning styles provide an auditory sample of the location of the capitals? Or would the teacher show a visual map of the country, with the capitals labeled? In Willingham's opinion, "The task is inherently visual" (para. 11). He believes the content of the information plays a large role in the way the information should be presented to students. In other words, if the students are learning about a location on a map, a format that requires the student to examine a visual display, the information provided to students should be visual.

According to Willingham (2005), memories are stored depending on the meaning the individual makes of the material. He clarifies that one can and does store auditory or visual information, but when experiencing new information, one usually receives the information in more than one modality. For example, when looking at a picture book, one reads written text and looks at visual pictures. Similarly, Willingham states that "our minds have different types of representations for a reason: Different representations are more or less effective for storing different types of information" (para. 8). Therefore, according to Willingham, teaching in one modality to a student may be less effective than changing the modality according to content.

Another criticism of learning and cognitive styles is the quality of research done on the topics. "Style researchers were well aware of the criticism of the field, particularly around conflicting definitions, reliability, validity and application and importantly they

were concerned about these issues and ranked them as very important for future research"

(Peterson, Rayner, Armstrong, 2009, p. 522). This is an area in need of improvement for

this community of research. Definitions need to be clearly marked so the community can

discuss and research the topic without letting gray areas of terminology get in the way in

interpretation.

Learning Styles and Instruction

Before one acts upon and makes instructional decisions about learning and

cognitive styles in the classroom, it is essential for one to understand the difference and

historical context between the two concepts. Cognitive styles can be considered the

umbrella term for a number of different styles, including learning styles, which stemmed

from cognitive processing research in the 1970s. The biggest difference between

cognitive styles and learning styles is the variability within the style. Cognitive styles are

recognized as stable, innate biological preferences, while learning styles take into account

variable experience created from the environment. These two terms cannot and should

not be interchanged. They are two separate entities, with two different meanings. When

looking at a classroom, the term learning styles is most appropriate because it focuses on

learning behavior, although cognitive styles, a broader term, can play a role in student

performance because it focuses on how information is processed in the brain.

There have been a number of criticisms against style research. In Kozhevnikov's

(2007) opinion, the quantity of style dimensions is the biggest criticism to style research.

> The number of styles was defined by the number of applied fields in
> which styles were studied. As a consequence, the cognitive style construct
> multiplied to include decision-making styles, learning styles, and personal

styles, without clear definitions of what they were or how they differed from the 'basic' cognitive styles identified previously. (pp. 470)

The inconsistency of definitions in distinguishing between cognitive styles and learning styles, has led to some problems within the field (Kozhevnikov). In addition, the divisions of learning style theories have led to misconceptions on how learning styles can be defined. As one can see from Dunn's Model to Kolb's Theory, no two versions are identical.

Learning styles, as a category, can be broken down into several variations, depending on the research one is reading. Each new author seems to have a new spin on the learning style theory, with new terminology and divisions of learning styles. From Dunn's model to Kolb's theory, as well as others, no two learning style theories are quite the same. This makes it difficult to look at learning styles as a whole because each study may focus on one or two interpretations of the learning style community and make conclusions based on only a sample of the population. This also can make communication about learning styles difficult for teachers and educators. One teacher may be basing his or her classroom on Dunn's Learning Style Model, while another may be focusing on Kolb's Experiential Learning Theory.

Research clearly shows that there is substance to the argument that not all students learn the same. Do learning styles exist? Yes, they are a real idea and people use learning style theories to help modify instruction. The research shows that preferences for how an individual processes information (cognitive styles) and preferences for which modality the information is presented in (learning styles) does exist. There are multiple resources that educators can purchase to help them assess student preferences, determine which learning style best fits the individual, and adjust their curriculum to match that

student preference. But the questions is, are learning styles effective in the classroom as an integral part of instruction?

Students may have preferences for the way they receive information, but does that mean teaching that student in that preferred modality alone or accommodating to the detailed list of preference that a visual-spatial learner needs in order to succeed is the best way for them to learn? Not necessarily. As the research has shown, instruction that matches student preference does not provide significant differences in academic achievement. That being said, varied instruction has shown to be beneficial for students, to ensure that student preference is matched, at least part of the instructional time.

 Even if there is truth behind teaching to a student's learning preference, why should teachers limit them to one modality? Due to the fact that research has not clearly demonstrated the ineffectiveness of mismatched modality, exposing students to other forms of instruction, other than their preferences, should not be harmful to their academic success. Once they enter the working world, employers will not be expected to create visual, auditory, or kinesthetic messages accommodating to each employee's list of preferences. The amount of time it would require a teacher to design lesson plans around each student's preference is unimaginable. This is an inefficient and unrealistic idea for the classroom. At the same time, that does not mean teachers should have, *my way or the highway* mindset when instructing.

As a recommendation, providing students with various options, perspectives, modalities, and strategies from day to day will increase understanding of a concept because student preferences will be partially met. As stated in the research, little evidence shows that matching learning style preference to instruction is an effective practice for

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instruction. In addition, the research that is available has been criticized and questioned on validity and reliability. As Willingham would suggest, teachers should also consider the content of the material and determine which modalities and strategies will work best for the given material. Teachers could provide students with the opportunity to voice how they believe would be the best method for instruction on the topic. The students may have unique ideas and contributions the teacher had never considered. In this way, student preference and content can be taken into consideration when designing instruction. All in all, the research suggests that learning styles should not be at the center of instruction, but they should be taken into consideration when planning instruction.

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