Update the Dots before Connecting Them: Learning Styles in the 21st Century

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Abstract

This article responds to Just & Bruner's (2020) call for connecting the dots of student under-preparedness. While many of the suggestions in the essay are useful in the 21st century, the inclusion of learning styles is questionable. The following is a review of the current literature regarding learning styles and why they are not needed in the 21st-century classroom.

Keywords: Learning styles, student success

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Student under-preparedness is a growing issue for colleges, but there is a shortage of literature on how to best combat the problem (Just & Bruner, 2020). Reasons for this deficiency can be attributed to policies such as No Child Left Behind (NCLB) and the tendency of K-12 to teach to the test (Trolian & Fouts, 2011). The added

stressors of the COVID-19 pandemic exacerbate all of these problems and present new ones. It is not hard to see why incoming students have such trouble meeting higher education standards.

Another major issue, according to Just and Bruner (2020), is the inversion of the Pareto principle or 80/20 rule when students get to college. Accordingly, in the K-12 system, student learning stems mainly from the teacher while in the classroom environment. When the students come to the higher education setting, the learning will now be 20% in the classroom while the other 80% is up to the student through reading materials and other supplemental items. This calculation may also be seen in the Carnegie credit unit wherein three credit hours are generally assigned to a classroom course: one hour for in-class instruction and two for out-of-class instruction.

Learning assistance programs exist for successful students as much as for struggling students, but the changes in learning environment from K-12 to college have caused an uptick in referrals to support services such as developmental courses, mental health counseling, and tutoring. These increases in recommendations indicate a much larger problem to be solved: the divide between K-12 policy and higher education expectations and standards.

Just and Bruner (2020) suggested countering the divide using a series of seminars on such items as time management skills, strategic planning for homework, and motivation versus procrastination. The recommended items include productive skills college students need to navigate their educational journey successfully. These suggestions are direly needed at campuses across the country and logically follow as useful methods to meet the needs of the current generation.

One concern with the suggestions made by Just and Bruner (2020) is their addition of learning styles and the need to apply them in higher education. The inclusion of learning styles is problematic and contrary to other points in their suggested list, such as the student's ownership of learning and personal/academic responsibility. The nature of this essay is to illustrate issues with using learning styles, describe the field of learning styles in its current scope, and explain possible reasons for their continued use.

Problems With Using Learning Styles

To briefly illustrate the scope of learning styles theories, a survey of the major theories is needed. Widely used theories include Dunn and Dunn's (1990) learning styles model with categories such as environmental, emotional support, sociological composition, physiological, and psychological elements, meaning these external stimuli in the learning environment influence student learning. Kolb's (1984) experiential learning styles labels students according

to stages of learning, which includes accommodators, convergers, divergers, or assimilators. Honey and Mumford's (2000) Learning Styles Questionnaire is similar in construct to Kolb's but classifies students as activists, reflectors, theorists, and pragmatists. The last main learning style is the VAK method (Fleming & Mills, 1992), which is an acronym for how students prefer information to be shared with them: visual, auditory, and kinesthetic. A read/write category was added later to create VARK. In just this small sample, one may find the field confusing when looking at it in its entirety. The next issue is the constructs on which the theories are formed.

A significant area of contention with learning styles is evaluating and employing the theories. Dembo and Howard (2007) suggested that faulty research laid the foundations of learning styles theories. They argued that the *validity* (Does the test measure what it claims to?), *reliability* (Can the test be replicated?), and *application* (Are the results usable and practical?) are all questionable in the majority of learning styles studies.

The issues highlighted by Dembo and Howard (2007) and others were corroborated and built upon by subsequent studies. Pashler et al. (2009) articulated what might be sufficient evidence to validate learning styles theories and found the literature lacking in support. In their review, An and Carr (2017) found

that the frameworks of many learning styles did not explain the underlying mechanisms and that measures of learning styles were based on self-reports and lacked reliability. Additionally, in their review, there was no link between achievement and objective learning.

Barry and Egan (2018) discussed the ambiguity of the terms within the learning styles literature and the poorly defined concepts. Given these issues, they suggested that such research "should be questioned as to its specificity, practical utility and validity" (p. 34). The methodological criterion is one controversy, but how do learning styles apply to actual learning?

Researchers have started critically evaluating the effectiveness of learning styles in their respective fields. For instance, recent scoping reviews in counseling education (Aafjes-van Doorn et al., 2021) and medical education (Davies-Kabir & Aitken, 2021) agree that learning styles are not beneficial to effective learning in these fields. Many studies have built upon a foundation of empiricism started by Pashler et al. (2009). These studies found no scientifically proven support for the idea that matching information presentation to students' learning styles equates to real learning (An & Carr, 2017; Husmann & O'Loughlin, 2019; Rogowsky et al., 2015; Rogowsky et al., 2020).

At issue is the conflation of learning with preference. Reiner and Willingham (2010) argued that differences in a student's capacity to

learn various content areas are not the same as that student's preference for a style of instruction. Yet, the two are often conflated (Willingham et al., 2015). Reiner and Willingham (2010) also suggest that students differ in their interests and background knowledge, which influences their ability to learn new concepts. All of this illustrates that, yes, students are individuals, each with their own learning journey. However, it does not mean that their preference or style is related to their learning.

Rogowsky et al. (2015) demonstrated that differences in learning styles did not significantly predict differences in learning aptitude. Accordingly, their results showed that adult learners' preferred learning style is not their aptitude for learning. A style may refer to how a student desires to learn a concept, but ability is how well that student can learn it (Willingham et al., 2015). The analogy used by Willingham et al. (2015) to illustrate this difference is that of two basketball players wherein both share the ability to play, but one may prefer to take more risks than the other. The question of whether or not that preference is beneficial for the player arises.

For the last forty years, researchers have argued that learners are not always aware of what they do not know, particularly with what is best for their learning (Clark, 1982; Kirschner & van Merriënboer, 2013; Massa & Mayer, 2006). This reality provides

another area of concern in learning styles theories, particularly because they equate preference with objectivity. Building on the work of Clark (1982,1989) and the term *mathemathantic*, which describes the phenomenon of a learning strategy that harms student learning, Kirschner (2017) stated, "what people prefer is not, per definition, what is best for them... the question arises as to whether learners actually 'know' what is best for them" (p. 167). With learning styles, the methods often tell us what the students prefer, but what is preferred is not usually what is best for the individual (Husmann & O'Loughlin, 2019; Kirschner & van Merriënboer, 2013).

Moreover, if learning styles are effective, they will be effective both in the classroom and out of it. Husmann and O'Loughlin (2019) found that was not the case. In their study, 67% of students (n = 426) used study strategies contradicting their scores on a VARK inventory. Also, the students who used a study method in line with their VARK category performed no differently in the class than those who did not use a designated VARK-appropriate strategy.

Papadatou-Pastou et al. (2018) demonstrated that some teachers feel they can rightly judge a student's learning style based on interactions with the student and provide anecdotal evidence to support that claim. Nevertheless, teachers' assumptions about their students' learning styles did not correlate with the self-reported learning styles of the students. Complicating the matter, all of the

teachers in the study reported their belief that tailoring their teaching to the students' learning style helps them learn better.

Another area of contention with teaching to students' preferences or perceived strengths is that the act rarely incentivizes the students to engage or work on their weaknesses. While there is evidence supporting a "strengths-based" approach to education (Lopez & Louis, 2009), giving students an excuse to disregard their weaknesses as not their preferred learning style is problematic (Papadatou-Pastou et al., 2021). Additionally, students often allege that their professor did not teach to their learning style as an excuse for poor academic performance or simply not wanting to read course material because they are visual learners (Frost-Camilleri, 2021).

The opposite of this may also be true. Dembo and Howard (2007) suggested that the appeal of learning styles lies in the promise of simple solutions to educational problems, and they offer teachers an excuse for poor student performance. The issue is that this belief shifts the emphasis of learning from the supposed learner to the teacher. Where is the agency for the students and responsibility for their learning (Vaughn, 2020)? Also, Pashler et al. (2009) suggested that emphasizing learning styles may be appealing because parents and students feel like it encourages educators to treat them as individuals. This allows students and parents to blame the teacher for poor performance

instead of evaluating whether their study habits and efforts in the class are sufficient.

An additional problem with learning styles theories is the impracticality of distinguishing individual attributes. Advocates of learning styles and similar systems such as Gardner's multiple intelligences (Rousseau, 2021) or even Universal Design for Learning (Boysen, 2021; Murphy, 2021) have argued that people are not fixed in a learning style and that an individual may encompass more than one style at a time even though the process of creating and employing distinct categories implies a certain amount of fixation. One promoter of learning styles even stated, "The number of attributes that distinguish one type of learner from another is uncountably large. Encompassing most of them in a single theory would be virtually impossible, and even if it could be done, the model would be too cumbersome to be of any practical use" (Felder, 2020, p. 4). Other research attempting to support the use of learning styles theories acknowledged the restrictive nature of focusing on a single methodology for teaching (Dantas & Cunha, 2020).

One last key issue, and arguably the one with the most harmful implications, is the act of pigeonholing or labeling students and putting them into fictional boxes. Kirschner and van Merriënboer (2013) suggested at least three problems with pigeonholing learners: "Many people do not fit one particular style, the information used to assign people to styles is often inadequate, and there are so many

different styles that it becomes cumbersome to link particular learners to particular styles" (p. 173). The general method of discovering a person's learning style is through self-reported surveys, and there are over 70 different styles to choose from (Coffield et al., 2004).

Instead of this fixation on categorical thinking, educators should know that the brain is an amazing part of the human anatomy with numerous inputs, outputs, and myriad complexities (Coch, 2018). The conversation about how neuroscience and psychology apply to education and learning is much more nuanced than any category created by learning styles proponents. Due to brain plasticity, educators should avoid attempts to predict a learner's potential, especially when the categories themselves are not based on empirical evidence (Sankey & Kim, 2018). Scott (2010) contended, "rather than being a harmless fad, learning styles theory perpetuates the very stereotyping and harmful teaching practices it is said to combat" (p. 5). With the potential for harm so great, where do learning styles stand in the 21st century?

Current Status of Learning Styles

One prominent researcher on learning styles related her experience to watching a scary movie where the monster keeps coming back regardless of what is thrown at it (Hall, 2016). She suggested that, in the case of learning styles, "no matter what

we've hit it with, the thing won't die" (p. 18). Other writers have compared learning styles to ugly sweaters where one gets a little enjoyment for a brief period wearing them but realizes that they are a gimmick and would seem out of place in everyday use (Barclay, 2017). Despite these assertions, the discussion is still ongoing.

Newton et al. (2021) found that 91% of papers published since 2015 on learning styles (n = 112) highlighted the theories' supposed positive effects and utility despite the growing evidence indicating otherwise. Papadatou-Pastou et al. (2021) demonstrated that educators might conflate and combine the numerous learning styles approaches to create a 'mix and match' model. These studies illustrate Coffield's (2013) assessment that the learning styles field is "theoretically incoherent and conceptually confused" (p. 1).

Researchers such as Kirschner and van Merriënboer (2013), Howard-Jones (2014), and Kirschner (2017) have previously called for a critical evaluation of current practice and for empirical research to guide education. Others suggest that much of the research supporting learning styles has not engaged the significant body of evidence that the theories are unsubstantiated (Barry & Egan, 2018; Newton, 2015). Still, others request for the field of education to ask more and better questions about what is taught and how (Kim & Sankey, 2018) and advocate for a crossover of education and neuroscience disciplines (Coch, 2018).

While the theoretical underpinnings of learning styles and other neuromyths have been questioned, the practical utility of using these theories is murky waters indeed. They may act as a placebo wherein mere belief in them is enough to manifest a change in learning (Sankey & Kim, 2018), but other factors are likely present, and this assessment does not deny the potential harm caused by the beliefs. Barry and Egan (2018) as well as Knoll et al. (2016) both agreed that learning styles may have limited utility in that they encourage students to think about how they learn, but that this effect should be tempered by the realization that preference is not a limiting factor in a student's learning. Given the status of learning styles, why do they persist in education?

Reasons for Continued Use of Learning Styles

Reasons for continued belief in learning styles include previously held opinions primarily due to early childhood education, anecdotal evidence and intuition, non-scientific thinking, the proliferation of the theories in popular culture, and finally, the excitement of learning one's style. Teaching learning styles to young students is one reason the theories are embedded in the adults who become teachers themselves. In their multi-year study, Kim and Sankey (2018) found that the pre-service teachers who believed in learning styles theories were more confident in their belief than those who were more skeptical of

the theories. These beliefs are often deep-seated due to their use in childhood and high school education, with nearly half of respondents in Kim and Sankey's (2018) study reporting their schoolteachers as the genesis of the ideas. Attempts to change these beliefs in many educators fail due to the human mind being "loyal to what it has known and used for a longer period, even when confronted with the incorrectness of that knowledge" (de Bruin, 2020, p. 6).

Research in other areas such as misinformation and disinformation illustrated that "Objective truth is less important than familiarity; we tend to believe falsehoods when they are repeated sufficiently often" (Lewandowsky et al., 2020, p. 5), a process called the *illusory truth effect*. As the falsehood is shared and not questioned, belief in its truthfulness grows and the more lodged into the human consciousness it becomes. Even when corrections are made to these fallible beliefs, the misinformation continues to operate subconsciously to influence an individual's thought processes through an effect called the *continued influence effect*, meaning that the corrective measures may not "translate into attitude or behavior change" (Lewandowsky et al., 2020, p. 6).

Many of these beliefs follow the educators into their classrooms. Any positive performance from their use is taken as evidence to support the views without question, providing the individuals with anecdotal proof. Menz et al. (2021) found in their study of pre-

service teachers that belief in learning styles stemmed largely from personal experiences and stories from others. These experiences add to confirmation bias. Previous research has alluded to confirmation bias as one reason why learning styles persist in education (Reiner & Willingham, 2010). With confirmation bias, coherent stories are formed based on the information a person has (and likes). These stories then supersede statistics or any other kind of evidence through an effect Kahneman (2011) called "WYSIATI: what you see is all there is" (p. 85) and offer an illusion of validity to an "unfounded intuition" (p. 239). The emphasis on intuitive thinking creates problems in many human endeavors, including education. Acknowledging this problem is the first step toward change. The second is to apply more critical thought to the field and use scientific evidence where possible.

Some researchers have questioned the practice of evidence-based education (Wrigley, 2018), while others have called for a more pragmatic approach (Newton et al., 2020). Still others suggest educators teach students to think like scientists, meaning they should be equipped with the skills needed to create sound arguments and evidence-based research while recognizing poorly designed and biased research (Schmaltz et al., 2017). Unfortunately, many teachers are not trained in this manner. What hope is there that they can teach others to do so? Some

may take offense and argue that intuition and personal judgment are sufficient evidence. The problem with basing practice on judgment alone is human judgment is often rife with problems, namely the myriad biases that impair one's view of a given situation or idea (Kahneman, 2011).

Beliefs in learning styles and their implications are not limited to the educational setting. They carry over into the non-education environment, most likely due to average citizens hearing the theories during their school career. Nancekivell et al. (2020) found that most respondents to their survey (n = 331) believed learning styles predicted career outcomes, a longer-lasting implication than just that of learning in the classroom.

Two other interesting findings in their study were that there was little difference between non-educators' and educators' assumptions about learning styles, and that belief in learning styles declined as the respondents who were educators shifted from elementary school through to higher education. The only factor that Nancekivell et al. (2020) found to significantly predict educators' beliefs in learning styles was the age of the students they taught. van Dijk and Lane (2018) observed similar results in their study of misconceptions about the brain, such as learning styles, right-brain/left-brain learners, and dyslexia. They found that higher education faculty correctly identified the myths at a statistically higher rate than general education and special education teachers.

They were also more prone to choose the "Do Not Know" option, possibly indicating their willingness to question their own knowledge.

A possible reason for the fixation of belief in learning styles in the early education experience that was not discussed by Nancekivell et al. (2020) is that many high school teachers and higher education faculty are not exposed to learning styles in pedagogical classes to the extent that early childhood and middle school teachers are (Hughes et al., 2020). Another might be that the upper-level teaching professions generally engage in more deliberation about their content, a process shown to reduce beliefs in inaccurate information (Nyhan, 2021).

A final and perhaps most alluring reason for the enduring nature of learning styles is they can be exciting to discover. Pashler et al. (2009) argued that most learning styles taxonomies borrow from Jungian psychology in that they lump people into distinct categories or "types." Early learning styles theorists such as Felder (2020) admit to being influenced by Jung's theories and the subsequent Myers-Briggs Type Indicator (Myers, 1962). Based on this information, there is a certain appeal to learning what "type" of person one is and what his or her future entails. Reading the horoscopes in the daily newspaper or discovering which Hogwarts house one might be in offers a similar

experience. While it is fun and appealing, it is unnecessary for education and learning.

Can Beliefs Be Changed?

To combat the prevalence of neuromyths and lack of evidence-based teaching paradigms, the field of education needs a solution that may also help students' under-preparedness. Building on a tradition set by Carl Sagan (1996), there is a drastic need for more skepticism in teaching and education. The essence of this skeptical thinking is to recognize erroneous ideas and ill-supported practices. Some of the items included in Sagan's (1996) "baloney detecting" tool-kit are independent confirmation of facts (*allow neuroscience to confirm or deny the efficacy of learning styles*, see Grospietsch & Lins, 2021), substantive debate (*the learning styles debate has been considerably one-sided for many years*, see Newton et al., 2021), Occam's Razor (*with over 70 different styles in the literature, there is no simple answer*, see Coffield et al., 2004), falsifiability of hypothesis (*it is near impossible to disprove learning styles*, see Willingham et al., 2015), and carefully designed and controlled experiments with reproducible results (*for reasons learning styles experiments are often problematic*, see Pashler et al., 2009).

A person does not have to be a scientist to think like one, nor does every situation call for scientific thinking. There are certainly other ways of generating knowledge and meaning about the world that offer a robust understanding. But to alleviate much of the

guesswork found in education literature, the field would do well to ask more questions instead of simply repeating outdated and outmoded practices (Kim & Sankey, 2018). Pashler et al. (2009) issued a call for an upgrade to education as an institution:

> research—not intuition or standard practices—needs to be the foundation for upgrading teaching and learning. If education is to be transformed into an evidence-based field, it is important not only to identify teaching techniques that have experimental support but also to identify widely held beliefs that affect the choices made by educational practitioners but that lack empirical support. (p. 117)

To borrow a metaphor from General Semantics (Korzybski, 2010), learning styles may have provided a map of student learning at one time, but the map should be updated as the territory is better understood. Just as Google and Mapquest must constantly update their maps to make sure travelers get to where they are going without confusion, educators must also update the maps of how they engage with students. It must be stated that the map is not the territory it describes. The labels put on students are not the students themselves, whether it is converging, kinesthetic, or activist to use some of the major theories.

The labels applied to students and the categories into which they are placed are not concrete or based on factual data (Sankey

& Kim, 2018). They consist of reified concepts. Postman (1976) defined reification as "confusing words with things" (p. 135). In this regard, labels become a kind of "semantic illusion, sometimes referred to as the principle of identity. One of mankind's deepest intuitions is to respond to the symbols he invents as if they 'are' whatever it is that he invented them to symbolize" (p. 136). The categories found in learning styles theories describe tendencies in people but become problematic when taken as imperatives.

For a time, learning styles may have had utility as psychology and neuroscience had not made the discoveries in how learning occurs until recent years. In this case, learning styles labels were not realities, but tools for making meaning in the world. To that end, Postman (1976) argued that "a definition is not a manifestation of nature but an *instrument* for helping us achieve our purposes" (p. 139, emphasis added). But, just as some instruments no longer have practical utility, such as an abacus or slide rule, learning styles have outlived their usefulness if there ever was any. Postman (1976) later asked what purpose is there in using the definition, label, or term? Originally, learning styles were used as attempts to understand student learning. Now, with a better understanding of how students learn, which does not include learning styles, what is the purpose of using them?

What is Needed Instead of Learning Styles

Despite the evidence contradicting learning styles, arguing against the theories has been questioned by recent research. Attempts to discredit the myths in education have their issues. Various training efforts, whether in psychology or neuroscience, and attempts to debunk learning styles may not be the most practical method for dissuading belief in the theories (Newton & Salvi, 2020). Pearson (2020) suggested a more diplomatic approach that accounts for the personal views of the educators. Instead of arguing against learning styles, opponents of the theories should redirect the conversation toward growth mindsets (see Dweck, 2008) and brain plasticity, both of which highlight resilience and the ability to adapt when challenged.

Other researchers suggest the field of education focus on proven teaching methods (Donoghue & Hattie, 2021; Dunlosky et al., 2013a). Promoting proven effective techniques such as retrieval practice, spaced learning, and practice tests may be the answer (Newton & Salvi, 2020). Indeed, too often, students use strategies such as rereading, highlighting, flashcards, and Quizlet as their primary study methods. These techniques are not the best ways to learn and likely keep students from using more beneficial methods (Dunlosky et al., 2013b). The problem with asserting that teachers should teach students updated learning strategies is that education departments are still introducing new

educators to invalidated methods (Kim & Sankey, 2018; Nancekivell et al., 2020). Dunlosky et al. (2013b) stated, "students are not being taught the best strategies, perhaps because teachers themselves are not schooled in them" (p. 53). Dunlosky et al.'s (2013b) statement may be the reason current educators and professionals are still calling for the use of learning styles.

Discussion

This article has argued that students discovering their learning style is not a strategy needed in 21st-century education. Calls for the use of learning styles are antithetical to many of the problems the authors hope to assuage. Just and Bruner (2020) suggest that by only focusing on testing, educators miss the "opportunity to aid the students in *true learning* that consists of a foundational skillset of reading and processing materials according to their learning style" (p. 135, emphasis added). "True learning" is not defined in this context, but, to date, many studies illustrate that knowledge of a person's learning style or preference has little bearing on whether or not the student learns better according to their chosen style (Husmann & O'Loughlin, 2019; Knoll et al., 2016; Massa & Mayer, 2006; Pashler et al., 2009; Rogowsky et al., 2015; Rogowsky et al., 2020).

If student under-preparedness largely stems from K-12 education practices (Just & Bruner, 2020), then suggesting bringing K-12 practices up into higher education does not logically follow.

Higher education faculty do not need any other excuse for students to give for not learning in the classroom. Giving credence to statements like, "I didn't do well in his class because he didn't teach using my learning style," is hardly the way forward.

Another area of contention with Just and Bruner's (2020) suggestion to use learning styles is tied to their admission that learning in the college setting lies mainly outside the classroom, even citing the Pareto principle. According to this logic, if learning styles are effective for learning, students' study habits outside the classroom should also align with their preferred style. Husmann and O'Loughlin (2019) demonstrated the problems with this assumption. Most students do not use their VARK preference in their study habits, and those who do show no difference academically from those who do not.

The history and narratives surrounding learning styles are vast, but troubled. To this point, "With such a long and storied history of different approaches, one would expect that if matching learning styles could produce measurable and consistent improvements in learning we would have ample evidence to this effect" (Dembo & Howard, 2007, p. 105). Even after fifteen more years of legitimate research against learning styles, they are arguably just as prevalent as ever in education circles. Instead of focusing on items with little evidence of learning effectiveness, educators should encourage

student agency through other methods suggested by Just & Bruner (2020) such as better time management and study habits, and students taking propriety of their learning.

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