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The Scientific Status of Learning Styles Theories

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Abstract

Theories of learning styles suggest that individuals think and learn best in different ways. These are not differences of ability but rather preferences for processing certain types of information or for processing information in certain types of way. If accurate, learning styles theories could have important implications for instruction because student achievement would be a product of the interaction of instruction and the student's style. There is reason to think that people view learning styles theories as broadly accurate, but, in fact, scientific support for these theories is lacking. We suggest that educators' time and energy are better spent on other theories that might aid instruction.

Keywords

learning styles, academic achievement, cognitive style, individual differences, teaching methods

Learning styles theories are varied, but each of these theories holds that people learn in different ways and that learning can be optimized for an individual by tailoring instruction to his or her style. For example, one theory has it that some people learn best by watching (visual learners), some by listening (auditory learners), and some by moving (kinesthetic learners). Thus, a first grader learning to add numbers might benefit from an introduction that respects her learning style: the visual learner might view sets of objects, the auditory learner might listen to rhythms, and the kinesthetic learner might manipulate beads on an abacus. How marvelous it would be if this theory (or a similar theory) was true. Ideas that students had found elusive would suddenly click, all due to a modest change in teaching practice. But is the theory true?

Certainly, belief in learning styles theories is widespread. A recent review (Howard-Jones, 2014) showed that over 90% of teachers in five countries (the United Kingdom, the Netherlands, Turkey, Greece, and China) agreed that individuals learn better when they receive information tailored to their preferred learning styles. Although data on U.S. teachers are limited (Ballone & Czerniak, 2001), our experience has been that belief in the accuracy of such theories is widespread among the broader public. To test this impression, we conducted a brief survey using Amazon Mechanical Turk. Participants (N = 313, 53.4% female, mean age = 35.2 years) rated on a 7-point Likert-type scale (1 = *strongly disagree* and 7 = *strongly agree*) their agreement with this statement: "There are consistent differences among people in how they learn from different experiences: specifically, some people generally learn best by seeing, some generally learn best by listening, and some generally learn best by doing." The mean rating was 6.35 (SD = 1.11).[1] We observed this strong belief even though literature reviews over the last 30 years have concluded that most evidence does not support any of the learning styles theories. The purpose of this article is to (a) clarify what learning styles theories claim and distinguish them from theories of ability, (b) summarize empirical research pertaining to learning styles, and (c) provide suggestions for practice and implications supported by empirical research.

What Are Learning Styles Theories?

Researchers have defined "learning styles" in several ways (Messick, 1984; Peterson, Rayner, & Armstrong, 2009), but because we are interested primarily in applications to education (and not, e.g., in how personality dimensions impact learning), we focus on learning styles as (a) differential preferences for processing certain types of information or (b) for processing information in certain ways. The former definition would include learning styles theories that differentiate between visual, auditory, and kinesthetic learners (Dunn, Dunn, & Price, 1984) or between visual and verbal learners (Riding & Rayner, 1998). Learning styles theories based on preferences for certain types of cognitive processing would include distinctions between intuitive and analytic thinkers (Allinson & Hayes, 1996) or between activist, reflecting, or pragmatic thinkers

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(Honey & Mumford, 1992). Numerous theoretical distinctions like these have been around since the 1950s (Cassidy, 2004).

Note that the definitions provided earlier distinguish learning styles from abilities. The two are often confused, but the distinction is important. It is relatively uncontroversial that cognitive ability is multifaceted (e.g., verbal ability and facility with space have distinct cognitive bases), and it is uncontroversial that individuals vary in these abilities. For "styles" to add any value to an account of human cognition and learning, it must mean something other than what ability means. While styles refer to *how* one does things, abilities concern *how well* one does them. The analogous distinction is made in sports: Two basketball players may have equivalent ability but different styles on the court. One may take risks, whereas the other plays a conservative game.

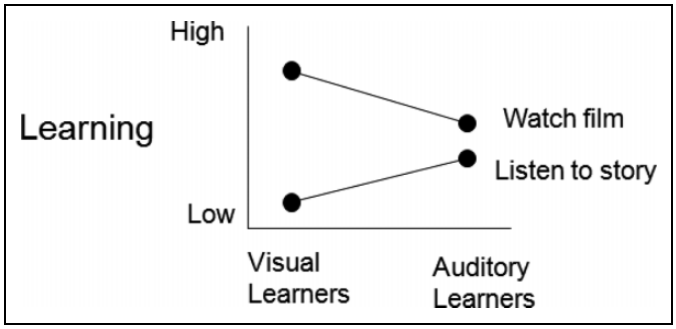

Figure 1. This pattern of data would support learning styles theories but would indicate that differences in learning styles should not be accommodated in instruction.

Predictions and Data

Learning styles theories make two straightforward predictions. First, a learning style is proposed to be a consistent attribute of an individual, thus, a person's learning style should be constant across situations. Consequently, someone considered an auditory learner would learn best through auditory processes regardless of the subject matter (e.g., science, literature, or mathematics) or setting (e.g., school, sports practice, or work). Second, cognitive function should be more effective when it is consistent with a person's preferred style; thus, the visual learner should remember better (or problem-solve better, or attend better) with visual materials than with other materials.

Consider the first prediction. Simply enough, it means that if you're a visual learner today, you shouldn't be an auditory learner tomorrow, or if you're a visual learner on task X, you shouldn't be an auditory learner on task Y. This bar—consistency—seems fairly low for a theoretical prediction, but most learning styles theories have failed to vault it. Although there are a multitude of inventories and models for assessing learning styles, most are not reliable (Coffield, Moseley, Hall, & Ecclestone, 2004). And researchers are well aware of this problem. A recent survey of 92 learning styles researchers showed that problems of reliability were among their chief concerns with progress in their field (Peterson et al., 2009).

Regarding the second prediction—cognitive performance—one must draw a distinction between evidence that might support a learning styles theory and evidence that would prompt a change in educational practice (Pashler, McDaniel, Rohrer, & Bjork, 2009). To support the theory, one needs to observe a statistical interaction between the learning styles of individuals and the method of instruction. For example, suppose we examined "visual learners" and "auditory learners." Members in each group would be randomly assigned to an instructional condition, where material would be presented either visually (e.g., a silent film) or auditorily (e.g., an audiotaped story). Participants should learn better when they experience the material in their preferred modality. Figure 1 shows a graph with a hypothetical outcome on a test of participants' memory for the material.

We see the predicted effect in Figure 1: Visual learners remember more than auditory learners when the film is shown, and the opposite pattern appears when participants listen to the audiotape. *But everyone learns best with a visual presentation*. Practical classroom implications require a particular pattern of data that not only supports the theory but also shows that instruction matched to learning styles optimizes achievement for each group. In other words, the two lines in the graph would have to cross, indicating (in this example) that the visual learners learned best when watching the film, whereas the auditory learners learned best when listening to the story.

Is there support for either prediction—for educational practice, or barring that, at least that the theory might be correct (even if it's not helpful)? No. Several reviews that span decades have evaluated the literature on learning styles (e.g., Arter & Jenkins, 1979; Kampwirth & Bates, 1980; Kavale & Forness, 1987; Kavale, Hirshoren, & Forness, 1998; Pashler et al., 2009; Snider, 1992; Stahl, 1999; Tarver & Dawson, 1978), and each has drawn the conclusion that there is no viable evidence to support the theory. Even a recent review intended to be friendly to theories of learning styles (Kozhevnikov, Evans, & Kosslyn, 2014) failed to claim that this prediction of the theory has empirical support. The lack of supporting evidence is especially unsurprising in light of the unreliability of most instruments used to identify learners' styles (for a review, see Coffield et al., 2004).

There is an underlying challenge to conducting research on learning styles: It is impossible to prove that something does not exist. However unpromising the data today, a new experimental paradigm may eventually reveal that the theory was right all along. Still, given our focus on educational application, we set a different standard. We don't insist that the theory be proven definitively wrong. We are interested in classroom practice, and before a theory is permitted to influence classroom practice, there should be an evidence that the theory is correct. In fact, we need more. We not only need to know that learning styles exist but also need to know that teaching to learning styles benefits students in some way.

Why Do People Believe Learning Styles Theories?

There are probably multiple reasons why people believe learning styles theories are correct, and two of these reasons strike us as especially relevant. First, people often take things to be scientific fact when they have not seen any of the evidence that they suppose must exist. For example, most educated people believe in the atomic theory of matter, but their knowledge of the supporting evidence is scant. It is just something that "they" (i.e., scientists) have figured out. People's belief is further bolstered by social proof: So many other people believe the atomic theory of matter that it would seem oddly perverse to challenge it. Furthermore, teachers are exposed to a plethora of materials that purportedly respect students' learning styles, materials that often claim a scientific basis for their design.

Once exposed to all these seemingly reliable (or at least not overtly unreliable) sources, the confirmation bias (Nickerson, 1998) could easily support and maintain the belief. For example, suppose a teacher was helping a student struggling with a concept. The teacher tries a few different ways of explaining it but to no avail. Finally, she draws a diagram, and the idea clicks. It is natural for the teacher to conclude, "Ah, this student must be a visual learner." But perhaps *any* student would have benefited from the diagram because it was an effective way to communicate that particular idea. Or perhaps the student needed to hear just one more explanation. Many accounts of the sudden insight are possible, but the confirmation bias would lead to an interpretation that supports one's existing beliefs.

A second possible reason for widespread belief is the confusion between ability and style. As noted earlier, most researchers agree that ability is multifaceted and that people vary in these abilities. From there, it is a short step to the idea that weakness in one ability can be supplemented with strength in another—for example, that a student having difficulty in math might benefit from a lesson plan that played to his strength in music. This "alternate route" idea certainly looks like a style. Gardner's (1983) theory of multiple intelligences—which is an abilities theory—has been interpreted this way for many years (e.g., Armstrong, 2000), although Gardner (2013) has said that this interpretation is inaccurate. The substitution idea is inaccurate, Gardner maintains, because recoding simply cannot happen, and that is part of what makes different abilities (or, in Gardner's theories, intelligences) different. To do math, you have to think mathematically. To use musical cognition to think mathematically would be like trying to use a .wmv file in Microsoft Excel. They are simply incompatible.

We agree with Gardner, but note that it is at least theoretically possible that there may be occasional exceptions. If one could learn material equally well in two different ways, and if those different ways match differences in human ability, then recoding for individual students would not only be possible but also be effective. Indeed, there are some limited data indicating that people who believe they are better with mental images (or better with words) do such recoding on their own (e.g., Kraemer, Rosenberg, & Thompson-Schill, 2009) and that this recoding can benefit performance (e.g., Thomas & McKay, 2010). This is not an instance of learning styles, rather, it is an instance of ability appearing as a style.

Why All the Fuss?

So the weight of evidence fails to support learning styles. So what? Lots of theories are poorly supported and most do not merit an article in *Teaching of Psychology*. The difference here is that the idea has seeped into popular culture, and many people believe it, perpetuating its (ungrounded) influence in educational settings and products. Happily, it seems only rarely to influence how students study. Less happily, learning styles theories, when invoked, are most often offered as an explanation for poor classroom performance. Most of us have had a student protest, "Your teaching is not compatible with my learning style," with the expectation that the teacher will make individual accommodations that go beyond quality instruction.

Learning styles theories ought to be debunked, and a great place for this to happen is in our psychology classrooms. One could simply tackle it head on, of course, telling students about the theory and the lack of evidence. But it strikes us as an excellent opportunity to have students think through the problem themselves. If they believe it, *why* do they believe it? What does evidence look like in psychological science? What would evidence for this particular theory look like? Could students collect relevant evidence in the classroom? Indeed, evaluating learning styles theories might serve as an excellent classroom research project. Take, for example, the following two classroom scenarios.

Class Activity Scenario 1

With the intent to explore challenges around research intended to assess the impact of styles on learning, the teacher can moderate a classroom experiment. To do this, the teacher might create a learning activity that requires students to identify their own best learning styles and then attempt to learn new material (e.g., new vocabulary) via (a) their primary learning style or (b) a different learning style. For example, visual learners and auditory learners in the class might be presented with new vocabulary. Students in each learning style group would be randomly assigned to a learning condition, resulting in some visual learners and auditory learners accessing the new vocabulary visually (e.g., reading it in text) and some visual learners and auditory learners accessing the new vocabulary auditorily (e.g., listening to a recording). All students would be assessed on the new vocabulary they learned, and class data would be graphed and analyzed. Class discussions might focus on expected results (e.g., higher performance on vocabulary learned via a primary style), actual results, factors that may have impacted results (e.g., preference or prior knowledge), limitations to the research, and how the results may or may not translate into classroom practice (see previous discussion about Figure 1).

Conducting this classroom experiment would take some preplanning. Prior to starting this activity, students would need to complete a learning styles assessment (e.g., http://www.vark-learn.com/english/page.asp?p=questionnaire), and the teacher would need to prepare a learning opportunity where information is available via each learning style (e.g., text to read and audio of text). The teacher would also have to minimize influencing factors such as prior knowledge or time spent on learning. Replicating this activity for learning other information (e.g., mathematics, application of theory, summary of story, and memorization of dates and events) would allow students to explore if learning styles are consistent across content and, if not, why.

Class Activity Scenario 2

Another activity might explore the reliability of the assessment of learning styles. For example, do external factors, such as experiences prior to taking the assessment, influence the outcome? If students have recently completed activities or had experiences that positively impacted outcomes, would they be more or less likely to select an answer based on that experience or memory? For example, if someone recently listened to an audible Global Positioning System (GPS) to find a location, would that person be more likely to select an audible method of delivery for directions over using a map, even if they consider themselves to be a visual learner? Would a bad experience with an auditory GPS, but a good experience reading a map, prompt a self-identified auditory learner to select a more visual method for directions? If recent experiences matter, does that change the reliability of the measure? Class exploration and discussion can address these elements.

Differences and Commonalities in Educational Practice

The hope underlying learning styles theories is that an understanding of student differences will improve instruction. But then, too, we expect that there are some aspects of the mind that *do not* differ, that are common across students, and that honoring these basic features will improve instruction. There is a tension in applying these two types of knowledge in the classroom. On one hand, obsession with student individuality will lead to paralysis: If every student is unique, how can teachers draw on their experiences with other students to improve the instruction of this particular student? If each student is unique, there is no reason to think that what worked before will work now. On the other hand, if teachers focus solely on what they believe is true of all students, then teachers are likely to identify one set of ''best practices'' and stubbornly apply those practices to all students.

To many, learning styles offer a middle ground—a middle ground between treating every student the same way and treating every student uniquely. The proposed solution has been to create categories of learners based on their unique learning styles. Categorization means using a few, easily observed features to infer that other features are present. For example, by observing some perceptual features of an object—it is round, red, and shiny—we categorize it as an apple and thus can safely infer other nonobservable properties: It has seeds inside, it is edible, and so on. Similarly, learning styles also categorize. By gaining knowledge of a few properties (e.g., answers on a questionnaire), teachers hope to infer other characteristics (e.g., how the student will respond to different types of instruction) that can be used to improve the educational process. The point of this article, however, is that such categorization ultimately fails.

More broadly, the history of psychology shows very limited success in finding any useful categorization scheme for students. By far, the most successful type of categorization is one that is already painfully obvious to educators: Differences in prior knowledge and ability ought to be respected (Cronbach & Snow, 1977).

Psychology has had much greater success describing commonalities among students than it has had in describing categorization schemes for differences. Researchers have compiled a fairly impressive list of properties of the mind that students share. And although going from lab to classroom is not straightforward, there is evidence that students benefit when educators deploy classroom methods that capitalize on those commonalities. For example, we know that spacing learning over time and quizzing (among other methods) improve memory (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013). We know that teachers can modify the classroom environment to decrease problem behaviors (Osher, Bear, Sprague, & Doyle, 2010). In mathematics, there is a particular developmental progression by which teachers can best teach numbers and operations (National Mathematics Advisory Panel, 2008). In reading, phonics instruction benefits most children (Reynolds, Wheldall, & Madelaine, 2011).

Thus, psychologists have made some impressive contributions to education. When it comes to learning styles, however, the most we deserve is credit for effort and for persistence. Learning styles theories have not panned out, and it is our responsibility to ensure that students know that.

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Note

1. Half of the subjects saw a reverse-coded version (There are not consistent differences among people in how they learn . . .). The reverse-coded mean was 5.22 ($SD = 2.19$), which was significantly lower than the rating for the standard question, $t(311) = 5.65$, $p < .001$. We suspect that this difference was due to some participants

failing to understand the reverse wording. In the standard version, very few subjects (2.1%) indicated that they thought the learning styles theory is incorrect (as noted by choosing 1 or 2 for their response). In the reverse-code condition, 20.4% of participants chose a rating indicating disagreement. We suspect these subjects wanted to agree with learning styles theory but got confused by the wording (i.e., disagreeing with a negative statement).

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