ARE LEARNING STYLES INVALID? (HINT: NO!)*

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As every teacher discovers, no two students approach learning in exactly the same way. Some get more from visual imagery while others prefer verbal explanations; some tend to try things out and see what happens and others are more inclined to think things through first; some reason in a relatively sequential manner and others have a more holistic orientation; some are most comfortable with concrete ("real-world") information and others are more drawn to abstract theories and symbolism, and so on. A *learning style* is a particular set of those tendencies. Keefe[1] formally defines learning styles as "characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment." Awareness of learning style differences can help instructors teach in a manner that effectively reaches most students rather than putting a large subset of them at a disadvantage.

Since the number of ways in which learning preferences may differ is unlimited, a theory that attempted to encompass most learning style dimensions would be too cumbersome to be of any practical use. A *learning styles model* specifies a small number of dimensions that collectively provide a good basis for designing effective instruction. Like all models in the physical, biological, and social sciences, they are incomplete but potentially useful representations of reality, and should be judged by how well they characterize and interpret observations and inform professional practice.

Since the 1970s, countless students have had their learning styles assessed using a variety of models and associated instruments. Many of these students have benefited from learning about how they learn and how their patterns may differ from those of their classmates[2]; many instructors have made effective use of learning styles in planning their teaching[3–5]; and many studies have been published attesting to the usefulness of common models for both metacognitive and pedagogical purposes.[5–7] Nevertheless, learning styles are not without their detractors. In a recent study, for example, Pashler *et al.*[8] investigated the validity of taking students' learning styles into account when designing instruction. They declared that a credible validation must prove that the optimal teaching method for students with one style is not optimal for students with a different style. They surveyed the literature, failed to find a published study that met their criterion, and concluded that "there is no adequate evidence base to justify incorporating learning-styles assessments into general educational practice."

That study is not exactly groundbreaking. Every two years or so, some academic psychologists conduct a literature review and conclude that no research supports the use of learning styles in teaching, and journal reviewers and editors treat this conclusion as a new revelation that once and for all debunks learning styles. These pronouncements have never had the slightest effect on the world academic community's extensive and continually growing use of learning styles models and assessment instruments, but that has never deterred others from repeating the exercise two years later.

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The validity of incorporating learning styles into instructional design hinges on the answers to several questions:

1. Do students with different assessed learning styles respond differently to specific forms of instruction? Are the differences consistent with the learning styles model upon which the assessment was based?
2. Does instruction that matches a student's learning style lead to greater learning than mismatched instruction? (Pashler *et al.*[8] call an affirmative response to this question the "meshing hypothesis.")
3. Whether or not the meshing hypothesis is valid, can instruction be improved by taking learning styles into account? If so, how?

The remainder of this essay examines each of these questions.

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A familiar dimension of learning styles is *sensing* vs. *intuition*. Sensing learners are generally more comfortable with concrete information—facts, observations, data—than with abstractions—theories, symbols, mathematical models. Relative to intuitive learners, they tend to be more practical, observant, and attentive to details; more patient with replication of calculations and experiments; slower at solving analytical problems; and less inclined to think outside the box. This learning style dimension is a component of the *Myers-Briggs Type Indicator*® (MBTI) model based on Jung's Theory of Psychological Types[3,9–10] and of another model formulated by Felder and Silverman[5,11] that provides the basis for the widely used *Index of Learning Styles*®.[12–14] It is also a close relative of the *concrete* vs. *abstract* dimension of Kolb's experiential learning model.[15]

Contrary to a common misinterpretation of learning styles, sensors and intuitors can be successful in any profession or endeavor. Learning styles are not mutually exclusive categories but preferences that may be mild, moderate, or strong, and the fact that someone is classified as a sensor says nothing about how good he or she is at intuitive skills, or for that matter at sensing skills. Contrary to the claims of learning styles debunkers, however, sensing and intuitive learners do tend to respond differently to certain teaching approaches, as do students with opposite preferences on all other learning style dimensions.

The Center for Applications of Psychological Type database lists 292 publications and dissertations relating students' MBTI profiles to their academic performance and attitudes,[16] and many studies have also been carried out using other common learning styles assessment instruments. The findings of Pashler *et al.*[8] notwithstanding, significant and predictable performance differences have been found in many of these studies. The engineering education literature alone provides numerous examples. In several studies based on the MBTI, intuitors in theoretical/analytical engineering courses with examinations that rewarded problem-solving speed predictably did better on average than their sensing classmates, while in courses taken by the same students that stressed engineering practice and required careful observation and attention to detail, the sensors predictably did better.[17–18] Also consistently with type theory,

intuitors were three times more likely than sensors to give themselves high self-ratings for creative thinking; extraverts initially reacted more positively to team assignments than did introverts; thinkers consistently outperformed feelers in the impersonal environment of the engineering curriculum and the feelers were more likely to drop out, even if they were doing well academically.[18–21] Similar correlations have also been found between engineering students' performance and attitudes and their learning styles as assessed by the *Index of Learning* Styles[12,22] and the Kolb *Learning Styles Inventory*.[23–24]

Does instruction that matches a student's learning style lead to greater learning than mismatched instruction? (The "meshing hypothesis")

If students are taught in a manner heavily mismatched with their learning styles, one might expect that their resulting discomfort would diminish their motivation to learn and hence the extent of their learning.[25] That expectation is borne out by the research cited above showing that students whose preferences matched the dominant instructional environment did better than their counterparts with opposite preferences.[17–24] As we will see in the next section, however, the validity of the meshing hypothesis has no bearing at all on the appropriateness of taking learning styles into account when designing instruction.

Whether or not the meshing hypothesis is valid, can instruction be improved by taking learning styles into account? If so, how?

Most learning styles debunkers base their arguments on the meshing hypothesis. They claim they have found no credible evidence that matching teaching to students' learning style preferences leads to improved learning, so there is no reason to take learning styles into account when designing instruction.

There is at least one good reason not to attempt to teach all students in their preferred manner, but it has nothing to do with the validity of the meshing hypothesis. It is, rather, that doing so is for all practical purposes impossible. As long as the students have more than one learning style among them, whenever students with one style receive matched instruction, the other students will automatically be taught in a mismatched manner.

This does not mean that learning styles have no place in instructional design, however: there is another view of their utility that the debunkers have chosen to ignore. The point is not to match teaching style to learning style but rather to achieve *balance*, making sure that each style preference is addressed to a reasonable extent during instruction.[4,5] From this viewpoint, instruction is ineffective if it heavily favors one set of learning preferences (and hence one set of students) over another.

The rationale for this proposal is straightforward. To succeed in any profession, students will need attributes associated with all learning style categories. Teaching that provides guidance and practice almost exclusively in, say, intuitive skills (as much college instruction does) may make intuitors happy, but it unfairly disadvantages sensors and also fails to help the intuitors develop important sensing skills. The converse is true of teaching that focuses almost entirely on sensing skills (as much precollege instruction does)—the sensors may like it but it's not doing them any favors. Good instruction alternates between addressing the preferences of sensors and those of intuitors. The optimal balance between sensing and intuition in a course depends on the

nature and level of the course and the backgrounds of the students, and an important part of the instructor's job is to figure out that balance. The same can be said of every learning style dimension.

In brief, the recommended way to incorporate learning styles into teaching is this:

1. *Choose a learning styles model*. The ideal choice is a model that has been used successfully to characterize student populations of the type for which instruction is to be designed.
2. *Design instruction that alternately addresses the preferences of students at each pole of each model dimension*. (In Kolb's[15] terminology, "teach around the cycle.")

If the entire goal is to teach in a way that addresses the needs of most students in a class, Steps 1 and 2 are sufficient: it is not necessary to even assess individual students' learning styles, let alone tailor instruction to them. Only if the goal includes increasing students' metacognitive awareness (understanding of how they learn and how others may learn differently) should the third step be taken:

3. *Assess the learning style preferences of the students in the class and discuss the meaning of the results.*[2]

Teaching to address all categories of a learning styles model is not a radical idea, and specific suggestions for how to do it should look familiar to anyone who has studied the literature of effective pedagogy. *Don't just lecture—provide opportunities in class for both practice in course-taught methods* (for the active learners) *and reflection on the outcomes* (for the reflective learners). *Teach basic principles and theories* (which intuitive learners are comfortable with), *but only in the context of their real-world applications and with numerous examples of how to apply them* (without which many sensors may have difficulty grasping the underlying concepts). *Provide information both visually* (pictures, diagrams, flow charts, concept maps, demonstrations,…) *and verbally* (written and spoken explanations) *rather than making almost everything verbal* (as is usually done except in art and architecture courses). *Teach new course material in a logical and systematic way* (which thinkers and sequential learners need), *but be sure to show how it connects to the students' prior knowledge and experience and to problems of global and social importance* (for feelers and global learners).

These rules of thumb and many others that involve balancing the needs of opposing learning styles are supported by extensive research and endorsed in most standard references on effective pedagogy. While the rules can be taught without mentioning learning styles, a good learning styles model provides a coherent and persuasive framework for teaching them. When instructors recognize their own tendencies as learners in descriptions of learning styles and also recognize that many of their students have different tendencies, they quickly come to appreciate the value of balanced teaching. The same level of appreciation is not easily attained through a series of apparently unconnected teaching tips.

Summary and conclusions

Learning styles are preferences and tendencies students have for certain ways of taking in and processing information and responding to different instructional environments. They are

neither infallible guides to student behavior nor made-up constructs that have no basis in reality, but simply useful descriptions of common behavior patterns. Although their validity is routinely challenged in the psychology literature, the most common learning styles models have been used frequently and successfully to help teachers design effective instruction; help students better understand their own learning processes; and help both teachers and students realize that not everyone is like them and the differences are often worth celebrating.

The following points may help the reader to maintain a realistic perspective on this unfortunately controversial subject.

- Learning styles are not either-or categories, but preferences that may be mild, moderate, or strong. The fact that students may be classified as, say, sensing learners, says nothing about either their intuitive skills or their sensing skills. It follows that students with any learning style can succeed in any career or endeavor. It is wrong and arguably unethical to give students career or curriculum recommendations based on their learning styles.[5]
- Both logic and published research suggest that students taught in a manner matched to their learning style preferences tend to learn more than students taught in a highly mismatched manner. It does not follow, however, that matching instruction to fit students' learning styles is the optimal way to teach. For one thing, it is impossible if more than one learning style is represented in a class. Rather,
- *The optimal teaching style strikes a balance (not necessarily an equal one) between the poles of each dimension of the chosen learning styles model.* When this balance is achieved, all students are taught sometimes in their preferred mode, so they are not too uncomfortable to learn, and sometimes in their less preferred mode, so they are given practice and feedback in critically important skills they might never develop if instruction were perfectly matched to their preferences.
- The ideal balance among learning style categories depends on the subject, level, and learning objectives of the course and the backgrounds and skills of the students. Part of the instructor's job is to attempt to ascertain that ideal and to teach in a manner that comes as close to it as possible.
- Acquainting students with their learning styles can enhance their awareness of some of their natural learning strengths, and it can also alert them to learning needs which, if unaddressed, could create academic difficulties for them. The instructor should make clear, however, that learning styles provide no indication of what the students are and are not capable of, nor are they legitimate excuses for poor academic performance.

As long as learning styles are viewed in this moderate manner, they will continue to be widely used in education, and no one—neither students, teachers, nor disapproving psychologists—will be any the worse for it.

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