



Science education mythbusters: Challenging 'Learning Styles'

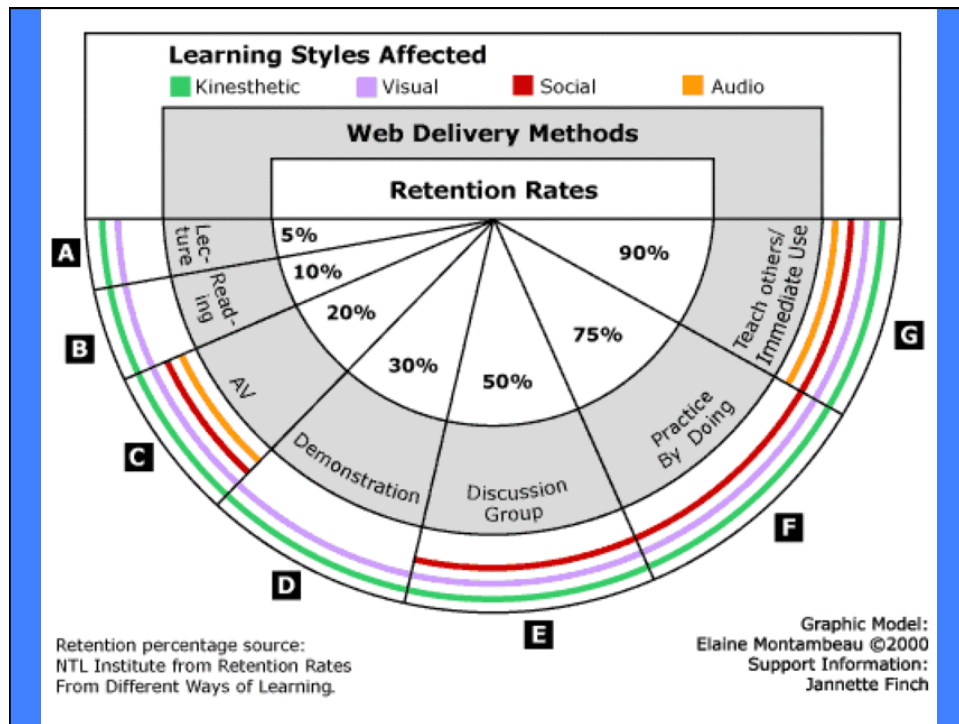


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SCIENCE EDUCATION
MYTHBUSTERS



What are Learning Styles?

“...refers to the concept that individuals differ in regard to what mode of instruction or study is most effective for them.”

Pashler *et al.* (2009)

Learning-style (“meshing”) hypothesis

- Idea that instructional methods/styles should be aligned with the student’s learning style (Mayer, 2009)

Evidence-based Practises in Education

“Begin with a commonly held belief about educational practice and follow the evidence to see if the practice is warranted.”

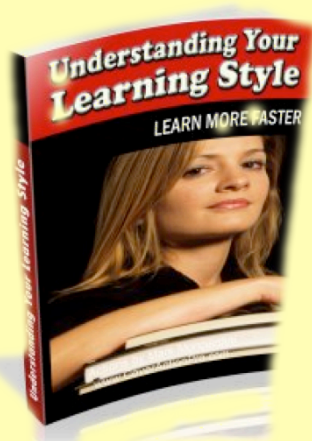
Richard E. Mayer (2009)

“The profession of teaching will improve...as the leaders in education direct their choices of methods by the results of scientific investigation rather than general opinion.”

Edward L. Thorndike (1906)

Question 4

Have you had your learning style assessed?
If so, what ‘type’ are you?



<http://www.ldpride.net/learningstyles.MI.htm>

What is your Learning Style?

- Most commonly assessed with self-reporting questionnaires

>71 different proposed 'theories' of learning styles!

Coffield *et al.*, 2004

What is your Learning Style?

- VARK (or VAK) Assessment (*e.g.*, Dunn & Dunn)
- Visual, Auditory & Kinesthetic (VAK) Survey
- Kolb's Learning Style Inventory (LSI)
- Honey & Mumford Learning Styles Questionnaire (LSQ)
- Mumford's Learning Diagnostic Questionnaire
- Index of Learning Styles (ILS)
- Gregorc's Style Delineator (GSD)
- Jackson's Learning Styles Profiler (LSP)
- Myers-Briggs Type Indicator
- Hermann Brain Dominance Indicator
- Benziger Thinking Styles Assessment
- Cognitive Style Analysis
- Multimedia Learning Preference Test
- Allinson-Hayes Cognitive Style Index
- Kirton's Adaption-Innovation Inventory
- Verbal-Visual Learning Style Rating
- Santa Barbara Learning Style Questionnaire
- Verbal-Visualizer Questionnaire
- Approaches to Studying Inventory
- Merritt and Marshall Learning Style Questionnaire – Extended.

What is your Learning Style?

- Kolb's Learning Style Inventory (LSI)

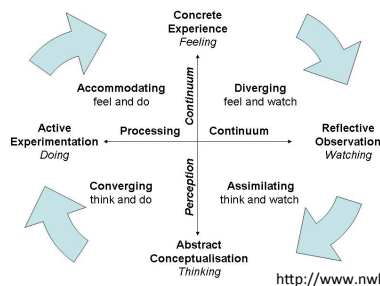
Discriminating
Receptive
Feeling
Accepting
Intuitive
Abstract
Present-oriented
Experience
Intense

Tentative
Relevant
Watching
Risk-taking
Productive
Observing
Reflective
Observation
Reserved

Involved
Analytical
Thinking
Evaluative
Logical
Concrete
Future-oriented
Conceptualisation
Rational

Practical
Impartial
Doing
Aware
Questioning
Active
Pragmatic
Experimentation
Responsible

Poor validity
& reliability

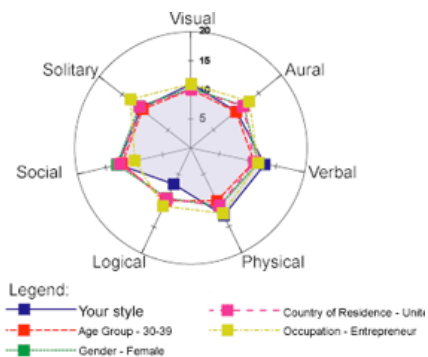
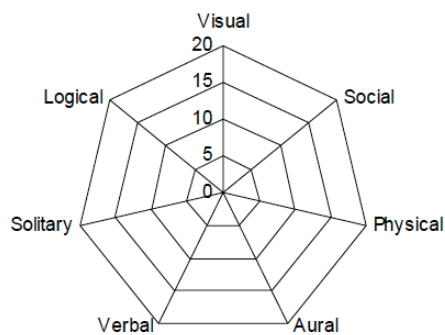


Test Validity: the assessment instrument measures what it says it measures.

Test Reliability: repeated assessments provide consistent results.

What is your Learning Style?

- Memletics Learning Styles Inventory Quiz



<http://www.learning-styles-online.com/inventory/>

Memletics Learning Styles Inventory Quiz

0 – sounds nothing like you; 1 – sounds partly like you; 2 – sounds exactly like you

1. You have a personal or private interest or hobby that you like to do alone.

3. Jingles, themes, or parts of songs pop into your head at random.

24. You use many hand gestures or other physical body language when communicating with others.

36. You notice and like the feel of clothes, furniture and other objects.

43. You have a good sense of colour.

46. You read self-help books, you've been to self-help workshops, or you've done similar work to learn more about yourself.

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

53. You enjoy dancing.

56. You love theme park rides that involve much physical action, or you dislike them because you are sensitive to the physical forces on your body.

61. You would prefer to touch or handle something to understand how it works.

67. You think independently. You know how you think and you make up your own mind. You understand your own strengths.

68. You like gardening or working with your hands in the shed.

<http://www.learning-styles-online.com/inventory/>

You can also determine your teaching style!

E.g., from Texas Collaborative for Teaching Excellence

Learning: varies from **rote** to **understanding**

Concept Representation: varies from **abstract** to **applied**

Cognitive processing: varies from **enactive** to **symbolic**

Interaction: varies from **individual** to **cooperative** groups

- formal authority
- demonstrator or personal model
- facilitator
- delegator

1. Do you find your teaching style:

- a) May lead to an inflexibility for managing the concerns of students.
- b) May cause students to feel inadequate when they can't emulate your example.
- c) Works well for most students but is very time consuming.
- d) May leave students feeling anxious about their ability to meet your expectations.

<http://www.texascollaborative.org/TSI.htm>

How knowing your teaching style can help you!

“Your scores should provide food for thought regarding the type of students you may be best suited to teach based upon your style of teaching, or the ways in which you may want to alter your style of teaching based upon the kinds of students you have in your classroom.”

-Texas Collaborative for Teaching Excellence

<http://members.shaw.ca/mdde615/tchstyles.htm>

How to make your learning style work for you!

Visual Learners:

- use visual materials such as pictures, charts, maps, graphs, etc.
- have a clear view of your teachers when they are speaking so you can see their body language and facial expression
- use colour to highlight important points in text
- take notes or ask your teacher to provide handouts
- illustrate your ideas as a picture or brainstorming bubble before writing them down
- write a story and illustrate it
- use multi-media (e.g. computers, videos, and filmstrips)
- study in a quiet place away from verbal disturbances
- read illustrated books
- visualize information as a picture to aid memorization

Auditory Learners:

- participate in class discussions/debates
- make speeches and presentations
- use a tape recorder during lectures instead of taking notes
- read text out aloud
- create musical jingles to aid memorization
- create mnemonics to aid memorization
- discuss your ideas verbally
- dictate to someone while they write down your thoughts
- use verbal analogies, and story telling to demonstrate your point

<http://www.ldpride.net/learningstyles.MI.htm>

Tactile/Kinesthetic Learners

- take frequent study breaks
- move around to learn new things (e.g. read while on an exercise bike, mold a piece of clay to learn a new concept)
- work at a standing position
- chew gum while studying
- use bright colors to highlight reading material
- dress up your work space with posters
- if you wish, listen to music while you study
- skim through reading material to get a rough idea what it is about before settling down to read it in detail.

Learning-styles (“meshing”) hypothesis

- Idea that instructional methods/styles should be aligned with the student’s learning style (Mayer, 2009)


NEWS

Parents Of Nasal Learners Demand Odor-Based Curriculum

MARCH 15, 2009 | ISSUE 36-09

COLUMBUS, OH—Backed by olfactory-education experts, parents of nasal learners are demanding that U.S. public schools provide odor-based curricula for their academically struggling children.

[Enlarge Image](#)



A nasal learner struggles with an odorless textbook.

"Despite the proliferation of countless scholastic tests intended to identify children with special needs, the challenges facing nasal learners continue to be ignored," said Delia Weber, president of Parents Of Nasal Learners, at the group's annual conference. "Every day, I witness firsthand my son Austin's struggle to succeed in a school environment that recognizes the needs of visual, auditory, tactile, and kinesthetic learners but not him."

Weber said she was at her "wit's end" trying to understand why her son was floundering in school when, in May 1997, another parent referred her to the Nasal Learning Research Institute in Columbus. Tested for odor-based information-acquisition aptitude, Austin scored in the 99th percentile.

"My child is *not* stupid," Weber said. "There simply was no way for him to thrive in a school that only caters to traditional students who absorb educational concepts by hearing, reading, seeing, discussing, drawing, building, or acting out."

Austin's experience is not unique.

"My 15-year-old daughter Chloe couldn't sustain her interest in academics and, as a result, she would goof off with her friends and get in trouble," said Michael Sweeney of Oswego, NY. "Now I realize that all those Ds and Fs did not represent any failure on my daughter's part, but rather her school's failure to provide an appropriate nasal-based curriculum."

ARTICLE TOOLS

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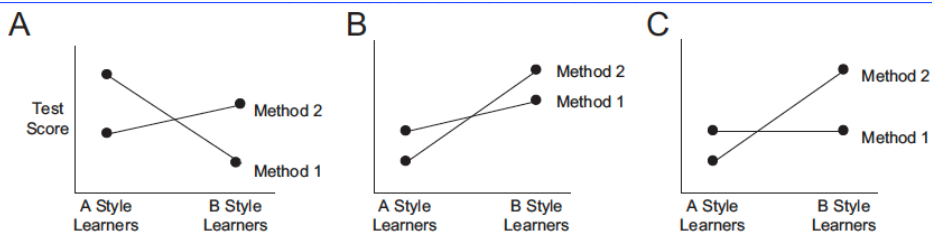
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<http://www.theonion.com/articles/parents-of-nasal-learners-demand-odorbased-curricu,396/>

So what's the evidence for the learning-styles hypothesis?

Acceptable:

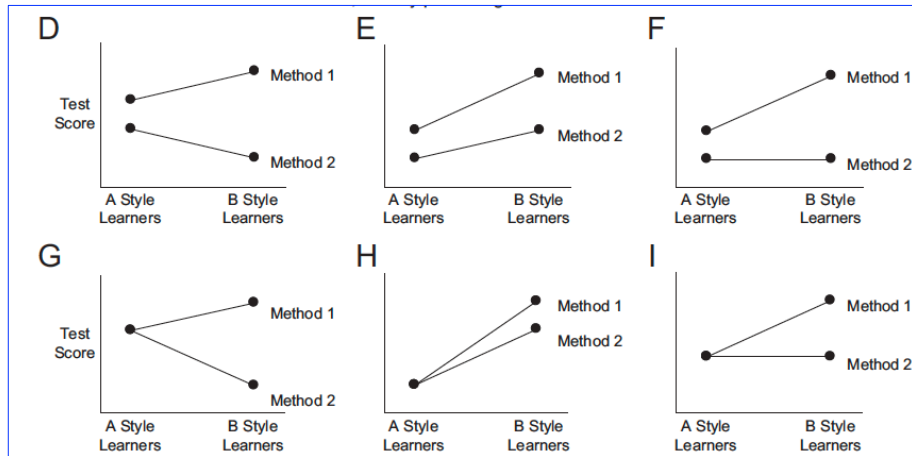


Modified from Pashler *et al.*, 2009

Attribute by Treatment Interaction (ATI)

So what's the evidence for the learning-styles hypothesis?

Unacceptable:



Modified from Pashler *et al.*, 2009

So the evidence...is lacking for the learning styles hypothesis...

1. Learning styles dependent on tests/questionnaires → reveal preferences.
 - If these are faulty, and tests of the hypothesis are based on these categories...
2. Very few studies of learning styles used good research methodology.
3. Material used to deliver content in different modality may actually be better organised or more interesting.
 - Can you then distinguish between modality or better instruction?
4. Of few studies with appropriate research methodology – provide contradictory or no support for learning styles hypothesis. (*e.g.*, Constantinidou & Baker, 2002).
5. Many studies are performed in artificial lab settings (may be issues with motivation).
6. Memory is stored in terms of meaning not modality (*e.g.*, auditory, visual).

Most taken from Pashler, 2009

General criticisms of learning style research

- No coherent style theory;
- Persistent flaws in models & measures of cognitive & learning styles;
- ‘Incestuous’ research for self-affirming replication;
- Commercial conflicts of interest
 - Undermine reliability & integrity of empirical research;
- Individual researchers promote own theories
 - (‘messianic drive for field domination’)
- Lacking established evidence of positive effects related to practise & application of learning styles;
- Disregard of effect size used in evidence-informed methodology.

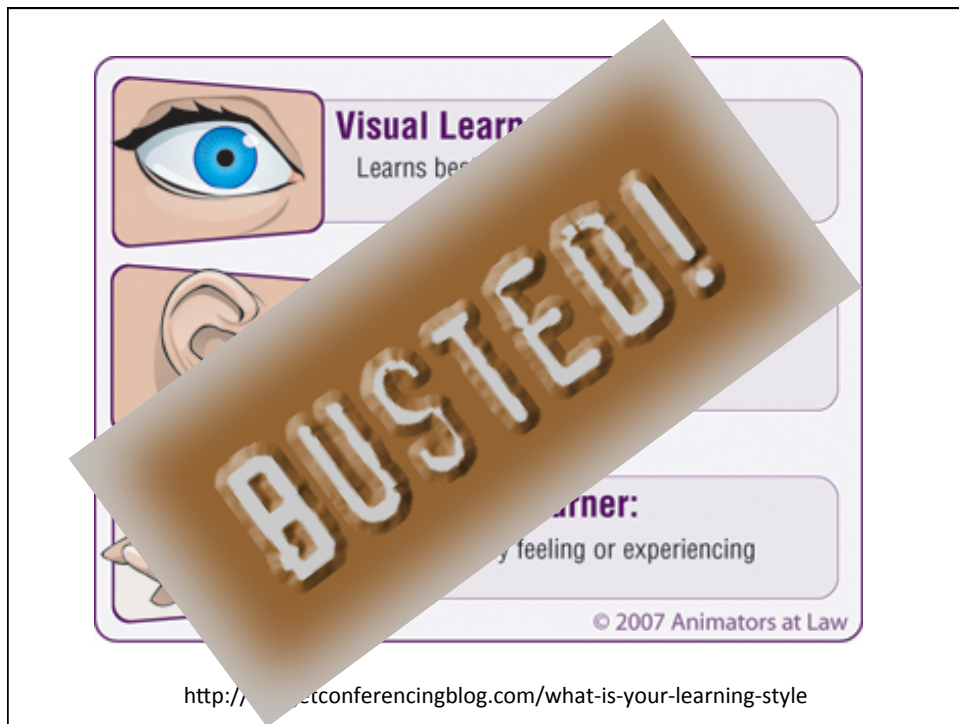
Taken & adapted from Rayner 2007, 2011

Does modality of intake translate to modality of retention?

Tailoring instruction to students’ preferred modalities not effective in producing better learning.

“We need to take extreme care when moving from the lab to the classroom. We do remember things visually and aurally, but information isn’t defined by how it was received.”

John Geake, 2005



Question

Why, if evidence is lacking, is the idea of learning styles so attractive?

The 'dangers' of ignoring learning styles!

“When mismatches exist between learning styles of most students in a class & the teaching style of the professor, the students may **become bored & inattentive** in class, **do poorly on tests, get discouraged about courses, the curriculum, & themselves**, & in some cases **change to other curricula or drop out of school**...Most seriously, ***society loses potentially excellent professionals***. To overcome these problems, professors should strive for a balance of instructional methods (as opposed to trying to teach each student exclusively according to his/her preferences).”

Richard Felder (Learning Styles: http://www4.ncsu.edu/unity/lockers/users/f/felder/public/Learning_Styles.html)

Emphasis mine

Question 5

What is the harm in propagating the learning styles mythology?

Why is it counterproductive to our aims?

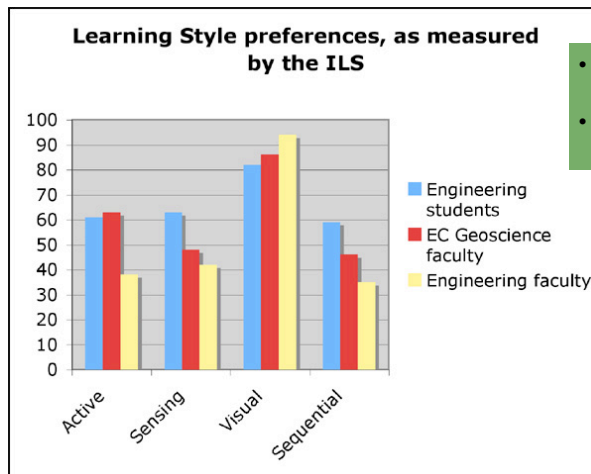
- How does the idea of Learning Styles shape faculty approaches to teaching?
- How does the idea of Learning Styles shape evaluation of teaching for tenure/promotion?
- Would the time/effort of faculty be better put towards more effective strategies known to promote increased student learning?

Question

What is the harm in propagating the learning styles mythology?

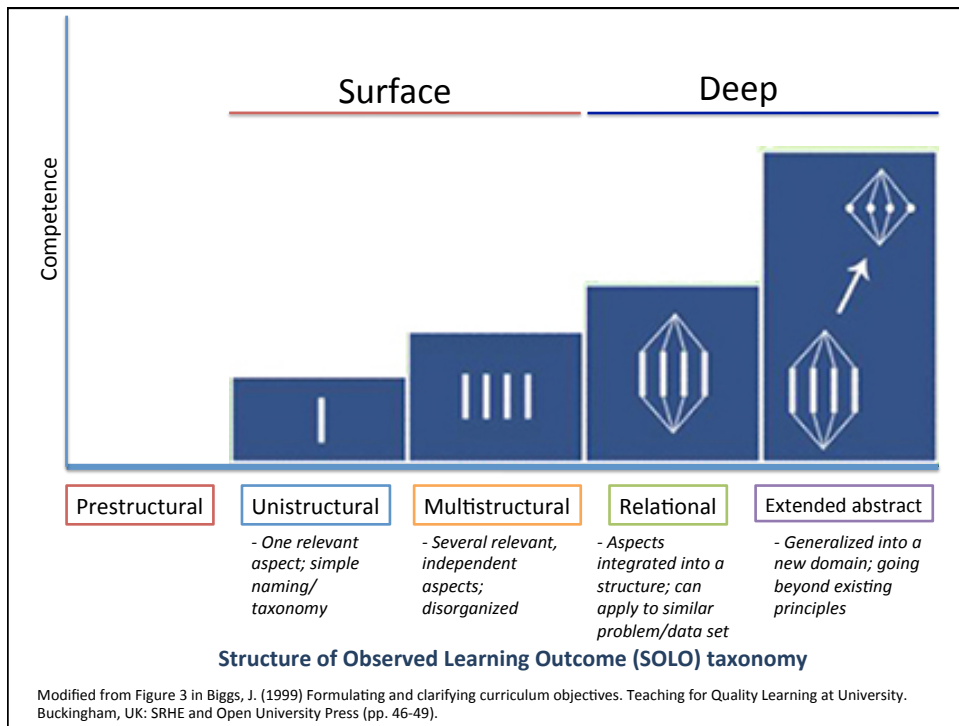
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Novice → Expert Thinking?



- Students preferred sensing; faculty intuiting
- Students preferred sequential; faculty global

- <http://serc.carleton.edu/NAGTWorkshops/earlycareer/teaching/learningstyles.html>
- Graph by Carol Ormand, using data from Felder and Spurlin (2005) and from the Early Career Workshop.



How do misconceptions regarding learning styles shape student expectations and affect student perceptions of teaching?

"As we start a new school year, Mr. Smith, I just want you to know that I'm an Abstract-Sequential learner and trust that you'll conduct yourself accordingly!"

Bunting

Evidence-based Practises in Education

“The contrast between the enormous popularity of the learning-styles approach within education and the lack of credible evidence for its utility is, in our opinion, striking and disturbing. If classification of students’ learning styles has practical utility, it remains to be demonstrated.”

Pashler *et al.* (2009)

“... fictional objects of assessment cannot be assessed with validity, and where validity is lacking, reliability is compromised.”

Knight (2010)

Question

What strategies are most effective for exploring misconceptions of learning styles with colleagues (faculty/TAs)?

With students?

Thanks! Please feel free to contact us:

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Biology version of VASS (E.g. Q)

1. Learning biology requires:

- a) a serious effort.
- b) a special talent.

Classifications:

- Folk
- Low Transitional
- High Transitional
- Expert

2. If I had a choice:

- a) I would never take any biology course.
- b) I would still take biology for my own benefit.

3. Different branches of biology, like genetics and ecology:

- a) Are interrelated by common principles.
- b) Are separate and independent of each other.

How do you figure out your learning style?

1. Approaches to Studying Inventory (Entwistle and Ramsden, 1983)

- 1. Didn't correlate with progression through a degree
- 2. But correlation with achieving score and performance on exams significant for 3rd yr students

18 items

I find it easy to organise my study time effectively.

It's important to me to do really well in the courses here.

Often I find I have to read things without having a chance to really understand them.

I tend to read very little beyond what's required for completing assignments.

What are Learning Styles?

“...refers to the concept that individuals differ in regard to what mode of instruction or study is most effective for them.”

Pashler *et al.* (2009)

“The profession of teaching will improve...as the leaders in education direct their choices of methods by the results of scientific investigation rather than general opinion.”

Edward L. Thorndike (1906)

Learning styles in education

“It would therefore be hazardous for an investigation of learning to proceed on the assumption that learning is independent of external factors, or that students possess inherent, invariant styles of learning.”

Laurillard (1979)