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Decoding the Literature

Scholarship of Teaching & Learning Network (SoTL)

Presented by:

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Decoding the Literature

Debunking Learning Styles June 27, 2022 12PM-130PM Online seminar & discussion

Who am I?

Current role: Academic Developer, Scholarship of Teaching & Learning Learning & Teaching Team – Institute for Academic Development

- BSc and MSc in Geology from Carleton University and University of British Columbia (Canada)
- PhD in Geoscience Education from University of Canterbury (New Zealand)
- Research interests:
 - authentic and situated learning (sociology),
 - inclusive pedagogies,
 - volcanology and natural hazards education,
 - academic development,
 - philosophy of higher education and its future

Decoding the Literature series

Why? Extensive history and catalogue of education literature; can be jargon rich.

How does it work? Reading & discussion series. Read the article; I will summarise and we will discuss together

Question for you all:

Do you have a paper that you'd like to present to the SoTL Network? Please be in touch

Another Nail in the Coffin for Learning Styles? Disparities among Undergraduate Anatomy Students' Study Strategies, Class Performance, and Reported VARK Learning Styles

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The concept and existence of learning styles has been fraught with controversy, and recent studies have thrown their existence into doubt. Yet, many students still hold to the conventional wisdom that learning styles are legitimate, and may adapt their outside of class study strategies to match these learning styles. Thus, this study aims to assess if undergraduate anatomy students are more likely to utilize study strategies that align with their hypothetical learning styles (using the VARK analysis from Fleming and Mills, 1992, Improve Acad. 11:137-155) and, if so, does this alignment correlate with their outcome in an anatomy course. Relatedly, this study examines whether students' VARK learning styles are correlated with course outcomes regardless of the students' study strategies, and whether any study strategies are correlated with course outcomes, regardless of student-specific VARK results. A total of 426 anatomy students from the 2015 and 2016 Fall semesters completed a study strategies survey and an online VARK questionnaire. Results demonstrated that most students did not report study strategies that correlated with their VARK assessment, and that student performance in anatomy was not correlated with their score in any VARK categories. Rather, some specific study strategies (irrespective of VARK results), such as use of the virtual microscope, were found to be positively correlated with final class grade. However, the alignment of these study strategies with VARK results had no correlation with anatomy course outcomes. Thus, this research provides further evidence that the conventional wisdom about learning styles should be rejected by educators and students alike. Anat Sci Educ 12: 6-19. © 2018 American Association of Anatomists.

Full citation:

Husmann, P. R., & O'Loughlin, V. D. (2019). Another nail in the coffin for learning styles? Disparities among undergraduate anatomy students' study strategies, class performance, and reported VARK learning styles. *Anatomical sciences education*, *12*(1), 6-19.

Cited by 188 articles



https://youtu.be/rhgwlhB58PA

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Definition: Learning Style

"A student's way of responding and using stimuli in the context of learning" (Claxton and Ralston, 1978)

A **preferred mode** (modality) of learning new things

Researchers from the 70's-recent advocate for learning activities **aligned with** students' learning styles

Learning style often practiced mostly **outside** of the classroom

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VARK model (Fleming and Mills 1992)

VARK categorises students based on the sensory modality in which they prefer to have information presented to them

Learners prefer new information...

Visual: ... through drawings, diagrams, or flowcharts

Aural (Auditory): ... through listening, discussion, reading notes out loud, podcasts

Reading & writing: ... in text and tables, writing out notes, lists and tables of information

Kinesthetic: ... in clearly relevant in real world examples, using their hands or body

Multi-model: ... in a variety of modalities

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Q1. Predict your learning style

Before we dive in,

Q1. What do you think your learning style is? When learning something new and being presented information to learn...

A Visual: I prefer new information to be presented to me through drawings, diagrams, or flowcharts

B Auditory: ... through listening, discussion, reading notes out loud, podcasts

C Reading/writing: ... through r/w in text and tables, reading and writing out notes, making lists

D Kinesthetic: ... through clearly relevant and real world examples, doing demonstrations; using your hands or body

E Multi-modality: ... in a variety of the above

VARK Questionnaire - 16 Questions

Open up a browser tab and take the questionnaire

https://vark-learn.com/the-varkquestionnaire/

It should take about **5-8 minutes** to get your results. It's free and you don't need to give any further information or sign-up.





Q2. What is your dominant learning style (highest score), based on the VARK questionnaire?





Q3. Your VARK Results 2

Q3. Were you categorised as uni-modal, bi-modal, or multi-modal in your learning style(s)?

A Uni-modal: Scored points in only one category

B Bi-modal: Scored points in two categories

C Multi-modal: Scored points in three or more categories

Introduction & context

First year undergraduate anatomy teaching - USA

Lecture & laboratory course

The problem:

- Common advice for first-year students is to use their preferred *Learning Style* when studying; and teachers asked to provide content in a *variety of Styles* to suit students needs
- However, Learning Styles' effectiveness is debated: When students use their learning style does it actually help them learn more and do better in your courses?



Critiques of learning styles

• Hawk & Shah (2007); Wehrwein et al. (2007); Leite et al. (2010)

- VARK untested & poor content validity
- VARK poor questionnaire design (multiple responses) and untested variable relationships
- Pashler et al. (2009) meta-analysis of learning styles studies
 - No rigorous evidence basis for learning styles claims
 - Learning styles appeals to self-esteem movement
- Breckler et al. (2009)
 - Students can't accurately predict their own preferred style (based on VARK questionnaire)

• Kollöffel (2012)

• Using preferred format (diagrams or text) does not enhance learning

RQ1. Does students preferred VARK learning style **match** their study strategies?

RQ2. When students do use their preferred style in their study strategies, do they **outperform** others that do not use the recommended style?

Basic Human Anatomy Course (2015-16)

Large, second-year, medical sciences class

Lectures and laboratory activities

- Lecture: Active learning techniques used
- Labs: Bones, models, virtual microscope, demonstrations with cadavers

Assessment (800 marks total = final course grade)

- Lecture: 4 multiple-choice exams + 8 online lecture quizzes (400 marks)
- Labs: 4 laboratory exams (400 marks)

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Case study Large-class surveying

Methodology

1. Learning style: <u>VARK questionnaire</u> (within 2 weeks of course start; 16 items)

2. Study strategies: <u>Study strategy survey</u> (Self-reported; after grades submitted; 26 items)

- 426 participants across two cohorts (2015, 16)
- Qualtrics surveying; advertised via learning platform
- Informed consent gained
- Study strategy survey collected strategies, attendance, attitudes and demographics

3. Performance*: <u>Final course grades (including</u> lab and lecture grades split)

Research paradigm: all valid and useful

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Methods: Statistical analysis

- Thorough and rigorous statistical approach
 - Good sample, checking for demographic representation
 - No performance differences between cohort 1 (2015) and 2 (2016), so treated as one population
 - Checked distribution of whole data and subpopulations
 - Normal distribution cannot be assumed (skewed data)
- Sub-population (group) comparisons were done using both parametric & nonparametric tests run
 - E.g., t-tests, Mann-Whitney U, and Kruskal-Wallis tests
- **Correlations** were calculated using parametric & non-parametric methods
 - E.g., Pearson, Spearman coefficients



Note that **correlations** vs.

group comparisons (ttests) are not the same thing

- **T-tests** compare 1 variable between groups or subpopulations.
 - E.g., Are younger and older staff members receiving the same salaries?
 - Make a list of all your staff, order them by age, and **put them into two** (or more) **groups**.
 - Compare the mean salary of those groups by running t-tests. Might find that the older group has statistically significant higher salary (on average)
- Correlation checks for the nature and strength of a relationship between two variables (e.g., age and salary)
 - Make graph with age (x) and salary (y), look at trends, and run a test.
 - It might show that there is a strong positive relationship between age and salary, where as you get older (more experience?) you tend to be paid more.







Q5. Always use preferred style?

Q5. When learning something new, do you **always** use/choose to use your preferred learning style?

A Yes, strongly prefer my style

B Yes, sometimes prefer my style

C No, I use any style

D Not sure

Results -VARK questionnaire 1. VARK numerical scores: Each student had a 'score' for each category

2. Highest VARK numerical score is their **dominant category**

3. Students checked for **unimodal** or **multimodal** styles

Example: Student scores Visual 10, Aural 3, Read/write 0, Kinesthetic 0

- V score 10, A score 3
- Dominant category Visual (V)
- Bimodal (multimodal)

Results – Study strategies survey

- Each unique study strategy was investigated for statistical relationships, e.g., "I used the ... virtual microscope, colouring books, or flashcards", etc.
- And each study strategy was coded by researcher to a V, A, R, and K category
- However, not all categories included the same number of questions, so <u>Ratios</u> of each were calculated for each V, A, R, and K.

Result 1. Students who participated in the VARK assessment study scored higher final grades (on average) than those who did not participate

- 55% response rate including both cohorts
- Self-selection effect?



68% of students had multimodal VARK results



Figure 3. Dominant VARK categories distribution



Most **popular** style (backed by other research)

Result 3. VARK numerical scores DO NOT have **correlation with course performance** overall, in lecture or lab



i.e., Plotting all the students Visual numerical scores and their grades and checking for a relationship

Result 4. But, most VARK numerical scores DO have a statistically significant **correlation with one another**



i.e., Plotting all the students Visual numerical scores against all of the students Aural numerical scores and checking for a relationship

Result 5. Students **using more types of study strategies** (than less) DO NOT have higher course grades

Sub Q. Were students using as many strategies as they can to try and improve their grades?

Result 6. **Dominant VARK categories** DO NOT have statistically higher course grades than one another

• i.e., Being in a VARK category group did not lead to better performance in the course overall or in lab/lecture portions of the course



Example: Aural learners (left) did not have higher grades as a group, than visual learners (right)

Result 7. Higher numerical VARK scores, within categories, DID NOT have statistically higher course grades

• i.e., Being considered a 'strong' visual learner vs. 'weak' visual learner did not lead to any statistical relationship





Result 8. Use of 8 study strategies were correlated* with lower/higher course grades



May be shallow, memorisation oriented activities

*Note: Correlation does not equal causation

Result 9. The majority (67.15%) of students DID NOT have **matching** VARK assessment and Study Skills categories

i.e., Few students actually used the strategies that matched VARK





Result 10. *Looking at the unimodal students only*, students who did use study strategies matching their VARK assessment DID NOT outperform those that matched.



- Agree and disagree group comparisons were calculated
- No statistical significance found

For example, Visual students who did use Visual strategies did not outperform Aural students who used Visual strategies



Q6. Research Questions Check 1

Question 6. In this study, did students preferred VARK learning style match their study strategies?





Q7. Research Questions Check 2

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Q7. When students **DO use their preferred style** in their study strategies, do they **outperform** others that do not use the recommended style?

Α	Yes
В	No
с	Not sure



Q8. Research Questions Check 3

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Q8. Do students with a high score on any V-A-R-or K dimension (e.g., Strong Visual Learner) outperform others regardless of their study strategies?

Α	Yes
В	No
с	Not sure



Q9. Research Questions Check 4

Q9. In this case study, which **study strategy**, when used, resulted in higher course grades (*select all that apply*)?

A Using flashcards

B Using a virtual microscope

C Using lecture notes

D Using outside websites

E Using practice questions



Primary Data Summary

68% of students had **multimodal** VARK results, with **Kinesthetic** the most dominant of all dimensions

VARK group learners (e.g., Visual dominant learner) did not lead to better performance overall, in lecture or lab. Within groups, weak and strong scores did not lead to higher grades

67% of students **DID NOT match** their VARK assessment and Study Strategies. Students who matched their VARK and Study Strategies **DID NOT outperform** those that didn't

Use of 8 study strategies were correlated with lower/higher course grades. Students who used the virtual microscope and lecture notes had higher grades

Students using more study strategies (than less) do not have higher course grades



Potential sources of error

Medium participation rate (55% of course)

– Unlikely, distribution similar to prev. research <u>Selection bias</u> (Grades of participants are higher, high-achievers?)

– maybe

<u>Small sub group</u> <u>samples</u> (smallest group 14 people) – *maybe, likely* <u>Self-reporting vs</u> <u>Actual studying</u> <u>behaviour</u>

– Likely

<u>Giving grades for</u> participation (1% of grade) – negligible influence

Hawthorne effect (study strategies different due to being observed?)

– maybe-likely



Learning or Performance? – If the reader isn't careful they might walk away thinking that Learning Styles don't impact Learning rather than Course Performance. Better measure needed ?

My critique of the research

Instrument validity – How robust and valid is the Study strategies survey? What study strategies are included? We don't know! Always include your surveys in your reports

Non-Gaussian distribution – I'd have loved to SEE the data that led to both parametric and non parametric tests being run on the data. Show me your data, please ©

Coding of the Study Strategies – The full study strategy statements and their coding would further support transparency and understanding of the data

Replicability - If you repeated this experiment in other contexts, would you get the same results? More replication is needed

Future work: What are the most effective study strategies?

 Avoid rigid focus on a preferred mode as the ONLY option for studying

- Students don't use preferred learning styles; resistant to trying new study strategies?
- Choice of study strategy may be related to:
 - Habits
 - Perceived effort
 - Perceived difficulty/challenge
- Students might prefer 'desirable', passive, low effort, habitual study habits

Selected implications (from the authors)

Implications: Cognition & preferences

What you are *good at*, what you *prefer*, and what *helps you learn* are 3 different concepts

Kollöffel (2012) (VVQ cognitive style)

- Using preferred format (diagrams or text) DOES NOT correlate to learning performance
- NO correlation between preferred style of cognition and cognitive performance (ability tests, e.g., spatial tests)
- Students like (appeal) of diagrams over text, 'text is boring'

Format is linked to domain (specific tasks linked to specific formats)

• e.g., Using maps is helpful when learning orienteering.

Conclusions:

Present findings, along with prior research, suggests that "we should not be promoting the concept of learning styles for studying and/or for teaching interventions" (pg. 17)

Reduce burden on teachers, focus on **active learning**

Support students to avoid the rigidity (e.g., "I'm not a visual learner")

Thanks!

SoTL Network:

https://www.ed.ac.uk/institute-academicdevelopment/learning-teaching/connect/sotl-network

Future SoTL Events (autumn)

- Getting started with SoTL
- Reading & Writing About Teaching
- Decoding the Literature
 - Motivations for Learning
 - Flow theory
 - Your topic? Get in contact!

Join the mlist

Want to talk about your own SoTL work? Get in touch – email me (j.dohaney@ed.ac.uk)

SoTL Network Survey:

https://edinburgh.onlinesurveys.ac.uk/sotl-network-welcomesurvey



What are the key takeaways for you?



() Start presenting to display the poll results on this slide.