

Multicentric Survey on Learning Styles Between Members of the Veterinary Field

Valentina Vitale ■ Michael P. Ward ■ Gaby van Galen ■ Vinciane Toppets ■ Giovanni Barsotti ■ Judit Viu ■ Denis Verwilghen

ABSTRACT

Teaching medical sciences is a continuously evolving process that requires an ongoing update for both students and teachers. Several methods are used to measure learning styles, among which the Visual, Auditory, Read/Write, Kinesthetic (VARK) framework focuses on how learners prefer to obtain information. With this study, we aimed to assess the VARK learning style on a large sample of veterinary students and educators in an aged-variety, multi-lingual, and multi-institutional setting. We obtained a total of 873 replies to our survey: 78.7% students, 6.6% veterinarians, 5.9% people with another occupation inherent to veterinary medicine, 5.7% European or American board-certified specialists, 1.1% veterinary nurses, 0.9% veterinary interns, and 0.9% veterinary residents of different specialties. The replies were obtained from French (56%), English (31.7%), Italian (11.5%), and Spanish (0.8%) versions of the survey. Most respondents (52.6%) were unimodal learners, while 47.4% exhibited two or more learning styles. Baby Boomers and Millennials were significantly less likely to use the visual and the aural style, respectively, compared with Generation Z. Moreover, Baby Boomers were approximately 54.2% less likely to be multimodal learners than Generation Z ($\chi^2 = 4.291, p = .038$). According to our results, the current veterinary student population is comprised of multimodal learners highly adapted to learn visually and by listening, although there are some differences between countries. An initial assessment with the VARK survey at the beginning of the course may help teachers to study their specific population. Finally, here we collect some specific recommendations to follow based on the country where students are enrolled.

Key words: professional development/lifelong learning, CBVE (Competency-Based Veterinary Education)

INTRODUCTION

Teaching medical sciences is a dynamic and continuously evolving process that requires constant updates for both students and teachers.^{1,2} Effectively delivering and retaining a vast amount of information within a limited timeframe is a significant challenge.¹ Furthermore, students need to reach specific learning outcomes, which are influenced by a variety of factors. With the shift in medical education from a teacher-centered to a student-centered approach,^{1,3,4} understanding the learner has become increasingly important. Specifically, learning style preference is a significant internal factor that can influence learning outcomes.² The term 'learning style' has been defined as the different and unique way individuals use to learn and recall information.⁵ There are several methods used to measure learning styles, such as the Visual, Aural, Read/Write, Kinesthetic (VARK) model,⁶ the Kolb Learning Style Inventory,⁷ the Gregorc Style Delineator,⁸ the Grasha-Reichmann Student Learning Style Scale,⁹ and the Productivity Environmental Preference Survey.¹⁰ The VARK framework examines how learners prefer to receive information, typically through their senses, and the questionnaire developed by Fleming and Mills is the most widely used to assess learners.⁶ This survey categorizes learners based on their preferences for sensory modalities: visual (V), aural (A), read/write (R), and kinesthetic (K) style.¹¹ Visual learners absorb information through videos, images, and figures; aural learners through listening; read/write learners through reading texts and writ-

ing notes; and kinesthetic learners through touch and action.¹² Some authors believe that a mismatch between the trainee's preferred learning style and the instructor's teaching method can be a barrier to the learning process.¹¹ However, other studies have not found any evidence that aligning teaching methods with the students' VARK preferences leads to improved career performance.¹³

While learning styles have been assessed in undergraduates and postgraduates in a wide variety of medical specialties,^{2,11,12,14-19} only a few studies have been completed in veterinary schools.^{3,20,21} Moreover, previous studies limited the investigation to students and did not describe teachers' preferences,^{3,20,21} although it has been argued that the learning style of faculty members may influence student learning and the level of their interaction in classrooms.¹⁸ Furthermore, most of the studies on learning styles were conducted in a single institution.

This study aimed to evaluate VARK learning styles among a large sample of veterinary students and educators, encompassing various ages and languages in a multi-institutional setting. Additionally, we aimed to investigate the degree of self-awareness of one's preferred style across this large population.

We hypothesized that learning preferences would vary across different generations, languages, and countries of origin, and that older individuals would exhibit greater self-awareness compared with younger generations.

© American Association of Veterinary Medical Colleges (AAVMC), 2025. For their own personal use, users may read, download, print, search, or link to the full text. Manuscripts published in the *Journal of Veterinary Medical Education* are copyrighted to the American Association of Veterinary Medical Colleges. Requests for permission to reproduce this article should be made to the University of Toronto Press using the Permission Request Form: <https://www.utpjournals.press/about/permissions> or by email: journal.permissions@utpress.utoronto.ca.

MATERIALS AND METHODS

The study protocol was approved by the ethics committee of the University of Sydney (HREC 2020/327) in 2020.

Version 7.0 of the VARK questionnaire (Supplementary material) was uploaded to RedCap software in four languages (English, French, Spanish, and Italian) and emailed to students and staff at three universities (University of Sydney, University of Pisa, and University of Liège) and one private hospital (Hospital Veterinario Sierra de Madrid). Participation was voluntary and anonymous, with no incentive provided. The questionnaire comprised 16 questions, each offering 4 options. Each option correlates to a particular learning style preference. Thus, the style that received the highest marks was considered the preferred style. As participants were free to select more than one option, multiple styles of various combinations could be obtained. Results were evaluated based on validated scoring instructions, classifying participants as unimodal, bimodal, trimodal, and quadrimodal if they exhibited one, two, three, or four preferred styles, respectively.⁶ In addition to the questionnaire, we also collected demographic data (age, gender, native country, occupation, and graduation year or expected graduation year) and self-perceived learning style preferences.

Statistical Analysis

The normality of demographic variables was assessed using the Kolmogorov-Smirnov test.

The Kruskal-Wallis test was employed to evaluate the relationship between the independent variables (V, A, R, and K categories) and age or graduation year. χ^2 tests were used to assess the association between the preferred style according to age, gender (female and male), language (English, French, Spanish and Italian), country of origin, and occupation (students, qualified veterinarians, board-certified specialists, veterinary nurses, veterinary interns, veterinary residents, and other occupations inherent to veterinary medicine). The self-perceived profile answers were then matched with the actual learning profile obtained from the VARK survey and the results were recorded as yes/no answers. This agreement was assessed with logistic regression models: the outcome variable was agreement (no/yes) as a binary variable with age, occupation, language, or graduation year as categorical predictor variables. Individual ordinary logistic regression models were fit for each of these four predictor variables separately. Associations were interpreted based on odds ratios; that is, the odds of agreement (versus not) associated with each predictor variable. Statistical significance was set at $p < .05$ and assessed based on the likelihood statistic.

RESULTS

Participants

A total of 873 responses were obtained. Of these, 489 responses (56%) were obtained from the French version of the VARK questionnaire, 277 (31.7%) from the English version, 100 (11.5%) from the Italian, and 7 (0.8%) from the Spanish. There were 388 (44.5%) female respondents and 482 (55.2%) males, while 3 (0.3%) did not specify their gender. There were 292 Belgians (33.4%), 183 French (21%), 175 Australians (20%), 103 Italians (11.8%), and 32 people from the United States (3.7%). A total of 88 respondents (10.1%) were from many other countries from all 5 continents (Table 1). The median age was 24 years (interquartile range, 17–28 years). As most of the participants were young, age was not considered a linear variable and gen-

Table 1: Countries of origin of the 873 respondents to the survey

Country	Number of people
Argentina	1
Australia	175
Belgium	292
Canada	13
Chile	1
China	5
France	183
Germany	5
Greece	1
Hong Kong	9
Ireland	1
Israel	1
Italy	103
Kenya	4
Luxemburg	3
Malaysia	3
Mauritius	1
Netherland	3
New Zealand	4
Poland	1
Portugal	1
Puerto Rico	3
Democratic Republic of the Congo	1
Senegal	2
Serbia	1
Singapore	7
South Korea	1
Spain	9
Switzerland	2
Taiwan	1
Thailand	1
United Kingdom	3
United States of America	32
TOTAL	873

eration categories were created as follows: Silent Generation (born between 1928 and 1945), Baby Boomers (born between 1946 and 1964), Generation X (born between 1965 and 1980), Millennials (born between 1981 and 1996), and Generation Z (born between 1997 and 2012). There were 432 participants of Generation Z (49.5%), 333 Millennials (38.1%), 73 participants from Generation X (8.4%), and 34 Baby Boomers (3.9%). One individual of the Silent Generation (0.1%) participated, thus, for the statistical analysis, Silent Generation and Baby Boomers were grouped together. Respondents included 687 students (78.7%), 58 qualified veterinarians (6.6%), 52 with another occupation inherent to veterinary medicine (5.9%), 50 European or American board-certified specialists (5.7%), 10 veterinary nurses (1.1%), 8 veterinary interns (0.9%), and another 8 veterinary residents of different specialties (0.9%).

Learning Styles

Most respondents (459) were unimodal learners (52.6%), while 414 exhibited two or more learning styles (47.4%), as shown in Figure 1. The largest unimodal preference was read/write, followed by aural, kinesthetic, and visual, as shown in Figure 2. The distribution of learning styles among respondents was significantly different between males and females: female re-

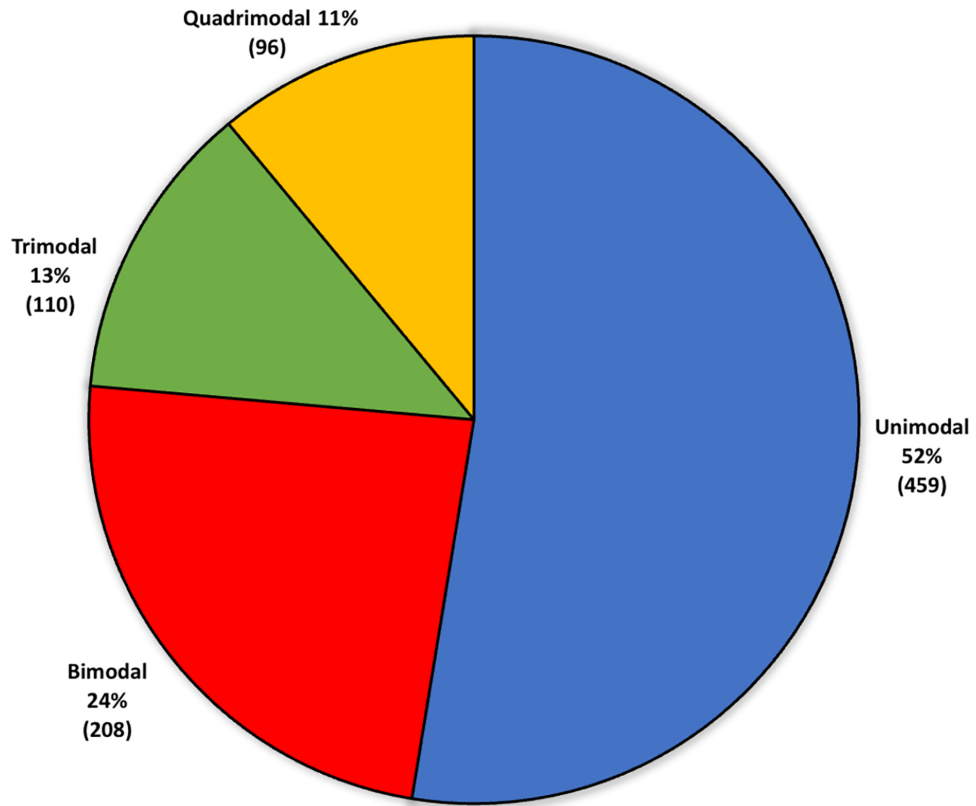


Figure 1: Distribution of the number of VARK learning style preferences among the whole population

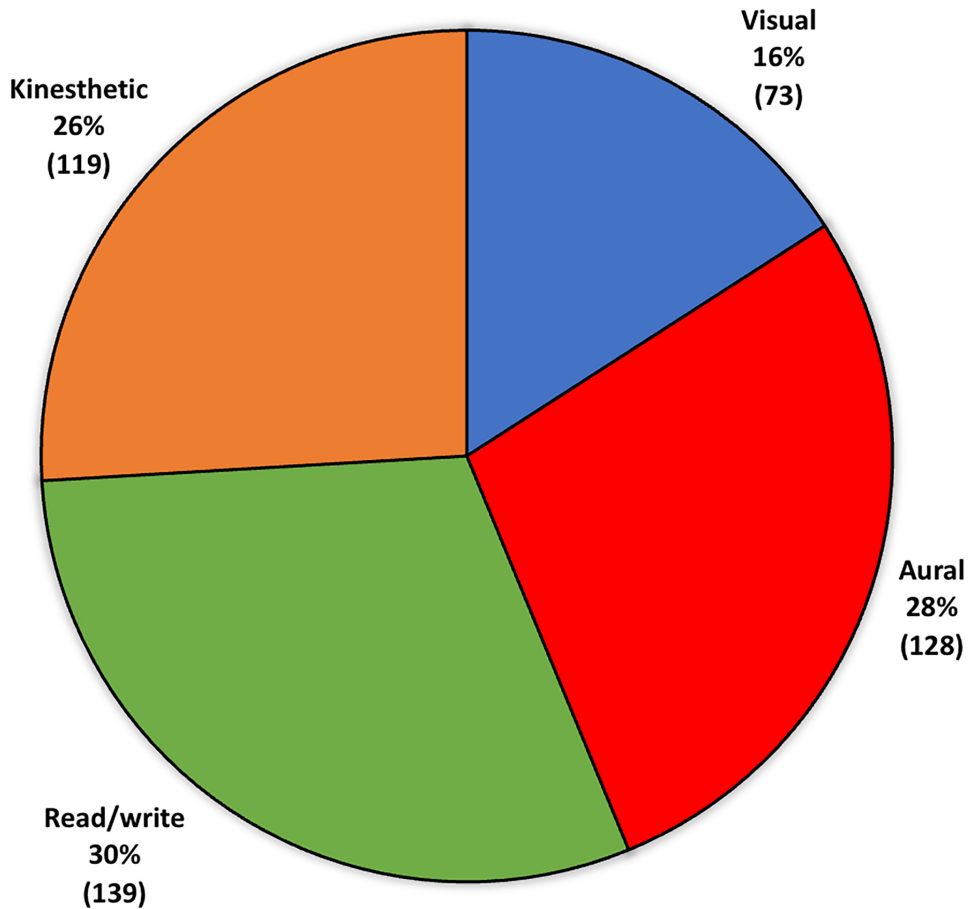


Figure 2: Distribution of VARK learning style preferences among unimodal learners

spondents were less likely to prefer aural ($\chi^2 = 10.088, p = .001$), read/write ($\chi^2 = 9.834, p = .002$), and kinesthetic ($\chi^2 = 8.785, p = .003$) styles compared with males. The distribution was also significantly different according to generation: Baby Boomers and the Silent Generation were significantly less likely to prefer the visual style ($\chi^2 = 3.839, p = .050$), and Millennials were significantly less likely to prefer the aural style ($\chi^2 = 8.032, p = .005$) compared with Generation Z. Moreover, Baby Boomers and the Silent Generation were about 54.2% less likely to be multimodal learners compared with Generation Z ($\chi^2 = 4.291, p = .038$). This was also confirmed by comparing the year of graduation: respondents who graduated earlier were less likely to be multimodal learners compared with those who graduated later ($p = .046$). When analyzing participants based on survey language, Italian were less likely to prefer visual ($\chi^2 = 14.863, p < .001$) and kinesthetic ($\chi^2 = 18.580, p < .001$) styles compared with English speakers, while French speakers were less likely to prefer the read/write style ($\chi^2 = 10.150, p = .001$). Furthermore, Italians, Spanish, and French were all less likely to prefer aural style compared with English speakers. To confirm these results the responses were analyzed not only by the survey's language but also by the participants' declared country of origin. Nevertheless, regarding read/write style, the difference was statistically significant only for people from France ($\chi^2 = 4.728, p = .030$) but not from Belgium.

According to occupation, there were also significant differences: qualified veterinarians were less likely to have a preference for the read/write style compared with students ($\chi^2 = 4.449, p = .035$), and respondents with another occupation were less likely to prefer kinesthetic learning ($\chi^2 = 5.639, p = .018$).

There was agreement between the questionnaire results and the self-perceived preferences for only 217 of the 873 respondents (24.9%). Significant differences were observed according to age: the oldest generation was 2.4-times more likely to agree compared with Generation Z ($p = .015$). Millennials and Generation X showed a slightly better agreement compared with the youngest generation, but it was not statistically significant ($p = .095$ and $.173$, respectively).

DISCUSSION

This study is the first to examine the distribution of VARK learning style preferences not only among students but also among educators within a large multi-institutional and multi-lingual population.

Most of our respondents were unimodal learners, which agrees with many recent studies.^{14,16,18,21}

While results for visual style were similar between males and females, we found that female respondents were less likely to prefer aural, read/write, or kinesthetic styles compared with males. No significant gender differences have been previously reported.^{2,11,14-17,22} However, some studies have found that men and women do listen differently. Based on magnetic resonance imaging results, the evidence suggests that the problem-solving areas of the brain are more active for men when they listen, whereas the more relational and empathic areas of the brain are active for women.²³ This could mean that women prefer to use their listening skills for human interaction instead of that for active learning.

Regarding generational differences, Baby Boomers were significantly less likely to prefer visual style and Millennials were

significantly less likely to prefer auditory style compared with Generation Z. These generational differences have already been highlighted as Baby Boomers tend to prefer a traditional teaching method compared with the youngest generation, which favors multimedia approaches.²⁴ Moreover, the younger people are, the less time has passed since classic theoretical lessons in school, so they tend to be more accustomed to passive listening to teachers' explanations, hence the preference for an aural learning style.¹

Moreover, according to our results, the oldest generation (Baby Boomers and Silent Generation) is significantly less likely to be multimodal learners and, thus, less flexible to adjust to different styles, compared with the youngest generation. Previous research found the exact contrary, stating that as people get older, they tend to lose their dominant style and start to adapt to different styles according to the particular phase of their lives.²⁵ This difference may be attributed to the veterinary profession. In particular, experienced veterinarians, especially those not involved in education, might be less flexible in changing their already-acquired learning and practical skills.

Explaining the differences in learning style preferences based on the language of the survey is challenging. For instance, Italian, French, and Spanish speakers were all less likely to prefer aural style compared with English speakers. This finding is unexpected, given that Romance languages typically emphasize verbal explanations.²⁶ Additionally, it is surprising that Italians, who are globally recognized for their expressive nonverbal communication with hand movements,²⁷ are less likely to be kinesthetic learners. Furthermore, the observation that French speakers are less likely to be readers compared with English speakers may be linked to recent statistics from the World Book Day, which revealed that only 2.6% of French people consider reading a main activity, despite French's rich literary heritage.²⁸ These findings suggest that cultural and linguistic factors significantly influence learning style preferences. Cultural norms, practice, and education may shape how individuals prefer to learn. Additionally, linguistic structures and educational systems within different countries can impact the development of learning preferences. The unexpected nature of these results highlights the complexity of the relationship between language, culture, and learning styles, warranting further investigation.

Moreover, according to occupation, the category of qualified veterinarian was found less likely to prefer the read/write style compared with students. It is possible that, once studies are finished, qualified veterinarians are less likely to keep reading and studying, and switch to a more practical approach to learning.

Regarding the agreement between the VARK results and self-perceived preferences, the oldest generation was more than twice as likely to correctly identify their learning style compared with Generation Z ($p = .015$). Similarly to our results, a previous study revealed that only 15% of students could accurately predict their VARK results.²⁹ However, there is a notable lack of research on educators' learning styles and their self-awareness, thus further studies are needed to explore this area.

The results of this study describe the VARK preferences of a large veterinarian and future veterinarian population from a wide variety of countries. The VARK questionnaire may be a way to improve self-awareness in university students, as most of them seem to be unaware of their preferences. However, for some authors providing students with their VARK category preferences may not have any appreciable effect on the

course's performance.¹³ Although the benefits of personalized study strategies may be uncertain, educators must keep students actively engaged in their learning. Therefore, any effort to understand students' characteristics can help enhance engagement and motivation, which are crucial in medical education. Thus, by customizing teaching methods, educators can boost both motivation and academic success.

Our findings indicate that veterinary students predominantly exhibit multimodal learning preferences and are well-adapted to auditory and visual learning. However, cultural differences play a role; for instance, French students might be less enthusiastic about reading and Italians might be less inclined toward hands-on activities compared with their English colleagues. Additionally, speakers of Romance languages tend to have a lower preference for aural learning compared with English speakers. These insights should guide instructors in designing effective teaching strategies.

An initial assessment with the VARK survey at the beginning of the course may allow students to better understand their learning preferences and teachers to know their current population. Moreover, this could also allow the provision of continuous feedback to help students identify and develop their preferred learning style and understand the difference between preferred and ideal styles. Recent studies suggest that using multimodal material for teaching would be more efficient as it covers all the learning styles.³⁰ However, this can be time-consuming. Here we provide some specific recommendations based on our study population, which are intended only as a general guide and not as a substitute for teachers' judgment.

For English speakers, who seem to benefit from auditory learning, the following strategies may be helpful:

1. Recordings of classes: providing recordings allows students to listen to them multiple times, reinforcing their understanding.
2. Class discussion and debates: encouraging dialogue and question-and-answer sessions help students process information effectively.
3. Additional resources: recommending podcasts and audiobooks related to veterinary medicine could aid in better retention of information.

In Romance-language countries, students benefit from a visual learning environment: graphics, videos, practical activities, and simulation can effectively reinforce concepts. Specifically, for French people, the following tips could be useful:

1. Concise summaries: facilitating and shortening reading activities during the study could be particularly useful for students not motivated to read.
2. Visual presentations: stimulating their natural predisposition to visual learning may improve knowledge retention.

On the other hand, for Italians, this recommendation could be applied:

1. Practical activity with step-by-step guidance: providing clear instructions and constant support during hands-on tasks may motivate students who have a lower preference for kinesthetic learning.

Finally, with the new generation growing up surrounded by technology, learning platforms have become invaluable resources, enabling students to access study material in different formats.

Teaching is an evolving science, and adapting different techniques to meet the needs of the students is crucial. The results of our study may have important implications for veterinary curriculum development. The predominance of multimodal learning preferences, particularly among Generation Z students, highlights the need for adopting diversified teaching strategies. Curriculum designers should incorporate a balanced mix of visual, aural, read/write, and kinesthetic methods to better address the spectrum of learning styles of the students. Moreover, given the generational and cultural variability, it is advisable to embed periodic assessments of the learning preferences (VARK surveys at course entry, for example) to provide adaptive teaching approaches throughout the program. Educators should also adjust eventual mismatches between their own teaching styles and students' learning preferences. These measures may enhance learner engagement, improve knowledge retention, and foster a more inclusive educational environment that aligns with the current profile of veterinary students.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

AUTHOR CONTRIBUTIONS

Conceptualization: V Vitale, G van Galen, D Verwilghen; Methodology: V Toppets, G Barsotti, J Viu; Formal Analysis: M Ward; Investigation: V Toppets, G Barsotti, J Viu; Writing – Original Draft: V Vitale, M Ward; Writing – Review & Editing: D Verwilghen; Supervision: G Van Galen, D Verwilghen; Project Administration: D Verwilghen.

ETHICS APPROVAL

The study protocol was approved by the ethics committee of the -blinded for peer review- (HREC 2020/327) in 2020.

DATA ACCESSIBILITY

Rough data that support the findings of this study are openly available in icloud at https://www.icloud.com/icloudrive/06fdNWBLsvkW0D4mjFChpQDOA#Data_VARK.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

PEER REVIEW

This manuscript has been peer reviewed.

ANIMAL STUDIES

N/A

REFERENCES

- 1 Samarakoon L, Fernando T, Rodrigo C, Rajapakse S. Learning styles and approaches to learning among medical undergraduates and postgraduates. *BMC Med Educ.* 2013;13(1):42. <https://doi.org/10.1186/1472-6920-13-42>. Medline: 23521845

- 2 Aboregela AM. Learning style preference and the academic achievements of medical students in an integrated curriculum. *J Med Life*. 2023;16(12):1802–7. <https://doi.org/10.25122/jml-2023-0366>. Medline: 38585538
- 3 Foster N, Gardner D, Kydd J, Robinson R, Roshier M. Assessing the influence of gender, learning style, and pre-entry experience on student response to delivery of a novel veterinary curriculum. *J Vet Med Educ*. 2010;37(3):266–75. <https://doi.org/10.3138/jvme.37.3.266>. Medline: 20847336
- 4 Vitale V, Bonelli F, Conte G, Orsetti C, Galen GV, Verwilghen D, et al. Novel board game versus active case-based discussion to teach final-year veterinary students the diagnostic approach to clinical cases. *J Vet Med Educ*. 2023;50(4):392–8. <https://doi.org/10.3138/jvme-2022-0016>. Medline: 39500496
- 5 Dunn R, Giannitti MC, Murray JB, Rossi I, Geisert G, Quinn P. Grouping students for instruction: effects of learning style on achievement and attitudes. *J Soc Psychol*. 1990;130(4):485–94. <https://doi.org/10.1080/00224545.1990.9924610>. Medline: 2232737
- 6 Fleming ND, Mills C. Not another inventory, rather a catalyst for reflection. *To Improve the Academy*. 1992;11(1):137–55. <https://doi.org/10.1002/j.2334-4822.1992.tb00213.x>
- 7 DeCoux VM. Kolb's learning style inventory: a review of its applications in nursing research. *J Nurs Educ*. 1990;29(5):202–7. <https://doi.org/10.3928/01484834-19900501-04>. Medline: 2162927
- 8 Harasym PH, Leong EJ, Lucier GE, Lorscheider FL. Gregorc learning styles and achievement in anatomy and physiology. *Am J Physiol*. 1995;268(6 Pt 3):S56–60. <https://doi.org/10.1152/advances.1995.268.6.S56>. Medline: 7598174
- 9 Khamphaya T, Pouyfung P, Yimthiang S. Enhancing toxicology achievement by the VARK and the GRSLSS-mixed models in team-based learning. *Front Public Health*. 2021;9:732550. <https://doi.org/10.3389/fpubh.2021.732550>. Medline: 35118035
- 10 LaMothe J, Billings DM, Belcher A, Cobb K, Nice A, Richardson V. Reliability and validity of the productivity environmental preference survey (PEPS). *Nurse Educ*. 1991;16(4):30–5. <https://doi.org/10.1097/00006223-199107000-00013>. Medline: 1866094
- 11 Kim RH, Viscusi RK, Collier AN, Hunsinger MA, Shabahang MM, Fuhrman GM, et al. Learning preferences of surgery residents: a multi-institutional study. *Surgery*. 2018;163(4):901–5. <https://doi.org/10.1016/j.surg.2017.10.031>. Medline: 29395237
- 12 Mozaffari HR, Janatolmakan M, Sharifi R, Ghandinejad F, Andayeshgar B, Khatony A. The relationship between the VARK learning styles and academic achievement in dental students. *Adv Med Educ Pract*. 2020;11:15–9. <https://doi.org/10.2147/AMEP.S235002>. Medline: 32021538
- 13 Husmann PR, O'Loughlin VD. Another nail in the coffin for learning styles? Disparities among undergraduate anatomy students' study strategies, class performance, and reported VARK learning styles. *Anat Sci Educ*. 2019;12(1):6–19. <https://doi.org/10.1002/ase.1777>. Medline: 29533532
- 14 Tonkaboni A, Pareshkooh MK, Manafi S, Mendes RA, Kharazifard MJ. Different scoring methods of the VARK questionnaire to evaluate dentistry Students' learning styles. *Eur J Dent Educ*. 2023;27(3):515–9. <https://doi.org/10.1111/eje.12835>. Medline: 35791846
- 15 Kim RH, Kurtzman SH, Collier AN, Shabahang MM. The learning preferences of applicants who interview for general surgery residency: a multiinstitutional study. *J Surg Educ*. 2016;73(6):e136–e41. <https://doi.org/10.1016/j.jsurg.2016.06.013>. Medline: 27424095
- 16 Hassanzadeh S, Karimi Moonaghi H, Derakhshan A, Masoud Hosseini S, Taghipour A. Preferred learning styles among ophthalmology residents: an iranian sample. *J Ophthalmic Vis Res*. 2019;14(4):483–90. <https://doi.org/10.18502/jovr.v14i4.5457>. Medline: 31875104
- 17 Urval RP, Kamath A, Ullal S, Shenoy AK, Shenoy N, Udupa LA. Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. *Adv Physiol Educ*. 2014;38(3):216–20. <https://doi.org/10.1152/advan.00024.2014>. Medline: 25179610
- 18 Padmalatha K, Kumar JP, Shamanewadi AN. Do learning styles influence learning outcomes in anatomy in first-year medical students? *J Family Med Prim Care*. 2022;11(6):2971–6. https://doi.org/10.4103/jfmpc.jfmpc_2412_21. Medline: 36119314
- 19 Thepsatitporn S, Pichitpornchai C. Visual event-related potential studies supporting the validity of VARK learning styles' visual and read/write learners. *Adv Physiol Educ*. 2016;40(2):206–12. <https://doi.org/10.1152/advan.00081.2015>. Medline: 27105739
- 20 Hiebert EC, Wills RW, Lathan P. Mucous membrane color assessment variability of veterinary students using either colorimetric or word-based scales. *J Vet Med Educ*. 2019;46(1):77–80. <https://doi.org/10.3138/jvme.0317-042>. Medline: 30418816
- 21 Nocera I, Vitale V, Conte G, Sgorbini M, Barsotti G. Evaluation of veterinary students' suture performance according to three different instructional modalities. *Open Vet J*. 2024;14(5):1103–10. <https://doi.org/10.5455/OVJ.2024.v14.i5.3>. Medline: 38938429
- 22 Farkas GJ, Mazurek E, Marone JR. Learning style versus time spent studying and career choice: which is associated with success in a combined undergraduate anatomy and physiology course? *Anat Sci Educ*. 2016;9(2):121–31. <https://doi.org/10.1002/ase.1563>. Medline: 26301828
- 23 Phillips MD, Lowe MJ, Lurito JT, Dzmidzic M, Mathews VP. Temporal lobe activation demonstrates sex-based differences during passive listening. *Radiology*. 2001;220(1):202–7. <https://doi.org/10.1148/radiology.220.1.r01jl34202>. Medline: 11425998
- 24 Johnson SA, Romanello ML. Generational diversity: teaching and learning approaches. *Nurse Educ*. 2005;30(5):212–6. <https://doi.org/10.1097/00006223-200509000-00009>. Medline: 16170263
- 25 Martín-García AV. Estilos de aprendizaje en la vejez. Un estudio a la luz de la teoría del aprendizaje experiencial (Learning styles in old age. A study in light of experiential learning theory). *Revista Española de Geriatria y Gerontología (Spanish Journal of Geriatrics and Gerontology)*. 2003;38(5):258–65.
- 26 Vinay JP, Darbelnet J, Sager JC, Hamel MJ. *Comparative Stylistics of French and English: A Methodology for Translation*. J. Benjamins; 1995.
- 27 Marentette P, Pettenati P, Bello A, Volterra V. Gesture and symbolic representation in Italian and English-Speaking Canadian 2-Year-Olds. *Child Dev*. 2016;87(3):944–61. <https://doi.org/10.1111/cdev.12523>. Medline: 27079825
- 28 Walfisz J. World Book Day: Which European countries are the biggest readers? And who's reading the least? *Euronews*; 2023.
- 29 Breckler J, Joun D, Ngo H. Learning styles of physiology students interested in the health professions. *Adv Physiol Educ*. 2009;33(1):30–6. <https://doi.org/10.1152/advan.90118.2008>. Medline: 19261758
- 30 Childs-Kean L, Edwards M, Smith MD. Use of Learning Style Frameworks in Health Science Education. *Am J Pharm Educ*. 2020;84(7):ajpe7885. <https://doi.org/10.5688/ajpe7885>. Medline: 32773837

AUTHOR INFORMATION

Valentina Vitale, DVM, PhD, Dipl. ECEIM (<https://orcid.org/0000-0003-2273-5377>), is an Associate Professor at Universidad CEU-Cardenal Herrera, CEU Universities, Facultad de Veterinaria, Departamento de Medicina y cirugía animal, 46115 Alfara del Patriarca, Valencia, Spain. Email: valentina.vitale@uchceu.es. Her research interests include equine internal medicine, in particular gastroenterology and cardiology, and veterinary clinical education.

Michael P. Ward, BVSc (Hons), MSc, MPVM, PhD, DVSc, FACVSc (<https://orcid.org/0000-0002-9921-4986>), is a veterinary epidemiologist in the Sydney School of Veterinary Science, University of Sydney, PMB 4003 Narellan NSW 2567, Australia. Email: michael.ward@sydney.edu.au. His research interests include analytical epidemiology, disease modelling, mapping and spatial analysis, disease emergence and One Health.

Gaby van Galen, DVM, MSc, PhD, DES, Dipl. ECEIM, Dipl. ECVECC (<https://orcid.org/0000-0002-0689-7141>), is a senior clinician at Goulburn Valley Equine Hospital, University of Melbourne, Congupna, VIC 3633, Australia, Professorial Fellow of the University of Melbourne, and Associate Professor at the Sydney School of Veterinary Science, University of Sydney, NSW, Australia. Email: gaby.galen@sydney.edu.au. Her research interests include equine medicine and critical care topics, mainly focused on kidney disease, antimicrobial stewardship, and veterinary clinical education.

Vinciane Toppets, DMV, PhD (<https://orcid.org/0009-0008-5654-4003>), is a Senior Teaching and Research Assistant in the Department of Morphology and Pathology, Faculty of veterinary medicine, Univer-

sity of Liege, Avenue de Cureghem B43, 4000 Liege, Belgium. Email: vtoppets@uliege.be. His research interests include digital histology and pathology, soft skills, and veterinary medical education.

Giovanni Barsotti, DVM, PhD (<https://orcid.org/0000-0002-6529-3348>), is an Associate Professor at the Department of Veterinary Science, University of Pisa, via Livornese snc, San Piero a Grado, 56124 Pisa, Italy. Email: giovanni.barsotti@unipi.it. His research interests include veterinary ophthalmology and surgery, and veterinary education.

Judit Viu, DVM, MSc, PhD, Dipl. ECEIM (<https://orcid.org/0000-0001-5166-4139>), is a clinician at Fundació Hospital Clínic Veterinaria UAB, Universitat Autònoma Barcelona, Cerdanyola del Vallès 08190, Barcelona, España. Email: judit.viu@uab.cat. Her research interests include equine medicine and critical care topics, mainly focused on acid base, fluidotherapy, and innovation on veterinary clinical education using AI and home-made simulators.

Denis Verwilghen, DVM, MSc, PhD, DES, Dipl. ECVS, Dipl. EVDC(eq) (<https://orcid.org/0000-0002-4174-6007>), is Clinical Director and Senior Surgeon at Goulburn Valley Equine Hospital, University of Melbourne, Congupna, VIC 3633, Australia, Professorial Fellow of the University of Melbourne, and Associate Professor at the Sydney School of Veterinary Science, University of Sydney, NSW, Australia. Email: denis.verwilghen@sydney.edu.au. His research interests include equine surgery with a focus on equine dentistry, surgical site infection prevention, antimicrobial stewardship, and veterinary clinical education.