# Teaching Nutrition to the Left and Right Brain: An Overview of Learning Styles

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**ABSTRACT**

Functioning effectively as a veterinarian requires proficiency in multiple learning styles. Whether the goal is to design a nutrition course, plan a veterinary curriculum, or help students develop interpersonal, communication, and leadership skills, students benefit when content, design, and delivery are balanced to meet their learning-style preferences. An overview of four different learning style models is presented: the Myers-Briggs Type Indicator (MBTI), Kolb's Learning Style Model, the Felder-Silverman Learning Style Model, and the Herrmann Brain Dominance Instrument (HBDI). A whole-brain approach (HBDI) was used in the development and implementation of the small-animal clinical nutrition course at the University of Minnesota College of Veterinary Medicine. One educational objective of this course is to help students develop mental dexterity, increasing their proficiency in both their preferred and their less preferred modes of learning. The instructional goals are to deliver the content of the small-animal clinical nutrition course through exercises that meet the needs of learners in each thinking quadrant (left and right, cerebral and limbic) at least part of the time. Examples of exercises are presented to portray a balanced or whole-brain approach to teaching clinical nutrition.

**Key words:** clinical nutrition, learning styles, lesson design, teaching styles

## INTRODUCTION

Veterinary students have different learning styles, strengths, and preferred modes of thinking and learning. Learning-style preferences affect how a student processes, stores, retrieves, and makes sense of information. Some students focus on facts and data, while others are more interested in theories and concepts. Some students respond better to visual forms of information, such as maps, pictures, and diagrams, while others learn better from verbal explanation, either written or spoken. Some learn best actively and interactively, while others learn better introspectively and individually.

In order to thrive in their profession, veterinarians must be competent in using all learning styles. The practice of veterinary medicine requires characteristics of *sensing* learners, such as good observation skills as well as methodical and careful attention to detail; it also requires characteristics of *intuitive* learners, including innovation, curiosity, and the ability to apply facts to interpretation and theory. Veterinarians must develop both *visual* and *verbal*[1] learning skills, since information presented in a DVM curriculum as well as in an examination room will come in both forms. A student or veterinarian will miss much of that information if he or she cannot function well in both of those modes.

Teaching predominantly in a manner that favors students' less preferred method of learning can increase their discomfort and stress to the point of impairing learning. On the other hand, when students are taught exclusively in their preferred learning style, they are not likely to develop the *mental dexterity*[2] needed to reach their full potential, both in school and as professionals. Ideally, education that promotes optimal learning should help students build their skills in both their preferred and their non-preferred learning modes. This ''whole-brain'' approach takes advantage of all the mental processes by teaching in all the various modes of learning.

There are several learning style models with slightly different ways of categorizing the different modes of learning. An understanding of the various modes provides a framework for designing teaching materials and curricula with the desired whole-brain scope. The goal should be to make sure that learning needs are met in each category at least part of the time. Instructing in this manner is referred to as teaching ''around the cycle.''[2]

At the University of Minnesota College of Veterinary Medicine (UMN CVM), veterinary nutrition is taught in two courses. In the first year of the DVM curriculum, students take a required two-credit course, Principles of Nutrition, which reviews nutrient metabolism, feeds, and food-production systems of the major domestic species and companion animals. In the third year, a 2.5-credit small-animal clinical nutrition course is offered. This course is a core requirement for the small-animal and mixed-animal tracks and is one of the later pre-clinical courses. This course was designed to provide opportunities to practice applying the clinical reasoning process when developing a nutritional management plan for patients. The first part of the course emphasizes the importance of nutrition in maintaining wellness with appropriate life stage nutrition; the remainder emphasizes the application of clinical nutrition in managing the more common small-animal diseases. This is modeled through application of the American College of Veterinary Nutrition (ACVN) iterative process,[3] called the ''Circle of Nutrition'' (CN; see Figure 1.) The CN begins with an assessment of the animal (any species), the diet, and the feeding management. Once these factors are assessed, a recommendation is made, and the process begins again to

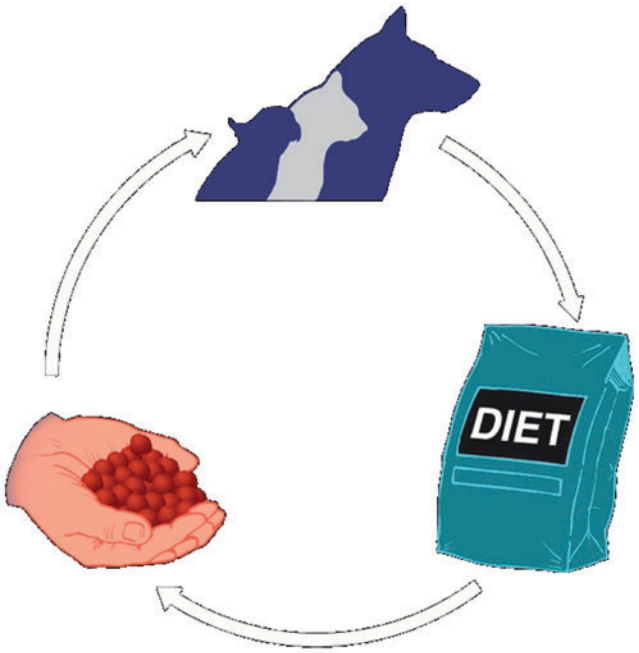


**Figure 1: Completing the "Circle of Nutrition" involves an iterative process to assess animal factors, dietary factors, and feeding-management factors.**

evaluate the success of the recommendation or the need for modification.[4] During course development, the author wanted to optimize learning of clinical nutrition and to find ways to promote the development of students' mental dexterity prior to the clinical year. Data on the performance of previous students in their clinical year indicated a lack of both competence and confidence in assessing and comparing pet-food products and making diet recommendations for the various life stages of pets. These core competencies were identified as learning objectives on which to focus teaching efforts with a whole-brain approach. The instructional goal was to teach "around the cycle" by designing and delivering content on pet-food labeling, regulations, and life stage nutrition in each of the different learning-style modes.

The remainder of this article presents a brief overview of the major learning-style models and some specific examples used in applying these to the instructional goals of the small-animal clinical nutrition course.

## LEARNING STYLE MODELS

### The Myers-Briggs Type Indicator (MBTI)

The MBTI classifies students according to their preferences on scales developed by reference to Carl Jung's theory of psychological types:[5,6]

- *Extraverts*, who focus on outer world of people and are more likely to try things out, versus *introverts*, who focus on the inner world and prefer to think things through
- *Sensors*, who are practical, detail oriented, and fact focused, versus *intuitors*, who are imaginative, creative, and focused on concepts and possibilities
- *Thinkers*, who are skeptical and make decisions based on logical reasoning and rules, versus *feelers*, who make decisions based on a personal or humanistic sense of appreciation
- *Judgers*, who are precise and set and follow the plan or schedule, versus *perceivers*, who are flexible and adapt to changes in the status of things

The MBTI type preferences can be combined to represent 16 different learning-style types. Traditionally, the veterinary curriculum has been oriented toward the learning preferences of the ISTJ: toward introverts with didactic lectures, individual exams/assignments, and assessments; toward sensors by focusing to a greater extent on details and facts than on meaning and possibilities; toward thinkers by stressing linear, logical thinking and rules rather than interpersonal relationships and connections; and toward judgers by following a structured syllabus and setting assignment deadlines instead of exploring ideas creatively.

### Kolb's Learning Style Model

The Kolb model classifies students into four types of learners based on (1) how they take information in, by concrete experience or by abstract conceptualization, and (2) how they internalize information, by active experimentation or reflective observation:[7,8]

- Type 1, Divergers: *Concrete, reflective* learners would ask the question, "Why?" These learners would prefer explanations of how material relates to their experience and interests, preferring to diverge from a single experience to multiple possibilities. Divergers like to learn by logical instruction or hands-on exploration.
- Type 2, Assimilators: *Abstract, reflective* learners would ask the question, "What?" These learners prefer information presented in a logical, organized fashion and benefit from time for reflecting. Assimilators prefer lectures for learning, or conversations that are thoughtful and logical. They also learn through demonstrations.
- Type 3, Convergers: *Abstract, active* learners would ask the question, "How?" These learners prefer opportunities for active learning of well-defined exercises or trial and error in a safe or low-risk environment, making small and careful changes. Computer-based learning is an effective method for these learners.
- Type 4, Accommodators: *Concrete, active* learners would ask the question, "What if?" These learners prefer to apply class material in new situations to solve real problems. Accommodators have a strong preference for doing rather than thinking and prefer hands-on practical learning rather than lectures.

Traditionally, a large proportion of the veterinary curriculum has been delivered as formal presentations or lectures, which would serve the preferences of Type 2 learners. In order to better meet the needs of all types of learners, the instructor could explain the relevance of each topic by relating it to clinical patients (Type 1); present basic topic information (Type 2); build exercises to give students

opportunities to practice the methods (Type 3); and encourage exploration of applications (Type 4), such as discovery of an unknown or designing a new diagnostic test. This instructional approach would be an example of ''teaching around the cycle.''

### Felder-Silverman Learning Style Model[9, 10]

This learning-style model classifies students based on their answers to four questions:

1. What type of information do you preferentially receive: sensory (sights, sounds) or intuitive (memories, thoughts, insights)? The sensing learner is concrete and practical, oriented toward facts and procedures; the intuitive learner is more comfortable with abstract concepts and theories and is more likely to be a rapid and innovative problem solver. This scale is the same as the sensing–intuitive scale on the MBTI.
2. What type of sensory information is most effectively perceived: visual (pictures, diagrams, demonstrations) or verbal (written and spoken) explanations?
3. How do you prefer to process information: actively (physical activity or active discussion) or reflectively (through introspection)? This scale is the same as the active–reflective scale of the Kolb model and is related to the extrovert–introvert scale of MBTI.
4. How does learning typically progress to understanding: sequentially (by logical, incremental steps) or globally (by large ''big-picture'' jumps)?

Felder and Soloman developed the Index of Learning Styles (ILS), a 44-question self-assessment tool available on the World Wide Web. The ILS is available free of charge for instructors or students who wish to use it to assess their learning preferences.[11, 12]

### Herrmann Brain Dominance Instrument (HBDI)

Several teaching and learning assumptions of the HBDI model are consistent with MBTI principles. Some of the shared assumptions are that people have different preferred modes of thinking and learning; that those preferences influence how information is processed, retrieved, and made meaningful; that all groups are made up of people with different thinking styles; and that effective learning is ''whole brained,'' taking advantage of all mental processes. The HBDI is based on the theory that the brain functions by processing in four interconnected regions, or ''thinking process modes'' (left, right, cerebral, and limbic), resulting in four mental quadrants or thinking styles (logician, organizer, innovator, communicator; see Figure 2). As in dominant handedness, dominance occurs naturally between the two halves of the brain and possibly between cerebral and limbic structures. The four thinking styles originate from the combination of left/right and cerebral/limbic dominance, each resulting in distinctly different thinking and behavioral characteristics. The preference to think in a certain way results in more frequent use of that particular part of the brain and, thus, in the developmentof greater competence in that set of mental activities. The HBDI, a 120-question survey, measures the strength of preference between the four brain regions (thinking process modes). Learners are classified into quadrants (see Figure 2) by their relative thinking-style preference:[13, 14]

- Quadrant A (left brain, cerebral): Logician—analytical, quantitative, factual, critical
- Quadrant B (left brain, limbic): Organizer—structured, sequential, detailed, planned
- Quadrant C (right brain, limbic): Communicator—emotional, interpersonal, kinesthetic
- Quadrant D (right brain, cerebral): Innovator—imaginative, synthesizing, visual, holistic

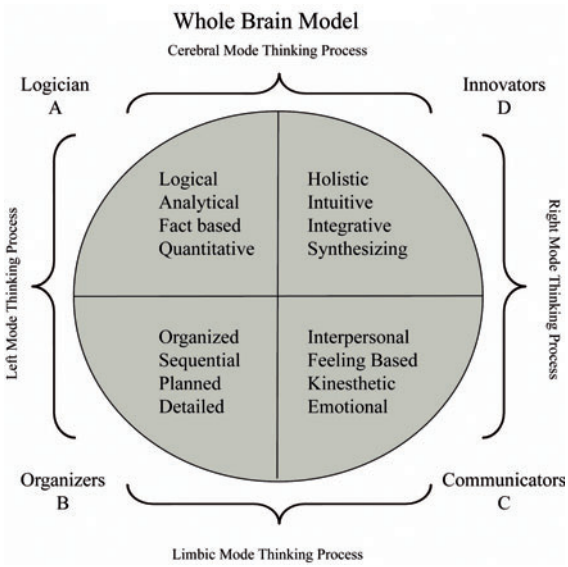


**Figure 2: The Whole Brain Model of Learning. Adapted from Herrmann International 1999.[14]**

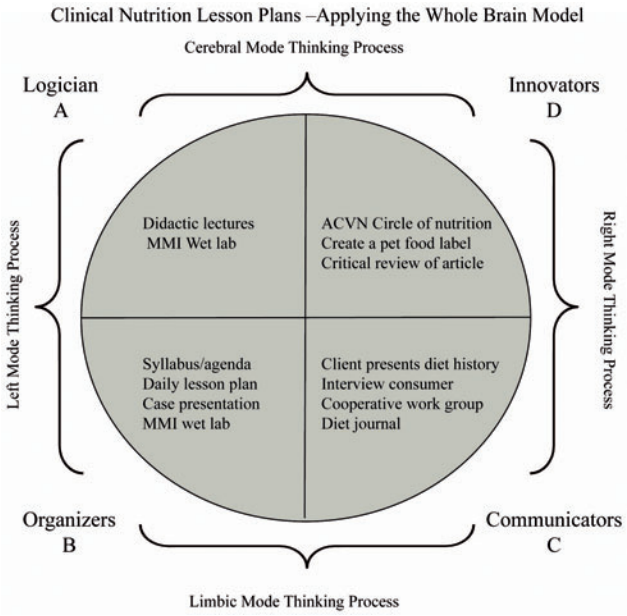


**Figure 3: Clinical nutrition exercises representing a balanced lesson plan through application of the Whole Brain Model of Learning. Adapted from Herrmann International 1999.[14]**

Students are more comfortable and proficient when instruction meets the needs of their individual thinking preference. Historically, the veterinary curriculum has been designed to predominantly favor left-brain learners. The left-brain approach to teaching has dominated in part because faculty tend to favor their own learning style or because they teach the way they were taught. But recent studies[15,16] have identified that veterinary graduates lack competence in non-technical or life skills, particularly those relating to teamwork, communication, and professionalism. Such skills are becoming increasingly recognized as essential in the curriculum as well to success in the veterinary profession. These non-technical skills can also be developed when instructional materials are delivered in a balanced, whole-brain approach. When balance is achieved, all students are taught partially in the manner they prefer, increasing their comfort and receptiveness to the material, and partially in their less-preferred modes, allowing them to learn and practice skills and problem solving through a different way of thinking. This may not initially be comfortable, but it helps develop a more balanced ''mental dexterity'' and improves learning of the skills students will need to become fully effective veterinary professionals.

In developing the small-animal clinical nutrition course at UMN, a whole-brain approach was used to try to increase the teaching effectiveness for a limited number of core competencies: pet-food labeling and regulations, comparisons of pet-food products (assessing diet factors), and life stage nutrition (animal factors). The instructional goal was to work with the diverse learning and thinking styles of the class by providing more balanced lesson plans with activities for each HBDI preference.

Instructional strategies would be different to meet the needs of learners from each quadrant (see Table 1). The Logician (quadrant A) learns well through lectures filled with facts and details, assignments from the textbook, or the presentation of research findings and the application of theory. The Organizer (quadrant B) is a learner who does well when the outline is presented and followed; checklists, worksheets, problem-solving exercises with sequential steps, and presentation of sets of procedures are well received. The Communicator (quadrant C) learns well with cooperative learning and group discussions and by sharing personal experiences or conducting interviews. The Innovator (quadrant D) learns best through creating or synthesizing materials or by brainstorming and performing a critical review of materials.

At UMN, the balanced lesson plan for small-animal clinical nutrition includes the following items (see Figure 3):

1. Agenda (quadrant B): The syllabus lists a schedule of topics and exercises that will be covered each day.
2. Overview (quadrant D): At the beginning of the course, the ACVN interactive process is introduced, with the explanation that it will be used each day and with each clinical case to practice the clinical reasoning process used to make a nutritional assessment and recommendations.
3. Warm-up (quadrant C): A client visits the classroom to model the process of taking a diet history. He or she brings along not only information about his or her pet but also many questions about different pet-food products, ingredients, and the nutritional needs of pets in various life stages.
4. Factual lecture (quadrant A): Throughout the first part of the course, there are lectures presenting information on the pet-food industry, the American Association of Feed Control Officials and their regulation of pet-food labels, and life stage nutrition of the dog and cat.
5. Concrete examples (quadrant B): A laboratory session sponsored by the Mark Morris Institute provides many examples of feed ingredients and pet-food labels to compare. An accompanying laboratory worksheet provides practice exercises. Additional questions are also assigned, presenting cases with client questions about ingredients and label information that will appeal to learners from both quadrant C and quadrant D.
6. Field trip: Students go on a self-guided tour of a pet-food retail store. They have a checklist to examine specific types of products (quadrant A) and are also assigned questions and asked to interview consumers about their perceptions of pet foods and pet-food labels (quadrant C).
7. Diet journal (quadrant C): Students keep a three-day journal of their own diet. They may be asked to make an estimate of their nutrient intake prior to the exercise and an assessment after the journaling process, as well as to make comparisons between human and pet food labels, to determine amounts of specific nutrients in their diet, or to discuss the role of nutrition in maintaining wellness. The learning objectives may vary depending on the specific tasks assigned. Depending on how the assignments are designed, this diet journal lesson plan can potentially require any or all four quadrants of thinking. Students gain an appreciation of the importance of an accurate diet history, label information, and the concept of complete and balanced nutrition, as well as of how additional supplements may affect the nutrient profile.
8. Brainstorming or mind-mapping (quadrant D): Students work in small groups to brainstorm and design a better pet-food label. After learning about the label requirements during lectures, gaining some hands-on experience in reading and comparing labels both in the laboratory session and at the pet-food store, then interviewing pet owners about their perceptions and opinions of pet-food products and labels, they are asked to synthesize this material and to design improvements.
9. Critical review of material (quadrants C and D): Students are assigned to read a popular lay publication's annual review of pet foods, which ranks the top products and identifies products to avoid. After reading the article, students must critically review the editor's system of evaluation and ranking and offer their veterinary interpretation of the article to a person posing as a client. This process requires synthesis and application of material previously presented.

**Table 1: Expectations of learners within the Herrmann Brain Learning Style Model (HBDI)**

| Quadrant A—Logicians | Quadrant D—Innovators |
|---|---|
| **Expect:** | **Expect:** |
| • Brief, clear, precise information | • Spontaneous, surprising approaches |
| • Materials direct and to the point | • Playful and fun environment |
| • Research references | • Pictures, metaphors, overviews |
| • Textbook reading | • Discovery of content |
| • Quantifiable numbers, data sets | • Freedom to explore |
| • Opportunity to ask challenging questions | • Quick pace, variety of formats |
| • Subject-matter expertise | • New ideas and concepts |
| • Presentation consistent with goals, objectives | • Connection to the big picture |
| **Are frustrated by:** | **Are frustrated by:** |
| • Off-the-track presentation | • Lack of connection to other concepts |
| • Apparent illogical content | • Too structured, predictable |
| • Expression of emotions or excessive ''chatter'' | • Too much detail |
| **Quadrant B—Organizers** | **Quadrant C—Communicators** |
| **Expect:** | **Expect:** |
| • Organized, consistent approach | • Group discussion and involvement |
| • Distinct beginning, middle, and end | • Kinesthetic, use of all senses |
| • Explanation of how it will happen | • Hands-on learning |
| • Opportunity to practice and evaluate | • Personal connection with teacher/group |
| • Practical applications | • Good attitude, enthusiasm |
| • Concrete examples | • Personal touch, informality |
| • Clear instructions and expectations | • To have their feelings respected |
| • Consistency and follow-through | • Empathy and consideration of their needs |
| **Are frustrated by:** | **Are frustrated by:** |
| • Absent, unclear, or changing agenda | • Lack of participation, team or pair exercises |
| • Disorganization, poor sequencing | • Dry, unenthusiastic approach |
| • Unstructured, unpredictable events | • Few opportunities for social interaction |
| • Lack of closure, ending late | • Impersonal approach or examples |

10. Summary exercise (quadrants A–D): Near the end of the course, as a final project or an examination exercise, students are presented with a clinical case (a large-breed puppy, for example) and asked to perform a complete nutrition assessment. Students review the diet history and evaluate a pet-food label from a lesser-known product. They must interpret the information in light of the specific life stage needs of the patient.

Not all of the above exercises are used every time the course is taught. Ideally, however, at least two exercises from each of the four thinking quadrants should be included in the instructional plan for each offering of the course in order to achieve a balance of teaching styles. Achieving balanced teaching should not require a major transformation in teaching clinical nutrition, or any other clinical material. Traditional lecture-based teaching will meet most of the needs of left-brain-dominant learners; case-based materials, with active or cooperative components, lend themselves easily to exercises adapted to suit those learners who do not thrive in a traditional lecture format.

## SUMMARY

There is obvious overlap among the various learning-style models. In fact, there is a correlation between MBTI and HBDI preferences.[17] It is perhaps less important *which* learning-style model is applied than to consider *one* of them

and to use these principles as a guide to providing balanced instruction that meets the needs of all students in the class. A balanced approach can prevent major mismatches between the teaching style of the instructor and the learning styles of most of the students. Instructors should be aware of their own learning preferences and how these affect their lesson plans. If mismatches are extreme, students may become frustrated, lose interest, become inattentive, and perform poorly. Instructors faced with inattentive, poorly performing students become discouraged, lose their enthusiasm, and may even become antagonistic toward their students. Both teaching and learning suffer under these circumstances. Whether the goal is to design a nutrition course, plan a veterinary curriculum, or help students develop interpersonal, communication, and leadership skills, students benefit when content, design, and delivery are balanced to meet their learning-style preferences. Ideally, a diversity of teaching styles should be used to teach around the cycle.

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