JAVE

JOURNAL OF THE ASSOCIATION OF VETERINARY TECHNICIAN EDUCATORS

OUR BIGGEST ISSUE YET!

The Need for Math Education

Oral Reports in Vet Tech Ed

Raising the Bar for Vet Ed in Europe

Hill's
Transforming Lives

Hill's Pet Nutrition is Proud to Introduce the

Veterinary **N**utritional **A**dvocate
Certificate Program

VETERINARY NUTRITIONAL ADVOCATE
Certificate Program

VNA is a FREE Online Certificate Nutrition Education Program

Enhance your ability to understand the benefits of proper pet nutrition

Complete each level to be awarded a certificate of completion as a Veterinary Nutritional Advocate for Wellness or Therapeutic Nutrition

Receive RACE CE credit

Scan the QR Code or click on this link:
https://na.hillsvna.com/en_US/vna

Journal of the Association of Veterinary Technician Educators (JAVTE)

The Journal of the Association of Veterinary Technician Educators (JAVTE), a peer-reviewed, scholarly journal, is the official publication of the Association of Veterinary Technician Educators (AVTE). Its purpose is to act as a publication for disseminating evidence-based research to people working as educators in the field of veterinary technology. The journal's emphasis is on encouraging collaboration among veterinary technology educators through scholarly inquiry relating to the understanding and/or improvement of educational processes and outcomes, organizational issues in education, concepts of teaching and learning, and student engagement based upon research, observations, and experience relevant to the field.

Submission Process and Deadlines
Papers will be reviewed using the JAVTE double-blind peer-review process and should be prepared using the JAVTE author guidelines (see Editorial Policies and Peer Review Process). Submission of papers is the author's acknowledgment of and agreement to JAVTE's ethical duties of the author policy.

Editorial Board

Contents

Cover Photo Submitted By:
Jessica Leary, RVT

BOARD MEMBERS

Letter from the Incoming President of the Association of Veterinary Technician Educators

Tricia Gorham, MA, CVT
AVTE President

I hope this message finds you well and energized as we step into 2025. As always, we are incredibly grateful for your continued support and commitment to the Association of Veterinary Technician Educators. Your involvement is what makes everything we do possible, and we look forward to another year of growth, collaboration, and success.

One of the highlights of the year that we are particularly excited about is our upcoming conference scheduled for August 1-3 in Louisville Kentucky. With our theme "The Triple Crown of Teaching Excellence: Leadership, Mentorship, and Innovation", this event promises to be an incredible opportunity for networking, learning, and sharing ideas with colleagues and experts in the field. We're thrilled to offer a variety of sessions, workshops, and keynote speakers that will inspire and inform.

Whether you're a first-time attendee or a return participant, we are confident that this conference will provide invaluable insights and a chance to connect with like-minded professionals. We can't wait to see you there and engage in meaningful discussions that will shape the future of our community.

AVTE board has been extremely busy in recent months to strengthen our commitment to "One Community" including some of the highlights below:

> Engaging with leadership of all our stakeholders during the VMX conference in   January

> Moving forward with a research project centered around student success on the VTNE

> Advocacy committee launch and support for members in California and Arizona that are struggling with states looking to remove educational requirements.

Thank you for being an integral part of AVTE. Together, we can make this year—and the conference— truly unforgettable.

Wishing you a year of success, inspiration, and valuable connections.

Warm regards,
Trish

Teaching Tips...

The CARE Approach for Side-by-Side Training in Veterinary Clinics
Daniela Alvarez-Cervantes, RVT, FVTE, FFCP

Teaching side-by-side in a veterinary clinic is one of the best ways to guide team members through hands-on skill development. As a Fear Free professional, I began noticing similarities between the principles I use with animals and how I approach training my teammates. Over time, these strategies evolved into the CARE approach - Calm, Assurance, Respect, and Engagement - a method that mirrors Fear Free principles but is tailored for human learners. The goal? To create an environment that supports emotional and psychological well-being while fostering growth.

Here's how you can bring the CARE approach into your teaching:

C – Calm the Environment

Set a calm tone for learning. Just as Fear Free tactics minimize stress for pets, creating a low-stress setting helps learners feel confident and focused. Be intentional about choosing patient cases that align with the trainee's skill level. If their first experience is overwhelming, it can set a challenging precedent for future learning.

> **Example:** Start with a manageable patient or even a stuffed animal during slower clinic hours. This creates a safe space for learners to build confidence without added pressure.

A – Provide Assurance

Reassurance goes a long way. Highlight progress and celebrate small wins to build confidence. Positive reinforcement not only helps animals thrive but also encourages people to step out of their comfort zones.

> **Example:** "You're doing a great job reading the patient's signals. Your attention to keeping them comfortable is spot on."

R – Show Respect for the Learner

Everyone brings unique skills and experiences to the table. Respect their pace, perspective, and existing knowledge to build trust and mutual understanding.

> **Example:** "Let's build on your knowledge of canine anatomy to refine your palpation technique. You've got a great foundation to work from."

E – Engage in the Process

Active engagement creates a collaborative and meaningful learning experience. Encourage questions, discussions, and reflections to deepen understanding.

> **Example:** After completing a task, ask reflective questions like, "What did you notice about the patient's response during that injection? What could we try differently next time?"

CARE in Action

When you use the CARE approach, you're not just teaching skills—you're creating an environment where learners feel supported, valued, and empowered. This reflects the Fear Free principle of reducing stress and anxiety, adapted for human learners. By fostering calmness, providing assurance, showing respect, and engaging collaboratively, you'll leave a lasting impact on their confidence and growth.

Isotonic, Hypotonic, Hypertonic Solutions
Jeanette Reinhardt, LVT, MA
SUNY Delhi

I have noticed students struggling with the relation of fluids and cells. I have tried to explain this in many different ways and still would have the students look at me like I just grew an extra head. Then I decided to use a demo in lab to try to explain the differences; I tend to learn better by having an example in front of me. What to use and how to describe it then came to mind. I wanted something that would expand and show size. I also wanted some of the items to only get to a certain size while others could continue to "grow". That's when I thought about the water orbs that my kids had when they were younger. I looked in the stores and there were none to be found in my area; then I took to online and found them through a popular shopping site.

I use a water orb to show the differences in solutions. I do have two different sizes of orbs; small and large. I used three old candles (cleaned out) and then fill with some water; I do not fill all the way, usually about half way or a little less. I let

the water orbs set in the water and expand. I then just add extra water to the container until I get the solution type I am trying to explain. I keep the hypertonic solution fairly full, but have less orbs in it so that they look like they are small (I use the larger orbs for this because they have a translucent look towards the outer parts when they fill with water, which gives an illusion that they are shrinking). The Isotonic solution has the smaller orbs and I keep the water to orb mixture the same. The hypotonic solution has the giant orbs in it that tend to look like they are going to pop and appears to have less water. You will have to change out the water orbs throughout the day or if you have labs multiple days.

I let them decide which solution is which and they label each with an index card. I then ask them why they chose that and explain their reasoning to me. Usually once we get started discussing the differences, the students will then change their answers as they realized what was incorrect.

"Muscle Memory" Game
Jeanette Reinhardt, LVT
SUNY Delhi

This is a little activity that I developed/re-invented for the Animal Anatomy & Physiology course that I am teaching. We have been working on muscles of the body and I had the students fill in a chart with the muscles that they pinned during lab and then they wrote the origin and insertion and then the action. I wanted to help enforce that learning somehow and I tried this approach. The set-up is what takes the most time. Typing up the different information and cutting and taping to cut card stock is going to take the majority of time to accomplish. I took regular size card stock

and cut it into quarters and then taped the different sections to different colors. For example; I kept all the muscles on red card stock and then used purple for the origin and yellow for the insertion point and finally blue for the action that occurs.

You will also need to figure out a key to be able to check students' answers; you do get it memorized pretty quickly if you have several labs (I have seven labs that I am in). I numbered each card from 1 to ? and then I would put those numbers onto the key (which is actually the chart that I had them fill in and turn in as a lab assignment)

MUSCLE–BONE ACTION CHART		
MUSCLE: FACE & SKIN	BONE OR CONNECTION POINT	ACTION (WHAT HAPPENS)
MUSCLE: TRUNK	BONE OR CONNECTION POINT	ACTION (WHAT HAPPENS)

I fortunately have 4 lab tables that can be used and I then spread out the cards upside down onto the table; one color per table to keep the confusion down.

Students had to work in small groups of two to three. They were given a sheet that had all the muscles on it and a line for instructor initials when they completed a full set, the group had to stay together and work together for each one.

MUSCLE MEMORY GAME CHECKLIST

____ Platysma	____ Brachiocephalicus
____ Temporalis	____ Trapezius
____ Masseter	____ Latissimus dorsi
____ Digastricus	____ Serratus ventralis
____ Nuchal ligament	____ Quadriceps femoris
____ Sternohyoideus	____ Gastrocnemius
____ Cutaneous trunci	____ Gluteal
____ Intercostal	____ Biceps femoris
____ External abdominal oblique	____ Gracilis
____ Linea alba	____ Pectineus
____ Rectus abdominus	____ Adductor
____ Transversus abdominus	____ Semitendinosus
____ Pectoral	____ Semimembranosus
	____ Deltoideus
	____ Infraspinatus
	____ Supraspinatus

The students would start with a muscle and then worked together to find the origin and then insertion and then action. Once they found all four cards, they then presented them to an instructor. The instructor would verify them and if they were correct, their sheet was initialed and they were sent on their way to repeat. If the student was incorrect, we (student and instructor) would go over the cards and see if we could figure out what was wrong and what the correct answer should be and the students then went off to find the correct answer. Once correct, the instructors would keep

the cards and then put them back on the tables when there was a moment. Students have the whole lab to work on this and I had about 30+ muscle cards (I have other items in this that support muscles that I felt were important) for them to work on and most were able to accomplish this within a lab period. This lab was for extra credit on an upcoming test, but it could be for a review for a test or lab practical of sorts. Majority of the students appeared to enjoy the lab and I found some of them actually smiling and laughing through the lab. I used tablecloths because the tabletops were leaving marks on the cards and it was getting difficult to read what was on them.

I had other instructors and instructional support assistants assisting in the labs that are thinking about taking my idea and applying it to their lab(s). Both were thinking about using this for surgical instrument identification. Having a physical instrument or a picture on one table and then on other cards the student has to find the use of that instrument, the name of the instrument and in some cases what species that instrument is used on.

Mind Mapping
Alyssa Root, LVT
Genesee Community College

There are three main components of any veterinary technology curriculum that scare students the most. I call these components the "big and scaries" of veterinary education.

BIG AND SCARIES:

1. 3-hour lectures

2. Practical exams

3. PowerPoints longer than 30 slides

Extensive PowerPoint presentations are a source of anxiety for many students, especially for those who struggle to condense course material into study material. To accommodate the needs of our students, I created specific mind map criteria for efficient and effective learning. The purpose of a mind map is to consolidate those scary 137 slide presentations into one sheet of paper. Flipping through 137 PowerPoint slides, 47 textbook pages, and 10 pages of written notes is intimidating to any student. Mind maps present key concepts from each of those resources on one organized paper in a manageable format.

MIND MAP CRITERIA:

1. Use white copy paper or cardstock – not colored or lined

2. Boxes do not touch each other

3. Boxes do not touch the paper's edge

4. Each box has a colored outline

5. Titles must remain consistent (ex. Types of…)

6. Each box must use the same format (ex. Bulleted or numbered)

Each criteria point serves a purpose to support our students' unique academic abilities. The front side of the paper is used for key points from lectures and textbook readings. The opposite side is used to present images related to the material covered on the front side or lecture material that was most clearly presented through imagery.
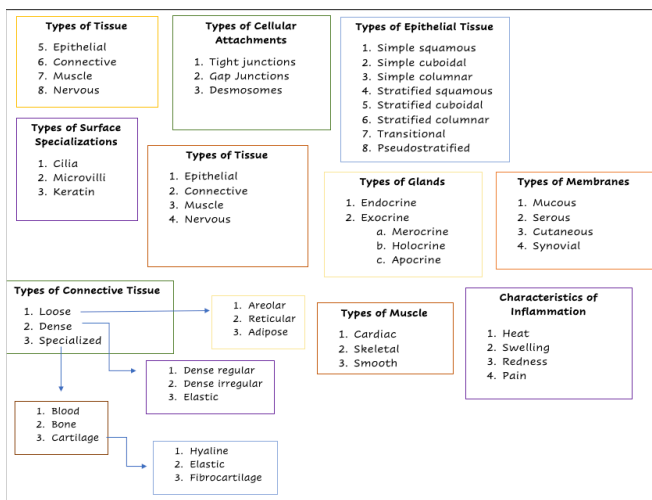
Encouraging Active Learning
Keren Allen LVT, MS
Baker College of Muskegon

Finding new ways to reach our students and ensure that they are not just memorizing the material, but also learning how to use it, can be challenging. Interactive and engaging teaching is one way to ensure students are learning the material and learning how to use the information in the future. With interactive learning, the learner is a participant, it is helpful as it establishes a friendly atmosphere by helping students connect with each other, boosts self-reliance and self-efficacy, aids low-achieving students, and allows students to continually use previously gained knowledge and experiences.[1]

The active learning approach, which requires students to actively engage with learning materials, participate in the class, and collaborate with other classmates, is considered the most effective approach for efficient teaching.[2] Teaching topics multiple times and in multiple ways ensuring that students are active participants can bring about positive outcomes for students. As an Anatomy and Physiology instructor, finding multiple times to teach the material can be a challenge due to the large amount of material

covered. One of the ways that this can be approached is by integrating technology, traditional lectures, and interactional learning activities in both lecture time and laboratory time.

Gamification is an excellent way to use technology in the classroom. There are many different resources available, including Nearpod, Kahoot, and Quizlet. These can be used before the traditional lecture to gain insight into the prior knowledge of the students, to determine if the readings for the material were completed, and to assess what material needs to be covered more thoroughly. Using gamification after the lecture can give equally valuable information for the best way to move forward for the students.

Traditional lectures are often perceived as boring; making the learners active participants in the learning process can help the retention of the material. It has been proposed that using teaching methods that promote active participation and encourage self-directed learning can enhance delivering core knowledge and explaining difficult concepts, leading to better learning outcomes.[3]

Utilizing an activity to reinforce the material will solidify the material for the students and create an opportunity for the students to use the material they have learned. Incorporating students' opinions when adopting pedagogical strategies can enhance the confidence, engagement, and learning of students.[4] Students are more likely to be active contributors if they feel safe and comfortable in the classroom and asking their opinion is one way to ensure they feel at ease.

The following are examples used to teach the cardiovascular and the immune systems that include gamification, traditional lectures, and activities.

CARDIOVASCULAR DAY ONE:

Cardio Clue - students are divided into small groups (3-4 students), and they are given one clue about the cardiovascular system to solve; when they get the correct answer, they are given clue two to solve, up to 11-12 clues. The answer to the last clue is the keyword to open a toolbox filled with treats. The rest of the class period is spent reviewing the material.

CARDIOVASCULAR DAY TWO:

Gamification using Kahoot is used to review the material. Students are split into groups and race to put the flow of the blood through the heart in the correct order. The remaining time is spent lecturing and reviewing the provided PowerPoint presentation which includes videos and songs to help them retain the material.

CARDIOVASCULAR LAB PERIOD:

Students take part in heart dissections and review blood flow. Students are then taken outside the classroom and

will draw the heart and blood flow with sidewalk chalk or complete the task inside depending on weather, by using tape on the floor. The hearts are made large enough that the students can walk the path of blood flow, and they are placed in an area where they will see it on their way to other classes. They are encouraged to walk the path each time they walk by it.

IMMUNE SYSTEM DAY ONE:

Includes active traditional lecture, students are provided with a PowerPoint presentation, and notes to fill in before or during class to encourage active listening.

IMMUNE SYSTEM DAY TWO:

Discussion Board topic on vaccines is reviewed and discussed in class. Students then take part in a Kahoot review of previously discussed materials. Topics are then reviewed based on answers given during the game. "Terms to know" are reviewed at the end of the class period.

IMMUNE SYSTEM LAB PERIOD:

Dissection is continued by finding lymph nodes and reviewing the locations of commonly palpated nodes. Students are then assigned a part of the immune system; examples include a macrophage that has eaten a specific bacterium, a T-lymphocyte, a B-lymphocyte that has specific antibodies, interferon or complement, etc. Viruses and Bacteria are created using several types of candy and labeling them accordingly. Students are then instructed to act out the part of the immune system they are assigned. For example, the macrophage chooses a piece of candy and then shows that to the T-lymphocyte, they then have to choose that same type of candy, and the T-lymphocyte can then show that to some helper T-cells and "kill" all of the bacteria. Once everyone has completed their task, this will be repeated to reinforce the concept of memory cells. If one student has vaccine immunity they are instructed to choose the same type of candy in the second round. Students then work on an assigned project of identifying white blood cells under the microscope, further solidifying the material.

Through all these modalities of delivering the information, students are encouraged to participate and take an active role. Using small groups of students who are friends can make them feel more comfortable to contribute and share. The experience of learning and acquiring knowledge is the center of education, and a good learning experience motivates us to learn more.[5]   Our goal should always be to encourage active involvement and collaboration to create a desire for lifelong learning in our students.

REFERENCES

1. Abykanova, Bakytgul, et al. The use of interactive learning technology in institutions of higher learning. International J. environ and science edu. 2016;11(18):12528-12539.

2. Tuma, Faiz. The use of educational technology for interactive teaching in lectures. Annals of Med. & Surg. 2021;62(1):231-235.

3. M. Wolff, M.J. Wagner, S. Poznanski, J. Schiller, S. Santen. Not another boring lecture: engaging learners with active learning techniques. J. Emerg. Med. 2015;48(1): 85–93.

4. Melo G, Monteza D, YY Colson G, Zhang. How to assess? Student preferences for methods to assess experiential learning: A best-worst scaling approach. PLoS ONE. 2022;17(10)

5. Hüvös A. Teaching students how to learn. In: Van der Laan G, Leesen T, Bot M, Dreezens E, Lakhani V, Loos MJ, Shekiladze A, Spoormans G, Willems T, eds. Educational Utopias: Liber Amicorum Prof. Dr. Alkeline van Lenning. Open Press Tilburg University; 2023:227-239.

From the Desk of FVTE: The Fellows Program of the AVTE

Professional and Personal Growth for Veterinary Technician Educators. Where Do We Go From Here and Why?

Tammy Sue Schneider, FVTE, RVT, PAS, RLATG, BS, AAS, Bel-Rea Institute

CORRESPONDENCE
fvte@avte.net

For many veterinary technician educators, the move from clinical practice to academia seems like an interesting, challenging and logical next step in advancing one's career. Becoming an educator and still staying in the field is a great way to prevent burn out that so many veterinary staff experience. Those technicians that make the jump from practice to education are typically the ones in practice who love and thrive on mentoring and teaching the new employees. Moving from clinical practice to academia is a challenge. Learning how to take skills, knowledge, application of knowledge, critical thinking, and clinical application that was developed in practice and translating that into the classroom with no formal teaching education has many challenges. If you are anything like me, I made many mistakes along the way and still have my share of failures! However, each and every failure gets turned into a learning opportunity to improve as a teacher. Just as we expect students to learn from their mistakes, and find a path forward, the same applies to educators.

But what is next for those of us who have been in academia for an extended time? What can we do to prevent burn-out? What can we do to advance our careers and our position within our programs, have a positive impact within our profession and on our students? What can we do to not become stagnant and end up teaching the same things the same ways? What can we do to feel a strong sense of accomplishment? Where can we go for professional growth and personal growth?

I thought it would be interesting first to explore some definitions of what professional growth is. I have included 3 here that I thought were applicable to veterinary educators.

Number one: Professional growth is the application of new experiences and skills to positively impact your current position and career pursuits (Herity 2024).

Number two: Professional growth refers to the ongoing process of developing skills, knowledge, and abilities to enhance one's career and achieve personal goals within a chosen profession. It involves continuous learning, skill development, and adapting to new challenges and opportunities. Achieving professional growth requires a proactive approach, a commitment to self-improvement, and a focus on building meaningful relationships in the workplace (Santini 2023).

And my definition, **number three:** Learning that creates a sense of accomplishment, expands knowledge and skill within the profession, improves the profession (student or industry), and that creates a sense of pride and joy!

Professional and personal growth should be fun and enjoyable. Yes, there will be parts that are challenging or maybe even frustrating, but the end goal should give you satisfaction and joy. I have learned through the years that an employer might not always recognize, find value in, or reward a new skill, certificate or accomplishment. Therefore, the motivation to take on a new challenge and improve the field of veterinary technician education has to come from within. When we focus heavily on the extrinsic rewards it can decrease our motivation to explore new opportunities for growth. My initial motivation is not that I might get a pat on the back or a raise (although that should happen) but from pride in a job well done. Will I feel good? Will my students benefit? Will this make me better at what I do? Will this have an impact on my profession? Will this create a sense of pride for the work I have done? I want to stress that we still can have professional and personal growth without it being solely attached to our current position or improvement of that position. We can grow even when there is no workplace growth options for higher positions. For some of us we have reached the last rung on our ladder at our current place of employment, but it might open doors outside of your employer for you. We can have a large impact on the future of our profession, and this can have many rewards. I think we also forget that our students are our employer! Approaching your professional growth from a place of benefiting students can also have extrinsic rewards.

I have compiled a list of the many things we can do for professional and personal growth within our programs, veterinary technician profession, and to continue to improve the quality of life for animals by training competent, compassionate veterinary technicians. I do also want to

point out, that taking a class on anything that you are interested in can promote growth, but my list will focus more on our profession.

Committees: Join committees and panels specific for your program or school, such as retention committees, faculty organizations, admission/ readmission panels or community outreach groups. This can give a sense of helping within your program other than in the classroom. Often you can be an advocate for students and fellow faculty when on these committees.

SCNAVTA or other club advisor: I personally am an advisor for a SCNAVTA chapter and an Agriculture Club. I love these groups! I get to mentor those students that will be the future leaders in our state organizations and in the veterinary profession. They will be the ones we hand off the torch to, so mentoring them is a great way to ensure the future of our profession. This one has many intrinsic rewards!

Volunteer: Join a committee or become an officer in state or national veterinary technician organizations. These organizations are the driving force and voice behind their members' needs including, but not limited to, title protection. You don't have to dive into the deep end and become an officer but can volunteer in many other ways.

AVTE committee or officer: become part of the great movement of veterinary technician educators! Email help@avte.net and find a place to have a role in our organization.

Veterinary Continuing Education: This is a requirement to maintain licensure/certification but is also very important to ensure that curriculum/content is current and up to date. It is also important to take CE on topics that you have no knowledge or experience with. Explore new areas and learn new things. Remember, veterinary technician education is a field that is constantly changing. There is always something new to learn.

Education seminar/webinar/podcasts: There are many free sources to expand your knowledge within education. I have a few podcasts that I really enjoy that are specific to educators in higher education. One of my favorites is the podcast Teaching In Higher Ed (https://teachinginhighered.com/episodes/) which can be found on many streaming platforms.

Publish: Write a peer reviewed article on veterinary technology or veterinary education, contribute to a textbook or better yet, author a textbook in an area you are passionate about. Write an article for JAVTE (shameless plug). Blogs and articles for your school newsletter are a great way to dip your toes into the world of print.

Conference Speaker: Presenting at conferences is an extremely rewarding endeavor. Speaking to peers, as opposed to students, can be a little more intimidating but you can start off small and speak at your local veterinary technician organization or maybe for your peers on campus.

VTS: For many of vet tech educators, specialization would require leaving academia and re-entering clinical practice, so that may not be practical. However, many in academia still work in the field so this could be a great way to get additional credentials and bring advanced skills, credibility and knowledge to the courses you instruct.

Formal education and training: Take a course at your local community college in education, something that will make you better at your job, or maybe that just gives you satisfaction. This can have a price tag associated with it, however, check with your program as they might have a tuition reimbursement program.

Bachelor's and master's degree programs: Many programs have options available for online, in person or a combination of both. Consider furthering your education by obtaining an advanced degree. There are many degree programs that are applicable to veterinary technology and education. Examples include degrees in education, veterinary technology, animal science, domestic animal biology, animal welfare and behavior, veterinary clinical care just to name a few. Some of these degrees have certificate levels if you don't want to commit fully to obtaining a bachelor's or master's degree.

Certifications: Look at additional certifications that you might qualify for. There are so many in this category that I can't include all of them. Here are a few that can contribute to personal and professional growth and benefit the students by increasing expertise in that area of veterinary medicine. AALAS Certification, NAVC Human Animal Bond Certificate, Recover CPR Certificate, AAEVT Equine Certificate, CAETA Peaceful Euthanasia, and Fear Free.

MOOC: This stands for Massive Online Open Courses. There are animal specific courses and general education courses. Most of these are free, but if you want a certificate of completion there is usually a small fee.

Technology: Learn a new technology that can be used in your class or that will make your work easier. There are so many new applications, websites and programs on the market for educators that can improve student engagement, improve retention of content, and promote excitement. Our students are very technology savvy, and we too need to keep up with the times!

AVTE Fellow: This is a program that was launched in 2024. It is a program that honors and recognizes veterinary technician educators who are innovative in their craft. There is an application process that is submitted to AVTE. This is an amazing group of educators. They are inspiring and encouraging. It is a community!

Veterinary Technician Education Specialist: Credentialing now under the AVTE umbrella will be an option for veterinary technician educators who meet the requirements and pass the exam. This is super exciting that AVTE has taken this over, and it is a great option for those in academia to get an additional credential that is very specific for our roles as veterinary technician educators.

In conclusion, I think regardless of our motivation, whether it be intrinsic, extrinsic, or a combination, there are many options for those of us who are credentialed veterinary technicians in academia to pursue professional and personal growth. Make it fun, enjoyable, and celebrate your accomplishments.

I would like to dedicate this to an outstanding veterinary technician and educator that recently retired after many, many years impacting future veterinary technicians. She was my instructor while I was in school and molded me into the vet tech I was in practice and then as a fellow instructor as she shaped the way I taught courses. She always pushed me to be the best I can not only for me, but for students and the animals our students will be caring for. She will forever be my mentor and friend. Janet King, the profession will miss you and the impact you have had will forever be remembered.

REFERENCES

1. Jennifer Herity : https://www.indeed.com/career-advice/career-development/professional-growth#:~:text=What%20is%20professional%20growth?,people%20or%20a%20bigger%20budget

2. Luciano Santini PH.D. https://www.linkedin.com/pulse/what-professional-growth-luciano-santini-ph-d-/

Solving the CRI Conundrum: Development and Use of a Novel Cheat Sheet for Veterinary Medicine

Arin Collins, Cert IV VN and **Alexsia Houridis,** BSc, DipLang, AssocDegVN, GradCertHE
University of Adelaide

CORRESPONDENCE

Arin Collins, Cert IV VN
arin.collins@adelaide.edu.au

In veterinary medicine, a constant rate infusion (CRI) is a method of delivering a continuous and controlled dose of medication over an extended period. This technique is commonly used for drugs that require steady administration, such as analgesics, antiemetics, sedation or anaesthesia. By maintaining a consistent drug concentration, CRIs can provide better control of the patient's symptoms and ensure precise therapeutic effects while maintaining patient safety (Cathcart et al., 2024; Barnette, 2020; Pritchard et al., 2024; Clancy, 2023).

Despite their benefits, CRI calculations remain a consistent challenge for veterinary professionals in practice (Conner, 2020). While some veterinary professionals may find it easy to understand and calculate fixed rate CRIs, such as metoclopramide, the principles behind titratable CRIs are often more difficult to grasp. Gaps between cases requiring CRI calculations also contributes to their difficulty in practice, especially when working with less common drugs or species.

In teaching settings, students frequently struggle with both the mathematical steps and understanding the overall purpose and flow of CRI calculations. As visual learners grasp and recall information most effectively through visual elements, they may struggle when complex processes are explained only through written or verbal instructions (George, 2024; Funderstanding, 2023). These challenges highlighted the need for a teaching tool that simplifies the process while considering different learning styles (Murphy, 2020).

The importance of knowing and understanding CRI calculations, supported by the learning needs of students, inspired the creation of CRI worksheets or cheat sheets which guides the user step-by-step through the CRI process. By clearly indicating the next action and showing how previous answers feed into subsequent calculations, this type of tool can transform what might feel like an overwhelming task into a manageable and structured workflow (Dutra et al., 2022). This not only enhances understanding but also builds confidence, providing students with the clarity they need to master complex concepts.

Two different cheat sheets were developed for use for both titratable CRIs using fluid bags and fixed CRIs (Appendix 1 and 2). The process of creating the sheets began with breaking down each step of a written calculation and formatting it to resemble the operations used on a calculator (Figure 1). For example, 1 mg/kg/day means the dog needs 12 mg/day (24 hours) of metoclopramide (12 kg × 1 mg/kg/day).

| 12 BW (kg) | x | 1mg/kg/day Dose Rate | = | 12mg/day Total Dose |

Figure 1: Example of calculated format for step 1 of CRI calculation

As the steps progressed, it became clear that earlier calculations could be forgotten, making it difficult to know where to apply previous results. To address this, colour-coding was introduced to help users track their progress and quickly identify when earlier answers should be reused, ensuring each step's relevance was easily understood. This feature enabled users to skip ahead or refer to the corresponding-coloured box as needed. Additionally, colour-coding highlighted that some answers might be used multiple times throughout the calculation, even if certain steps were skipped. For instance, if a unit conversion was not required at one step, the colour-coded answer would still be applicable later (Figure 2).

The next challenge was creating a template applicable to a range of drugs while ensuring that unit conversions, such as from mcg to mg or from minutes to hours or days to hours, were consistently applied. The use of multi-coloured answer boxes should prompt students to check the correct units and conversions at every stage (Figure 3).
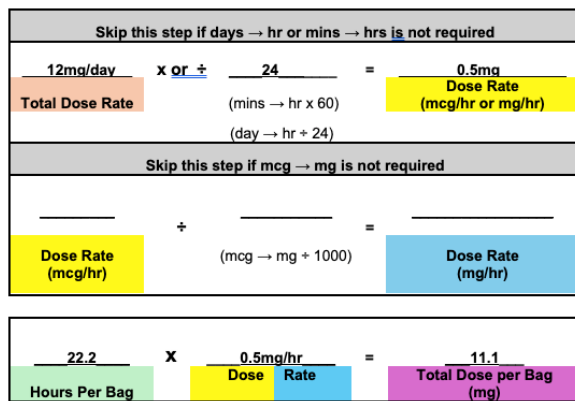
Skip this step if days → hr or mins → hrs <u>is</u> not required			
12mg/day	**x or ÷**	**24**	**0.5mg**
Total Dose Rate		(mins → hr x 60)	**Dose Rate (mcg/hr or mg/hr)**
		(day → hr ÷ 24)	
Skip this step if mcg → mg is not required			
_____	÷	_____	= _____
Dose Rate (mcg/hr)		(mcg → mg ÷ 1000)	**Dose Rate (mg/hr)**

22.2	**x**	**0.5mg/hr**	**11.1**
Hours Per Bag		**Dose** **Rate**	**Total Dose per Bag (mg)**

Figure 2: The dose rate (blue and yellow) may come from Step 2 (yellow) or Step 3 (blue), depending on the pathway

12mg/day	**x or ÷**	**24**	**0.5mg**
Total Dose Rate		(mins → hr x 60)	**Dose Rate (mcg/hr or mg/hr)**
		(day → hr ÷ 24)	

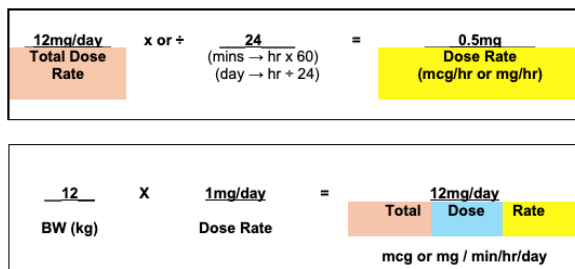| **12**	**X**	**1mg/day**	**12mg/day**
BW (kg)		**Dose Rate**	**Total** **Dose** **Rate**
			mcg or mg / min/hr/day

Figure 3: Example prompting users to check units and conversions, ensuring consistency from the initial multi-unit step to the single-unit 'Total Dose Rate' box

A scaffolded learning approach was applied to support the autonomous learning of students while optimising their zone of proximal development (Vygotsky 1978) during the implementation of the CRI cheat sheets. Scaffolded learning is a pedagogical concept which ensures that educators facilitate a learning environment where students are encouraged to participate in self-directed and peer learning (Vygotsky 1978). Initially, students were introduced to the concepts of constant and titratable CRIs. They were then provided with the cheat sheet templates and various case examples to practice the CRI calculations. They had access to these worksheets throughout the semester leading up to the final examination, where it was expected that the calculations could then be completed ad hoc. The combination of scaffolded learning and the use of the cheat sheet showed that students were able to confidently apply the CRI calculation steps in an examination context. However, future research should document and measure their effectiveness and consider the use and implementation of cheat sheets from the student perspective. Such insights could further refine this approach and enhance its application in veterinary education.

REFERENCES

1. Barnette, C. (2020). Constant rate infusions in small animal veterinary medicine. VetPrep. https://www.vetprep.com

2. Cathcart, E. J., Russell, E., Schortz, L. & Mossop, L. H. (2024). A Human Factors and Systems-Thinking approach to Veterinary Patient Safety Education: Why, What and How?. Journal of Veterinary Medical Education. https://doi.org/10.3138/jvme-2024-0009

3. Clancy, N. (2023). Constant rate infusions and calculations. In N. Clancy (Ed.), The veterinary nurse's practical guide to small animal anaesthesia (Chapter 17). https://doi.org/10.1002/9781119717027.ch17

4. Conner, B. (2020). Drug Calculations in Veterinary Medical Education – Where are we?. Journal of Veterinary Medical Education, 48(3). https://doi.org/10.3138/jvme.2019-0118

5. Dutra, S. V. O., Kumar, K. & Clochesy, J. M. (2022). Instruction strategies for drug calculation skills: A systematic review of the literature. Nurse Education Today, 111(105299). https://doi.org/10.1016/j.nedt.2022.105299

6. Funderstanding, (2023). Helping visual learners thrive: Strategies teachers should know. https://funderstanding.com/teachers/helping-visual-learners-thrive-strategies-teachers-should-know/

7. George, C. (2024). Visual learning styles and the best strategies for it. Creately. https://creately.com/guides/visual-learning/

8. Murphy, S. J. (2020) Powering Up Your Visual Learning Practice: Strategies to Help Students Succeed in Math. Savvas Learning Company. https://mysavvastraining.com/assets/files/documents/enV%20White%20Papers_Powering%20Up%20Your%20Visual%20Learning%20Practice%20by%20Stuart%20Murphy_1725637848.pdf

9. Pritchard, P., Lyllwhite, R. & Rippingale, M. (2024). Pharmacology and Dispensary Management. In R. Lillywhite & M. Rippingale (Eds.), Textbook of Equine Veterinary Nursing (pp. 331 - 384). John Wiley & Sons Ltd. https://doi.org/10.1002/9781119861973.ch9

10. Vygotsky, L. S. (1978). Mind in Society: The development of higher psychological processes. Harvard University Press.

The Use of Oral Reports in Veterinary Technician Education

Héctor L. Osuna León, PhD, Universidad Ana G. Méndez

CORRESPONDENCE

Héctor L. Osuna León, PhD
hosuna2@uagm.edu

Given the profession's evolution in the last decades, it is imperative that the education and training of future veterinary technicians become increasingly competent and effective. One useful method to achieve this is through the use of oral reports, which help students develop essential communication skills. Students face new realities that allow them to develop certain skills while others may be relegated to the background. Technology has played a crucial role in this, as it often does not allow for the development of so-called soft skills, which are essential in our professional field. Multiple studies have shown that the communication and writing skills of many students do not keep pace with the development of the technical skills they must possess[1,2]. However, we should not be disheartened by this, as this reality affects many other professions, not just veterinary technology. Therefore, it is necessary to identify varied, appropriate, and relevant didactic alternatives that facilitate the development of skills that enable future professionals to communicate effectively. For this article, the use of oral reports in the conceptualization and development of courses is described and proposed to veterinary technology professors, which can promote appropriate levels of communication in their students[3] if used correctly.

In the university educational context, an oral report involves the presentation of a topic assigned by the professor to a student or a group of students, in which they must demonstrate mastery of the topic and present it appropriately, usually to their classmates, taking into account the audience they will address and using the course and professor's specifications as a guide. The inclusion of oral reports in a course has multiple purposes. Among these are:

- **Development of oral communication skills.** This may be one of the main objectives of using oral reports, but it is not the only one. When students properly prepare to make their presentations, they develop skills that allow them to present and defend their knowledge by efficiently communicating relevant information and speaking in front of an audience. Often, depending on the individual, this practice needs to be repeated several times, perhaps in different courses, to achieve a lasting effect on the student.

- **Development of teamwork skills.** When an oral report is assigned to a group of students, they must learn to work as a coherent group seeking to achieve the presentation's objectives. This skill, necessary and unavoidable, acquired in the process, is fundamental when finally working in a veterinary clinic as part of the medical team.

- **Development of student leadership.** Within each group, one or more students will take control of planning the group's activities, resulting in the development of leadership attitudes within the team. In this scenario, other students, who are also necessary to complete all assigned work, may choose to follow these leaders, or they may feel motivated to assume leadership positions within the group, too. This skill will not only be necessary when finally working as veterinary technicians once they complete their academic training, but they will also be able to apply it in their daily lives as global citizens.

- **Creation of their own knowledge.** By engaging in this activity, students will have the opportunity to participate in decisions about what they will present (following the course professor's instructions) and how they will present it. In this way, they will take responsibility for their own learning[4,5], an attitude that should permeate the education of every professional.

This methodology of using oral reports as part of the veterinary technician classes may sometimes receive negative evaluations from some students, who may argue that the classroom dynamic becomes one of "students teaching students." This is not and should not be the purpose of oral reports in any course[4]. Therefore, professors are called to make this tool a truly effective instrument in the planning of their courses. To overcome this student perception, professors must explain in advance and detail

the expectations of the oral presentation, particularly regarding preparation, duration, participation of members, task assignment, and other aspects that can and should be considered. Only when students know in advance what is expected of them will they be able to adequately prepare and present truly relevant material coherently. Doing otherwise would be presenting information simply to fulfill a course requirement.

As part of the preparation for these oral reports, it will be the professor's responsibility to draft explanatory outlines that provide a detailed guide of the material to be included in the work. These explanations must be clear, precise, and easy to handle for the students, who, in most cases, will be facing the topic for the first time. Suppose the guides the professor provides to the students are confusing, vague, and difficult to use. In that case, the result obtained will not be as expected, and, of course, this failure cannot be attributed to the students, but to the professor who was not clear in the instructions given to them.

Professors are called to maintain constant and direct communication with each of their students[6] before the day of the presentation to clarify doubts, elaborate on the development of the topics, establish priorities, make edits, and present recommendations that contribute to the effective preparation of the presentation. Part of this communication should include the prior review of the information that will finally be presented to the group. However, this communication should not end the day before the final presentation; the professor should be an active participant in the presentation on the day of the report, asking questions that encourage the participation of the rest of the group, clarifying points that may not have been clear during the presentation, and bringing examples that clarify the information presented. For this, the use of diagrams and images that help clarify the data presented by the students, among other strategies, is recommended.

After the presentation is concluded, the professor should also provide feedback to the presenters on what was finally presented[7]. Only in this way, professors can ensure that the students have acquired the expected knowledge, which was not left to chance for each one to understand what they believed they should understand. The professor must be an active and present participant at all times before, during, and after the oral report.

For the implementation of this tool in the classroom, some strategies are recommended. Although some may represent a greater workload for the professor, the expectations of success for this tool will be higher in most cases, if applied regularly:

- The professor should be available whenever a student approaches them to clarify doubts related to this exercise. Sometimes the questions can be answered in a few minutes, and other times a greater investment of time will be required depending on the question or the approach to the answer.

- The professor should make genuine recommendations to clarify and improve the presentation because, after all, what all professors seek is the success of all their students. Teachers must take advantage of every opportunity for their students to achieve their maximum potential.

- The use of rubrics that allow for the evaluation of both group and individual performance within each group is recommended. These rubrics should be part of the initial orientation of the work and should be explained in detail so that all students are clear from the beginning about the professor's expectations regarding each student's performance.

In conclusion, the use of oral reports in the education of veterinary technicians can be a very effective strategy in the academic preparation of these professionals, as long as the professor does not become a mere spectator of the experience and instead works as a constant and important participant in the process of preparation and presentation of the topic. Only when the professor recognizes the importance of continuous mentoring and their intervention before, during, and after the presentation will this strategy yield the positive results expected.

REFERENCES:

1. Tapia M, Burdiles G, Arancibia B. Aplicación de una pauta diseñada para evaluar informes académicos universitarios. Rev Signos. 2003;36(54):249-257. doi:10.4067/S0718-09342003005400009.

2. Barrett NE, Liu GZ, Wang HC. Seamless learning for oral presentations: designing for performance needs. Comput Assist Lang Learn. 2020;35(3):551-576. doi:10.1080/09588221.2020.1720254.

3. Hammad EA. The impact of oral presentations on Al-Aqsa University EFL students' speaking performance, speaking anxiety and achievement in ELT Methodology. J Second Mult Lang Acquis. 2020;8(1):1-27.

4. Álvarez F, Rodríguez-Perez JR, Sanz-Ablanedo E, Fernández-Martínez M. Learning by Teaching: Development of Learning Material to Facilitate Autonomous Learning. Form Univ. 2008;1(6):19-28. doi:10.4067/S0718-50062008000600004.

5. Suliman WMM. Implications of Oral Presentation for Fostering Learners' Autonomy: A Case Study with Audi Learners Majoring in English as a Foreign Language. J Engl Teach. 2022;8(1):107-118.

6. Trejo-Sare JE. La retroalimentación oral o escrita para mejorar la producción escrita en la universidad. Educacion. 2021;27(1):79-83. doi:10.33539/educacion.2021.v27n1.2366.

7. Al Jahromi D. Can Teacher and Peer Formative Feedback Enhance L2 University Students' Oral Presentation Skills? In: Hidri S, ed. Changing Language Assessment. Cham: Palgrave Macmillan; 2020. doi:10.1007/978-3-030-42269-1_5.

Vet Tech Perspective on the CBVE Framework

Juan J. Morán, MAT, PhD, Harold Washington College

CORRESPONDENCE

Juan J. Morán, MAT, PhD
juanjmoran3@gmail.com

INTRODUCTION

For more than 20 years, various projects, studies, programs, and initiatives have been developed to identify and implement professional competency training within the veterinary field, from admission to colleges of veterinary medicine through coursework, workshops, residency programs, and membership in associations.[1-6] In both human and veterinary medicine, professional competency is defined as an observable ability of a health professional connected to a specific activity that integrates knowledge, skills, values, and attitudes.[7,8] Five years ago, the American Association of Veterinary Medical Colleges (AAVMC) released its first competency-based education (CBVE) framework of 32 professional competencies as a graduation requirement for veterinarians.[9] Earlier this year, the AAVMC released its latest version of CBVE as CBVE 2.0, which includes comprehensive examples, models, ratings, measures, and assessment tools.[10]

In this qualitative study, 15 veterinary technicians participated in 10 individual interviews and one focus group of 5 participants to offer their perspectives on the CBVE framework.[11] The veterinary technicians came from the Academy of Veterinary Technicians in Anesthesia and Analgesia, Academy of Veterinary Emergency and Critical Care Technicians and Nurses, and Academy of Veterinary Surgical Technicians. They were asked to provide their insights on six team leadership competencies outlined in the CBVE framework. The study aimed to answer three main research questions.

The researcher created two interview guides with questions corresponding to the three main research questions for the veterinary technicians, one for individual interviews and the other for the focus group; see Appendix 1 for details. In qualitative research, a theme is defined as a recurring pattern that emerges from analyzing data, typically concerning participants' perspectives or experiences on a topic.

RESULTS

Perceptions of Teamwork

The first research question inquired about veterinary technicians' perceptions of teamwork within their organizations. Five themes emerged from both the individual interviews and focus group data. They were *collaboration, communication, contributing members, issues existed before the pandemic,* and *team leadership*. Table 1 presents each theme along with the corresponding number of instances shared by individuals in both interview formats.

Table 1: Integrated Results from the Interviews and Focus Group under Research Question One

Theme	Number of Instances the Theme Emerges
Collaboration	8 coding instances out of 15
Communication	7 coding instances out of 15
Contributing Members	10 coding instances out of 15
Issues existed before the pandemic	15 coding instances out of 15
Team Leadership	7 coding instances out of 15

The responses indicated that these veterinary technicians viewed collaboration, communication, and having contributing members as essential components of teamwork. Furthermore, they expressed that the pandemic did not impact their responses concerning the existing issues, which they identified as pre-dating COVID-19. Lastly, they described three components of team leadership as key to effective teamwork, whereby leaders identify and resolve team issues while being mindful of available resources and external challenges.[12] Team leadership requires inclusion in decision-making to address team members' needs.[11]

Furthermore, participants defined collaboration as working together with veterinarians and team members, and communication as open and unambiguous. They described contributing team members as engaging, properly trained,

and interactive concerning necessary job tasks. Team leadership was also characterized as shared responsibility and non-hierarchical. Ballantyne suggested shared leadership in veterinary medicine, a point of view that was echoed by the participants.[13]

Team Leadership Behaviors

The second research question examined the specific team leadership behaviors that veterinary technicians desire from their leading veterinarian. Four themes emerged that were trust veterinary technicians, utilize technicians more, build trust with veterinarian and team, and veterinary technician utilization. Table 2 summarizes the themes and their corresponding instances during both interview formats.

Table 2: Integrated Results from the Interviews and Focus Group under Research Question Two

Theme	Number of Instances the Theme Emerges
Trust Veterinary Technicians	5 coding instances out of 15
Utilize Technicians More	5 coding instances out of 15
Build Trust with Veterinarian & Team	2 coding instances out of 15
Veterinary Technician Utilization	6 coding instances out of 15

Participants revealed a desire for their veterinarian to trust them and for the utilization of their skills. Trust was seen as a mutual requirement between veterinarians and team members. Under the veterinary technician utilization theme, technicians expressed the importance of empowerment and their ability to relieve veterinarians of some responsibilities and management complexity.[14,15] Trust facilitates inclusion and utilization in team settings. To help build relationships and to get others to begin to trust you, leadership expert Sinek recommends, asking, can you help me out?[16]

CBVE Framework

The third research question explored to what extent the CBVE framework accurately reflects the team leadership needs of veterinary technicians. The six team leadership competencies investigated within the study were: 6.1, solicits, respects, and integrates contributions from others; 6.2, functions as leader or team member based on experience, skills and context; and 6.3, maintains ongoing relationship to provide continuity of collaborative effort; the remaining three explored were: 7.2, practices time management; 7.3, reflects on personal actions; and 7.5, attends to wellbeing of self and others.[9, 10]

Table 3 shows the overlap of themes found in the individual interviews and focus group for research question three. It is only with professional competencies 6.1, 6.3, and 7.2

that common themes were identified across the individual interviews and focus group.

Table 3: Integrated Results from the Interviews and Focus Group under Research Question Three

Competency	Individual interviews	Focus group
6.1	In-school disconnect	In-school disconnect
6.3	Open communication	Open communication
7.2	Needs to be gained through experience	Needs to be gained through experience

Table 3 indicates that from this sample, both from the individual interviews and focus group, that these veterinary technicians perceived that for competency 6.1, which states that the veterinarian solicits, respects, and integrates contributions from others that an in-school disconnect exists in veterinary education for this competency.[9] These veterinary technicians do not perceive competency 6.1 to be a competency that veterinarians are learning nor can learn while in veterinary school.

In terms of competency 6.3, which states that the veterinarian maintains ongoing relationship to provide continuity of collaborative effort that in order for the veterinarian to sustain a continuous collective work, that it is possible through open communication.[9] However, the focus group also indicated that the competitive nature of veterinary school can stymie competency 6.3 for veterinarians to develop while in school.

Finally, in terms of competency 7.2, which states that the veterinarian practices time management, these veterinary technicians perceive that competency needs to be gained through work experience.[9] None of the remaining professional competencies (6.2, 7.3, and 7.5) shared common themes between the individual interviews and focus group.

LIMITATIONS

First, it is more objective to observe than to interview. However, for the purpose of the study, interviewing is a means to answer the research questions. Second, the researcher did not know how impressionable the participants would be during the focus group, yet they freely expressed agreement or disagreement. Third, there was a low response rate to the initial invitation to participate, likely due to the pandemic, social unrest in the nation, and the systematic injustices that occurred in our country throughout 2021.

In terms of the population sample, the researcher interviewed veterinary technicians who were board-certified members of academies and were not newly entering

veterinary technicians. Additionally, the researcher created the interview guides based on the research questions. Therefore, the researcher cannot serve as a purely objective instrument and capable of making mistakes. However, it was for this reason that the researcher implemented checks in the data collection and analysis processes and provided explanations and transparency throughout the study.

Lastly, there were a few limitations in the data collection and analysis as well. The researcher was a single individual collecting and analyzing the data for both the individual interview and focus group but did use verifying steps or checks in place to minimize mistakes. The researcher recorded the interviews so that responses could be checked over and re-checked as necessary. After the transcription, the researcher verified the transcription by listening to the audio at a slower pace. The researcher initially conducted a manual analysis after each interview and then used NVivo® to organize the analysis. In this way, the researcher worked to eliminate mistakes and needed to read and re-read the collected data.

CONCLUSION

The study sought to understand if the team leadership components, in the CBVE framework were the actions or behaviors that veterinary technicians perceive necessary from their veterinarian-leader within a healthcare team workplace.[9] The study's findings can serve to inform policy, learning, and practice for college of veterinary medicine leaders, veterinary faculty, hospital directors, and other veterinary professionals interested in team management. The perceptions of veterinary technicians can be used to inform a holistic understanding of how to supervise, delegate, or communicate between veterinarians and veterinary technicians on healthcare teams. The findings also demonstrated the relevancy and importance of all team members in the development, discussion, and evaluation of the CBVE framework.

In terms of the field of veterinary technician education, the relevancy and application of these findings are several. It includes informing veterinary technician students about the potential work cultures in which they may enter. It also then includes informing them how to engage stagnate leadership as derived from followership theory by challenging leadership in offering alternative solutions or by actively supporting organizational goals aligned to their values or beliefs.[17] Additionally, to provide them with workshops or learning activities as scenarios on soft skills development that enhance students' assertiveness, usage of direct speech, and confidence in their abilities, training, and educational knowledge.

REFERENCES

1. Brown D, Silverman H. Competency-Based Education in Veterinary Medicine: Historical Perspectives and Future Directions. J Vet Med Educ. 1999;26(3):181-188.

2. Cake M, Johnson A, Smart L, et al. Veterinary Competency Development: Toward a Practical Framework. J Vet Med Educ. 2016;43(4):352-358.

3. Harris C, Lloyd J. Assessment of veterinary competence: A necessary step for competence-based education. Vet Rec. 2011;168(3):76.

4. Lewis T, Klausner J. The role of competency assessment in veterinary training. Veterinary Medicine. 2003;8:117-123.

5. Lloyd J, O'Brien A, Bosio I. Competency frameworks: A review of potential applications in veterinary management. J Am Vet Med Assoc. 2002;221(10):1456-1463.

6. American Veterinary Medical Education Competencies. NAVMEC. 2011. Available from: [insert link if available].

7. Chaney KP, Beacham-Brown E, Zollinger A, et al. Understanding Competency in Veterinary Practice. J Am Vet Med Assoc. 2024;225(1):20-30.

8. Frank JR, Snell L, Cate OT, et al. Competency-based medical education: Theory to practice. Med Teach. 2010;32(8):638-645.

9. American Association of Veterinary Medical Colleges. Competency-Based Veterinary Education: A New Paradigm for Veterinary Education. 2019. Available from: [https://www.aavmc.org/competencybasedveterinaryeducation/cbve-framework.aspx].

10. American Association of Veterinary Medical Colleges. Competency-Based Veterinary Education 2.0. 2024. Available from: [https://static1.squarespace.com/static/5fd7ed081606b00a310bbbf5/t/66114bc6a42a333ee97af671/1712409543864/AAVMC-CBVE-2.0-05.pdf].

11. Zamora-Morán J. Veterinary Technicians' Perceptions on Team Leadership in the Competency-Based Veterinary Education Framework [Dissertation]. River Forest, Illinois: Concordia University Chicago; 2022.

12. Northouse P. Leadership: Theory and Practice. 8th ed. Thousand Oaks, CA: Sage Publications; 2013.

13. Ballantyne W. Shared Leadership in Veterinary Medicine: Perspectives for a Collaborative Future. Vet Clin North Am Small Anim Pract. 2019;49(3):547-558.

14. Armitage-Chan E, Chmielewski A, Kauffman G, et al. Empowering Veterinary Technicians: Reducing Workplace Stress and Increasing Engagement. J Vet Med Educ. 2016;43(3):233-241.

15. Moore W, Crouch M, Franklin R, et al. Job Satisfaction and Professional Burnout Among Veterinary Technicians. J Am Vet Med Assoc. 2014;244(5):561-568.

16. Jackson A. Don't be so competitive at work, says bestselling author Simon Sinek: How to get ahead instead. CNBC. December 05, 2023.

Accessed November 11, 2024. https://www.cnbc.com/2023/12/05/bestselling-author-simon-sinek-stop-being-so-competitive-at-work.html

17. Kelley R. E. The power of followership: How to create leaders people want to follow, and followers who lead themselves. New York, NY: Doubleday; 1992.

Appendix 1: Research Questions and Corresponding Interview Questions

RQ1: What are veterinary technicians' perceptions of teamwork within their organizations?	RQ2: What specific team leadership behaviors do veterinary technicians desire from their leading veterinarian?	RQ3: To what extent does the CBVE framework accurately reflect or depict the team leadership needs of veterinary technicians?
Interview Guide I (individual interviews) 8 questions total	**Interview Guide I (individual interviews) 8 questions total**	**Interview Guide I (individual interviews) 8 questions total**
1. What does teamwork consist of on a veterinary healthcare team?	3. If you could change anything about the veterinarian responsibilities, actions, or behaviors, what would they be?	5. What are your thoughts or impressions on the CBVE's domain of collaboration that include: professional competencies 6.1, 6.2, and 6.3?
2. What knowledge and skills are needed by the veterinarian on a healthcare team? What knowledge and skills are needed by the veterinary technicians on a healthcare team?	4. If you could change anything about the veterinary technician responsibilities, actions, or behaviors what would they be?	6. What are your thoughts or impression on the CBVE's domain of professionalism and professional identity that include: 7.2, 7.3, and 7.5?
8. Do you think that your responses to these questions would have been different one year ago? If so, how?	7. What behaviors or actions come to mind when you think of a leading veterinarian?	*All participants were given each CBVE competency above before & while interviewing*
Interview Guide II (focus group) 10 questions total	**Interview Guide II (focus group) 10 questions total**	**Interview Guide II (focus group) 10 questions total**
3. What does teamwork consist of on a veterinary healthcare team?	5. If you could change anything about the veterinarian responsibilities, what would it be?	1. What are your thoughts or impressions on the CBVE's domain of collaboration that include: professional competencies 6.1, 6.2 and 6.3?
4. What is the veterinarian doing? What is the veterinary technician doing?	6. If you could change anything about the veterinary technician responsibilities, what would it be?	2. What are your thoughts or impression on the CBVE's domain of professionalism and professional identity that include: 7.2, 7.3, and 7.5?
10. Do you think that your responses to these questions would have been different one year ago? If so, how?	7. What behaviors or actions come to mind when you think of a leading veterinarian?	*All participants were given each CBVE competency above before and during the interviews*
Questions 8 & 9 related to vet tech "utilization" on teams		

Using Simulation "Escape Rooms" to Put Students at the Center of Their Own Learning

Lane Robinson Torrington, DVM, Asheville-Buncombe Technical Community College

CORRESPONDENCE:

Lane Robinson Torrington, DVM
lanertorrington@abtech.edu

We are engaging students in their own learning through our use of "escape room" simulations in our veterinary medical technology curriculum. Active learning and simulation-based training have been shown to improve learning outcomes in academic and medical education settings.[1, 2] I wrote and designed five "rooms" for students in surgery prep, basic and advanced anesthesia, pharmacology, and diagnostic imaging. These escape rooms combine group and individual work; written, verbal, and physical demonstrations of knowledge; time-based and open-ended tasks; and problem-based learning using realistic case studies. The escape rooms engage students in an innovative way to practice skills and demonstrate knowledge, and they force students to reflect on gaps in their knowledge before exams. These activities achieve this in a low-stakes, highly reflective and self-motivating environment that puts students at the center of their own learning.

You can use your already-existing resources to create an escape room. For example, students can generate "codes" from answering multiple choice questions or doing math problems. This code could either spell out something important, or, you can use a custom-created excel spreadsheet that gives them their next clue if the correct answer is submitted. We also have at least one instructor present with the students while they are completing the escape room to help guide the students. This helps ensure that students do not head in the wrong direction since we want to make sure it is an educational experience for them. Instructors can also become "actors" in the room to provide clues or set up scenarios, such as hooking up an anesthesia machine incorrectly for the students to fix. If your program has access to animal manikins, these can be utilized in the room as the patient for students to practice skills such as intubation and ventilation, and regular stuffed animals can also be modified for use as "patients."

When writing an escape room for students in their last semester of the program, I wanted to make it a little bit more challenging to give these advanced students a chance to apply critical thinking. I surveyed coworkers about medical mistakes that they have either made themselves or have witnessed. This provided inspiration for some of the obstacles encountered in the simulations. For example, mixing up similarly sounding medications; students are told that a mock patient needs "Dex" to treat an allergic reaction, and a bottle of mock-dexmedetomidine is placed in the nearby drug cabinet in a more visible area than the bottle of mock-dexamethasone. Many students will automatically select the bottle of dexmedetomidine, but their mock patient's allergic reaction will not improve if they select this medication. The students need to work together to figure out what went wrong (and as a bonus, choose the correct reversal for dexmedetomidine). As another example, a mock-coworker pulls up premedication and hands this syringe to the student- but the syringe contains a different volume than what was calculated. We then see if the student verifies the volume before they "deliver" it to their mock patient. In this scenario, we can let it play out, and let students see that their patient gets excessively deep from the overdose of premeds if they do not check the syringe themselves. This can all occur in a simulation environment so that students can learn from mistakes without impacting patient care.

This also provides a framework to discuss a harsh reality in our profession- which is that medical mistakes are bound to occur. According to Kogan et al,[3] knowing how to respond to them professionally and appropriately is how we can improve patient care and mental well-being in the profession. After all students participate in the escape room, we debrief and have a class discussion on how to approach medical mistakes in practice.

The rooms can also be adaptable to meet students where they are. This fall, our community was devastated by Hurricane Helene. We were unable to hold regular class during this time. When we returned to in-person coursework, we did not want to jump right back into procedures with patients, since we knew the students would need to review after the break from class and that they may not be

emotionally ready for that experience. Instead, we pivoted to using the escape rooms as a chance to review prior to going back to our regular caseload.

Use of engaging formative assessments like these guide instruction by demonstrating and addressing gaps in student knowledge throughout the course, rather than waiting until summative assessments reveal where more attention is needed in the curriculum. They also provide a context for discussing real-world challenges, such as medical mistakes, and they can be adapted to where students are in their course of study. I highly recommend integrating similar active learning approaches into your teaching.

REFERENCES

1.   Freeman S, Eddy SL, McDonough M, et al. Active learning increases student performance in science, engineering, and mathematics. Proc Natl Acad Sci U S A. 2014;111(23):8410-8415.

2.   Elendu C, Amaechi DC, Okatta AU, et al. The impact of simulation-based training in medical education: A review. Medicine (Baltimore). 2024;103(27):e38813. doi:10.1097/MD.0000000000038813

3.   Kogan LR, Rishniw M, Hellyer PW, Schoenfeld-Tacher RM. Veterinarians' experiences with near misses and adverse events. J Am Vet Med Assoc. 2018;252(5):586-595. doi:10.2460/javma.252.5.586

BEST F.R.E.N.S.- You and Your Co-learners:
A student-centered approach to success in the classroom

Tyra Davis, DVM, CTHP, Southern University and A&M College - Baton Rouge

CORRESPONDENCE:

Tyra Davis, DVM, CTHP
tyra.brown03@sus.edu

In popular culture, as times change, so do ideas on fashion, music, and language. Similarly, educators must evolve with these shifts. As our student population diversifies, our teaching approaches must adjust to remain relevant and effective. Too often, as academics, we become stuck in outdated methods, techniques, and even vocabulary— sometimes clinging to the styles of previous eras. But to be true curators of knowledge, we must continuously adapt to meet the needs of our students (co-learners), or risk doing them a disservice rather than providing valuable educational support.

The cornerstone of effective learning outcomes is the student-learner. Three factors are essential for their success: they must be motivated to learn, they need the aptitude to absorb the material, and—perhaps most importantly—they must like their educator. Yes, that's right—students must like their teacher. This idea might seem surprising, especially considering that, traditionally, a teacher didn't need to be well-liked. However, the reality in today's educational landscape is that students are far more likely to engage with and learn from, educators they respect and connect with. As Rita Pierson famously stated in her TED Talk, "Kids don't learn from people they don't like." Does this mean educators should become people-pleasers? Absolutely not. Authenticity should never be sacrificed, but creating a welcoming, engaging environment can have a profound impact on learning outcomes.

So, what do students want from their professors? In a recent pre-course survey of my own students, the feedback was eye-opening. Many students expressed a desire to know exactly what to expect in class each day. Some preferred multiple-choice questions as a learning tool, and many reported having strong academic foundations from high school, despite their varying GPAs. However, a common theme emerged: many students felt unseen by their professors, expressing that their individual perspectives and unique needs were often overlooked. From my research and experience, students want several key things from their educators:

- They want classes to be interesting and engaging.
- They want passionate educators who care about the subject matter.
- They want professors who genuinely want to see them succeed.
- They want educators who can admit their mistakes.
- They appreciate non-traditional teaching methods.
- They expect mutual respect.
- They value their time and want it respected.
- They want to be noticed and acknowledged.
- They desire encouragement to voice their thoughts.
- They want relatable, approachable educators.

This list is straightforward, yet many educators struggle to meet these needs. Why? The answer often lies in ego. Teaching, at its core, is about imparting knowledge, yet our egos can sometimes create barriers to effective instruction. Just as students have expectations of their teachers, educators also have a set of expectations for their students:

- Educators want students to come to class prepared and ready to learn, motivated to engage in the learning process.
- They expect respect—both for themselves, as the authority in the classroom, and among students, fostering a respectful learning environment.
- Teachers want students to grasp and appreciate the core concepts being taught, applying them to real-life situations.
- Educators seek critical thinkers who are not just focused on getting the right answers but understanding the process that leads to them.
- Lastly, teachers hope students will recognize and work on their individual strengths and weaknesses.

If this is what educators want, why is there often a disconnect between students and teachers? The truth is,

it's not the students we dislike, but rather the behaviors that hinder learning—excuses, lack of attention, negative attitudes, and an absence of motivation. On the other hand, students often dislike us for our rigid teaching methods, inflexibility, and lack of cultural awareness. The challenge then becomes: how do we bridge this gap?

The key to bridging this divide lies in relationship-building. Positive relationships between students and educators are fundamental to creating a supportive, effective educational environment. When both parties feel safe and comfortable, it fosters engagement and a shared commitment to learning. Building strong connections with students improves academic performance, especially for vulnerable populations who benefit most from these bonds. These relationships are also critical for enhancing students' self-worth and mental health, which is essential for success. For educators, these connections facilitate professional growth and contribute to dynamic, thriving classrooms.

Creating these meaningful relationships requires intentional strategies. One of the first steps is conducting a p**re-class interview**, which helps educators understand their students' individual needs and goals. This early engagement establishes a foundation of trust and understanding. A **pre-course assessment** is another valuable tool that helps gauge students' starting points, allowing for tailored instruction that meets their specific needs. In my findings, students are much more open in these interviews than I ever expected. Students are asked about their educational background and college experiences thus far. They are asked their test and study preference as well as their preferred name and pronouns. I use this data to help structure test and learning activities which change each year based on the responses. **Post-course/exit interviews** are great tools as well. This allows me to see how my class affected each student's academic and mental well-being and provide insight to better support my students in their academic journey. To my surprise, many have felt unseen by previous instructors but none have felt unsafe. And even more surprising was that more than 75% stated they enjoyed their college experience, despite the gripes heard CONSTANTLY. On the post course exit interview, many students thanked me for having an open-door policy, checking in on their mental and physical well-being, and allowing them to feel seen. Most stated initially they hated not knowing what to expect for exams and classroom assignments but after completion of the course they better understood the method to my unorthodox madness and felt better prepared for future course work.

Another crucial aspect is **being consistently available** for students. By making ourselves approachable and accessible, we signal to our students that they can depend on us for guidance and support, which strengthens the student-teacher relationship. I have an open laptop policy. If my laptop is open I will respond...even at 3 am. Moreover, making content relatable through **engaging assignments, games, and activities** fosters excitement for learning

and helps students make meaningful connections to the material. Although some may initially shun the idea of "art" assignments or non-traditional course work, once they understand the connection to their retention of the material they look forward to future assignments.

In addition to innovative instructional methods, creating a **welcoming classroom environment** is essential for ensuring students feel included. Inclusivity promotes participation and encourages diverse perspectives, making the classroom a space where everyone's voice can be heard. Furthermore, thinking **outside the box** and employing non-traditional teaching methods breaks down the rigidity of traditional education, allowing us to meet the diverse learning styles of our students.

Lastly, maintaining **empathy while holding students to high expectations** creates a balanced approach. Students should feel supported, but they must also be pushed to strive for excellence. This combination of compassion and challenge motivates students to reach their full potential.

In conclusion, as educators, we must recognize the evolving nature of our students and the growth opportunities that come with it. Just as fashion, music, and language evolve with the times, so must our approaches to teaching. While we may not have to like all our students, we do have a responsibility to provide them with the best possible learning experience. By letting go of our egos and embracing a student-centered approach, we can build meaningful relationships that transform the learning environment and ensure our students' success. In the end, by making our students our best F.R.E.N.S.; being **Flexible**, **Relatable**, **Empathetic**, **Nurturing**, and **Supportive**, we will create classrooms that are not only more enjoyable but also more effective in fostering learning and personal growth.

The future of education lies in our ability to adapt, connect, and empower the next generation of learners. It is through these efforts that we can continue to make a lasting impact on the lives of our students, both academically and personally.

STUDENT SURVEYS

Each survey is linked below:

Pre-Course Interview Survey

Student Interview Plan

Post-Course Interview Survey

REFERENCES

1. Allen, K. A., Slaten, C. D., Arslan, G., Roffey, S., Craig, H., & Vella-Brodrick, D. A. (2021). School belonging: The importance of student and teacher relationships. In The Palgrave handbook of positive education (pp. 525-550). Cham: Springer International Publishing

2. Gablinske, Patricia Brady, "A CASE STUDY OF STUDENT AND TEACHER RELATIONSHIPS AND THE EFFECT ON STUDENT LEARNING" (2014). Open Access Dissertations. Paper 266. https://digitalcommons.uri.edu/oa_diss/266

3. Goldman, Z. W., & Goodboy, A. K. (2014). Making Students Feel Better: Examining the Relationships between Teacher Confirmation and College Students' Emotional Outcomes. Communication Education, 63(3), 259–277. https://doi.org/10.1080/03634523.2014.920091

4. Spilt, J. L., Koomen, H. M., & Thijs, J. T. (2011). Teacher wellbeing: The importance of teacher–student relationships. Educational psychology review, 23, 457-477.

5. Tormey, R. Rethinking student-teacher relationships in higher education: a multidimensional approach. High Educ 82, 993–1011 (2021). https://doi.org/10.1007/s10734-021-00711-w

ACOVENE: Raising the Bar for Veterinary Nurse Education in Europe

Krista Arnold, Dr.Med.Vet, MRCVS and **Julie Dugmore**, RVN
ACOVENE

CORRESPONDENCE

Krista Arnold, Dr.Med.Vet, MRCVS
kavs@gmx.com

Veterinary nurses play an indispensable role in animal health and welfare, contributing both technical skills and compassionate care to veterinary teams. But how do these professionals ensure they meet the highest standards of practice? Enter ACOVENE—the Accreditation Committee for Veterinary Nurse Education. Established in 2007, ACOVENE is dedicated to advancing veterinary nurse education across Europe through its voluntary accreditation of training programs. With over 70 accredited programs, ACOVENE sets the benchmark for what it means to be a qualified veterinary nurse in Europe.

WHAT ACOVENE DOES

At its core, ACOVENE's mission is to elevate the standards of veterinary nurse education. By accrediting educational institutions, ACOVENE ensures that future veterinary nurses are equipped not just with technical skills but with the ability to adapt to the changing landscape of veterinary care. Its work fosters collaboration among educational institutes, veterinary nurses, and industry stakeholders, supporting continuous improvement in the profession. Importantly, this accreditation is not compulsory but serves as a mark of excellence for schools choosing to meet these high standards.

Beyond accreditation, ACOVENE also plays a role in shaping veterinary conferences by recommending veterinary nurse-specific streams, including topics and speakers. Notably, ACOVENE contributed to this year's FECAVA Congress, which featured a dedicated veterinary nursing stream—evidence of the organization's commitment to supporting ongoing professional development.

NEW ACCREDITATION STANDARDS FOR 2024

2023 marked a milestone for ACOVENE as it approved its fourth edition of accreditation policies. Scheduled for implementation in 2024, these new standards emphasize a shift from skills-based training to outcome-based competencies. The goal is to produce veterinary nurses who are not only proficient in their technical roles but also capable of demonstrating professional behaviours and adapting to a variety of clinical scenarios. This progressive shift ensures that veterinary nurses are equipped to deliver the highest level of patient care while contributing meaningfully to veterinary teams.

ACOVENE also encourages veterinary faculties to recognize the economic value of utilizing veterinary nurses effectively. By promoting the integration of veterinary nurses into broader veterinary practices, ACOVENE highlights the positive impact that well-trained nurses can have on the quality and efficiency of care.

A BOARD REPRESENTING THE PROFESSION

ACOVENE is uniquely positioned to represent the interests of veterinary nurses, as demonstrated by its diverse leadership. The ACOVENE board is comprised of 50% veterinary nurses and 50% veterinarians, with the chair, Julie Dugmore RVN, herself a veterinary nurse. This balance ensures that the needs and perspectives of veterinary nurses are given equal weight in shaping the future of the profession. Along with other board members, ACOVENE demonstrates its commitment to promoting the role of veterinary nurses as an integral part of the veterinary team.

A VISION FOR THE FUTURE

ACOVENE's vision is clear: to create a thriving, harmonized European veterinary nursing community where professionals are recognized for their skills and empowered to deliver exceptional care. ACOVENE offers a model for elevating education through comprehensive voluntary accreditation that prepares veterinary nurses for the complexities of modern veterinary practice.

IN SUMMARY

ACOVENE's work extends far beyond accrediting educational programs. By driving educational standards, promoting professional collaboration, and fostering continuous development, ACOVENE ensures that veterinary nurses across Europe are prepared to meet the highest

demands of the profession. With its latest accreditation standards set for 2024 and a board that strongly represents the profession, ACOVENE is shaping the future of veterinary nursing. For anyone invested in veterinary nurse education, ACOVENE provides a blueprint for the next generation of veterinary nursing care.

The Need for Math Education Within Veterinary Medicine:
A Quantitative Research Study

Mariel Hendricks, MVEd, RVTg, FVTE - MentorVet

CORRESPONDENCE

Mariel Hendricks, MVEd, RVTg
mariel@mentorvet.net

SECTION 1: INTRODUCTION

Background and Problem

Having worked in the veterinary profession as a registered veterinary technician for 15 years, I have personally witnessed the trials and tribulations of daily life within general practice hospitals and specialty centers, specifically struggles with technician utilization and team-based medical approaches. When diving deeper into these two challenges, I've noticed that mathematical competency is intertwined with staff member utilization, which affects the level of team-based medicine being practiced. Historically, when I've witnessed a hierarchical system of medicine being practiced, veterinarians may not use their medical staff to their fullest potential, which then leads to lower hospital revenue.

While many medical staff members have formal schooling or on-the-job training in medical mathematics, they are not being tasked with using these skills for a variety of reasons. Team members with no formal math training crave math education so they would be utilized and trusted by their coworkers. This capstone project will focus on quantitative research on veterinary staff members' comfort levels with several numeracy concepts commonly used within veterinary medicine and their interest in formal, online math education focused on veterinary professionals as participants.

Research Questions

This capstone project seeks to answer the following research questions:

1. How do veterinary professionals feel about mathematical competency in practice?

2. Do veterinary professionals think that additional math education would contribute to a stronger team-based medicine approach in veterinary medicine?

3. Are veterinary professionals interested in formal, online veterinary math education?

SECTION 2: LITERATURE REVIEW

Concerns with Nursing Student Numeracy Skills

A 2005 study by Jukes and Gilchrist analyzed the mathematical competency of 37 nursing students in their second year of study in the United Kingdom. This study explored these students' ability to achieve a mastery score of 90% on a written drug calculation test (Jukes & Gilchrist, 2005). This test had questions that required skills in division, multiplication, percentages, ratio and proportion, conversion of units, and multiple-stage procedural skills are also used daily by medical staff within the veterinary profession. The study results showed a mean score of 60%, with only three students attaining the required 90% mastery score (Jukes & Gilchrist, 2005). The study stated that these findings supported past literature used within their research study.

A second study in 2013 tested 390 Australian students enrolled in a third-year unit, Transition to Graduate Practice, in a bachelor's nursing program. This study resulted in 25% of students not achieving a satisfactory score of 100% on a written math test. (Ramjan, et al., 2014). After a series of targeted interventions, 99.7% of the students tested were able to achieve a satisfactory score (Ramjan, et al., 2014).

While there are no current research studies analyzing the numeracy skills of veterinary technician students, the above studies show that those in nursing positions struggle with numeracy skills as they transition from student to professional. Having personal experience as a veterinary nurse, I have witnessed medical staff struggling to work through drug calculations, fluid rate calculation, and metric conversions, to name a select few examples of math skills used daily within practice. To gain appropriate data on this personal experience, this capstone project will try to gain additional knowledge in veterinary staff numeracy skills.

Feelings of Anxiety Surrounding Math Testing

A literature review in 2022 by McKenna et al. examined factors contributing to math anxiety and the impact that anxiety has on a student's performance on tests. The review listed the following as factors contributing to math test anxiety:

1. The requirement to achieve a passing score
2. Fear of failing
3. Making a mistake
4. The test itself
5. Incongruence among clinical instructions for an assessment (McKenna et al., 2022)

The impacts of this anxiety lowered a student's confidence, impacted learning, and physical symptoms of sickness were experienced, including intense dread and nausea (McKenna et al., 2022). These anxieties might be further compounded by poor mathematics skills and knowledge of principles, which promotes a reliance on calculators, as shown in a 2016 study by Bagnasco et al.

Based on this literature, confidence and testing anxiety are tightly intertwined, and any adult educational intervention in veterinary medicine must use a variety of approaches to satisfy each student's unique learning process.

Solutions to Veterinary Mathematical Skills Development

Research has shown several successful strategies for additional development of mathematical skills in nursing students in the human field, all of which would apply to veterinary nursing programs' curriculum structures. Past math educational experiences, repetition of math testing during nursing school, and type of instruction all have been studied and reported upon within human medicine (Revell & McCurry, 2013).

First, a study entitled Effective pedagogies for teaching math to nursing students: a literature review (Revell & McCurry, 2013, p. 1353), it was stated that "Undergraduate nursing student math calculation ability is related to pre-college math experiences. Basic calculation skills and problem-solving approaches are a cumulative process learned over time through the effort of the student." A second study, published in Canada, stated that a "knowledge gap around one or more of those basic math skills is likely due to an earlier lack of understanding of the underlying concepts" in middle and high school (Mackie & Bruce, 2016). This same study suggested a basic numeracy test upon admission into nursing school with individual remediation plans in place for student success upon graduation (Mackie & Bruce, 2016, p. 147).

Several research studies implemented different strategies for providing math remediation to nursing students to improve their math test scores before graduation. In Mackie and Bruce's 2016 study, the research identified a theory-practice gap in human nursing students. The nursing program partnered with the education program within the university to design and implement a virtual learning space for online resources, including "practice opportunities, online conceptual learning opportunities, and simulations (p. 151)" to close that gap between school and a professional environment. This online space would be provided to students during each of the three years in the Canadian nursing program (Mackie & Bruce, 2016). Providing students with asynchronous online materials to repeatedly practice real-life scenarios has been an ideal solution for this nursing program and would be an option for both veterinary nursing students and practicing veterinary medical staff for additional training opportunities.

A second study in 2014 stated that case-based mathematical scenarios taught and tested during or immediately after clinical placement have been identified as an ideal time for structured math education. They provided third-year study participants with online practice quizzes, simulated medication calculation scenarios, written in-person tests, an in-person didactic presentation, and a hands-on workshop over a 16-week timeframe (Ramjan et al., 2014). This study showed success by providing a variety of learning experiences for nursing students and diversified the classroom experience by applying visual, auditory, kinesthetic, and reading instructional strategies. Again, this would be ideal for both veterinary students and veterinary staff for deep learning in a professional environment.

A third study published in 2021 created an incredibly robust computer-based learning environment that embodied an immersive experience for the student (Zwart et al.). The computer program "includes features such as interactive stories" [that can] make situations more authentic by including learning tasks with essential aspects that students need to master for their future profession" (Zwart et al., 2021, p. 3). Participant feedback showed that the computer program made them more aware of their skills and benefited from it by being exposed to difficult, unclear situations that they are likely to come across in professional practice (Zwart et al., 2021).

Lastly, a fourth study from 2004 by Wright compared online math instruction to a didactic lecture paired with a math workbook. Math concepts for this study included multiplying fractions, ratios, interpreting information, place values, and percentages – all of which are used by veterinary medical personnel daily (Wright, 2004). Interestingly, students preferred the didactic lecture and math workbook that they could work on independently (Wright, 2004). This may be due to generational differences between Millennials and the newer generation, Gen Z, which are much more technically savvy. When developing math educational strategies for veterinary medical team members, this study shows that providing educational experiences both online and on paper would be beneficial for the different generations present in veterinary medicine. Implementing a range of different strategies improves students' perceptions of their math skills and their confidence in math (Wright, 2004).

Veterinary Team Utilization and Hospital Revenue

Utilizing veterinary team members to their highest potential will undoubtedly lead to higher practice revenue, according to facts and figures released by the American Veterinary Medical Association. Results show that "the average veterinarian's gross revenue would increase by $93,311 for each additional veterinary technician per veterinarian" (AVMA, 2009). However, that additional revenue can only be met if a technician's skills are being fully utilized. Employing technicians who can use their nursing skills to their fullest potential would allow nursing staff to do work that otherwise might be performed by veterinarians, freeing up their ability to focus on tasks only veterinarians are licensed to perform (Fanning and Shepherd, 2010). Thus, "nonveterinarian staff play an important role in both the revenue-generating and productive capabilities of veterinary practices" (Ouedraogo et al., 2022, p. 920).

An article by Heather Prendergast provides additional documentation on how credentialed veterinary technicians can be used to their fullest ability. State veterinary laws allow credentialed technicians to calculate drug therapy calculations, IV fluid therapy, and constant rate infusions based on the veterinarian's dosing orders (Prendergast, 2023). Prendergast stresses that education must be provided to all team members so that they may achieve trust with their team members, confidence in their skills, and self-fulfillment in their careers (2023).

SECTION 3: METHODS

Research Design

This capstone research study utilized a quantitative survey approach. Quantitative data was collected comprised of multiple-choice questions to collect demographics of the participants and Likert scale questions to collect math competency data. Survey questions can be found in Appendix A.

Participant Recruitment

A variety of social media outlets were used to attract veterinary staff participants to a Google Forms link, which led the participants to the research survey. The link was posted on veterinary-related Facebook groups, my personal Facebook and LinkedIn pages, and my personal Instagram page. Each link was accompanied by a short message urging only veterinary professionals to take the survey.

Data Analysis

All data collected were placed in pie charts for descriptive statistical purposes. No statistical analysis processes were done during this research study. All pie charts documenting participant answers can be found in Appendix B.

SECTION 4: RESULTS

Participant Demographics

A total of 289 participants took part in the survey. 60.6% identified themselves as veterinary technicians, 17.3% as veterinary assistants, 17.6% as veterinarians, 2.1% as a veterinary staff member, 1.4% as a student within veterinary medicine, and 0.1% as "other". When asked, "How many years of veterinary experience do you have?", participants identified themselves as 0-5 years (22.5%), 5-10 years (18%), 10-15 years (20.1%), 15-20 years (13.1%), and 20+ years (26.3%). Lastly, 83% responded as having formal math education in a school setting.

Participant State Law Knowledge

When asked, "Based on your job description or state license, are you allowed to perform math calculations in your professional environment?". 93% of survey participants responded "Yes", while 1.7% responded "No", and 4.5% responded with "I'm not sure".

Comfort Levels with Medical Math Competencies

Survey participants were asked about a variety of mathematical competencies used daily within veterinary clinical practice. The competencies were listed in what the author in this study believed were the easiest to hardest mathematical concepts. An overwhelming number of participants (93.4%) felt comfortable independently converting pounds to kilograms. When asked about independently calculating oral medications, 81.3% of participants also felt comfortable with the competency. 77.8% also felt very comfortable calculating injectable medications.

Moving into more difficult competencies, 1 in 4 of respondents felt "neutral" to "very uncomfortable" in calculating metric conversions. To put this into perspective, examples of metric conversions are converting liters to milliliters or grams to milligrams. 1 in 5 respondents also felt "neutral" to "very uncomfortable" independently calculating surgical fluid rates. 35.5% felt "neutral" to "very uncomfortable" independently calculating a fluid drip rate.

Moving on to converting a percent solution to mg/ml, 63% of respondents felt "very comfortable" or "somewhat comfortable" with this conversion, with 34.7% of respondents feeling "neutral" to "very uncomfortable" with this calculation process.

Lastly, the last competency asked was comfort levels when independently calculating constant rate infusions. A little over half of respondents (51.6%) felt "neutral" to "very uncomfortable" with this concept. Only 25.3% felt "very comfortable" independently calculating CRIs.

Participant Perspective on Math-Related Anxiety

Multiple choice, Likert scale questions were used when asking about a variety of anxieties surrounding mathematical competencies. These anxieties were pulled from human nursing research mentioned above in Section 2.
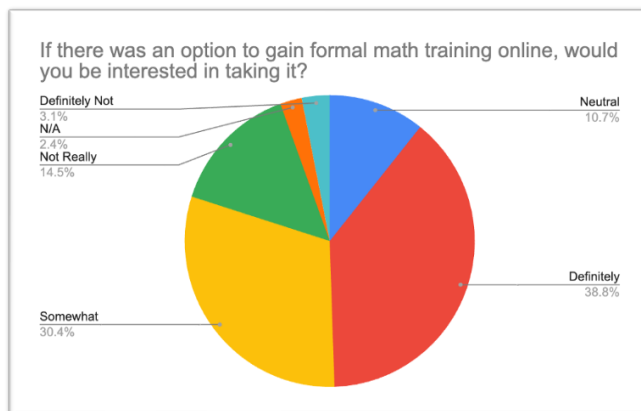
When asked, "I have anxiety using a variety of math skills for fear of making a mistake and hurting a patient," almost half of the respondents either marked "definitely agree" or "somewhat agree" when asked if that statement pertained to their own feelings.

When asked if their anxiety when using math concepts may be due to their lack of confidence in the math concepts being used, only 1 in 4 respondents "definitely agreed" or "somewhat agreed" to that statement.
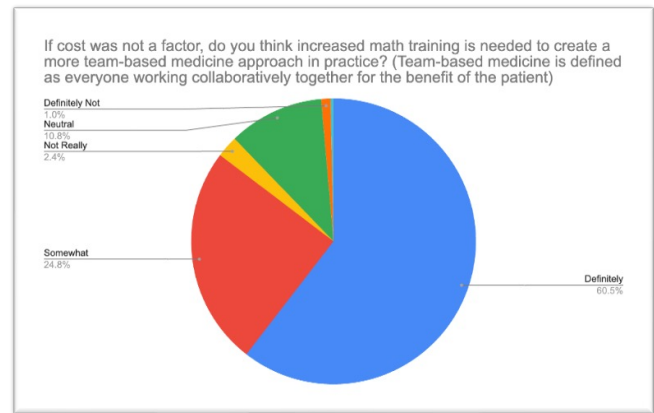
The last question surrounding math anxiety stated, "I have anxiety around independently using a variety of math skills because I do not understand math concepts used in veterinary medicine." While results show that 76.8% of respondents "definitely" or "somewhat" agreed with this statement, this still shows that 1 in 4 individuals within veterinary medicine do not have a solid understanding of mathematical competencies used in daily practice.

Participant Perspective on Math-Related Training

As seen in Chart 1, respondents showed a positive result in a want for additional math education if provided in an online environment.

If there was an option to gain formal math training online, would you be interested in taking it?

Definitely Not 3.1%
N/A 2.4%
Not Really 14.5%
Neutral 10.7%
Definitely 38.8%
Somewhat 30.4%

When asked if increased math training is needed to create a more team-based medicine approach in practice, an overwhelming 85.3% of participants responded with "definitely" or "somewhat". This result can clearly be seen in Chart 2:

If cost was not a factor, do you think increased math training is needed to create a more team-based medicine approach in practice? (Team-based medicine is defined as everyone working collaboratively together for the benefit of the patient)

Definitely Not 1.0%
Neutral 10.8%
Not Really 2.4%
Somewhat 24.8%
Definitely 60.5%

SECTION 5: DISCUSSION

Implications

This study highlights perspectives on veterinary mathematical competencies and identifies opportunities for additional veterinary math education as a way of supporting both an individual's professional growth and a veterinary hospital's ability to practice high staff member utilization. Based on the descriptive statistics gained from this project's survey, veterinary teams struggle with a variety of math concepts used daily in veterinary medicine, which may lead to lower utilization and lower hospital revenue. Team-based medicine cannot be practiced efficiently, and staff members may be supervised or not trusted to perform their job duties independently.

There was a high percentage of individuals who agreed that additional math education is needed for individuals using these math skill sets. While many online math resources were listed, the majority were cheat sheets that an individual can type in a weight and all calculations are done via technology. There was also a high percentage of participants who agreed that additional math education would increase the concept of team-based medicine being practiced within their facility, which may lead to higher technician/assistant job satisfaction, higher confidence, and a positive workplace culture (Prendergast, 2023). All of which may then lead to higher practice revenue (Ouedraogo et al., 2022).

Future Recommendations

A computer-based, online educational platform would be an ideal solution for adult learners in need of additional veterinary mathematical education while navigating their personal and professional obligations within daily life. This educational platform should focus on the shortcomings identified in the literature review above and closing the theory-practice divide those in clinical practice may be needing additional support with (Revell & McCurry, 2013). A theory-practice divide exists between school and using mathematical skill sets in a professional setting. Thus, a constructivist approach within the online educational platform that focuses on basic numeracy concepts such as

division, multiplication, fractions, decimals, and conversions and then building into these concepts with veterinary scenarios attached may be a successful approach (Revell & McCurry, 2013; Mackie & Bruce, 2016).

Based on this recommendation, the author has founded VetSmart Math Academy. Details and an outline of the program can be found in Appendix C.

Limitations

As with any research, this study does have several limitations. Despite having close to 300 responses to the mathematical competency survey, this is only a small number compared to the estimated 122,000 veterinary technicians and 78,220 veterinarians, according to the May 2023 report from the U.S. Bureau of Labor Statistics. The sample size is only 0.14% of the veterinary population. Also, while I tried to gain a variety of veterinary professional participants through social media platforms, my reach was limited, and thus, most participants identified themselves as veterinary technicians.

While the survey itself gained quantitative data on feelings surrounding mathematical competencies, it did not provide actual mathematical questions to truly identify if the participant population understood and correctly calculated veterinary-related math problems. I would like to see future research with this style of questioning to gain additional data on mathematical competency rather than just the participant's feelings on the competencies themselves. For example, it may be easier for a survey participant to "feel" completely comfortable calculating a CRI rate, but not actually able to come to the correct answer.

Conclusions

Literature in human medicine has shown that nursing students struggle with mathematical competency when transitioning from school to clinical practice. Anxiety surrounding math testing can be largely attributed to the lack of understanding in basic math concepts starting in grade school and revealing themselves when used daily in a medical professional's skillset. Because human nursing programs and veterinary programs are similar in coursework and teach related nursing concepts, this research may be used to identify veterinary staff shortcomings in mathematical competency.

Research has also shown that veterinary practice revenue is closely related to the high utilization of all medical staff members, ranging from assistants, to credentialed technicians, and veterinarians. Trust between team members, education for all staff, and team-based medical approaches to patient care all lead to high utilization and high revenue.

Education can be provided to veterinary staff members in many ways. When diving into adult math education literature, using a constructivist approach and applying a variety of instruction ranging from independent "paper and pen" practice to immersive online programming all lead to success in mathematical skill mastery if applied repetitively throughout a professional's career. This strategy will also address feelings of anxiety that veterinary professionals may experience while in clinical practice. Simulated clinical scenarios are also important in veterinary math education, as they bridge the gap between instruction and clinical relevance. This capstone project will add to research specifically for veterinary math competency and provide a solution for math education for those needing additional instruction to bolster their veterinary nursing "toolbelt".

APPENDIX

Click here to view appendices.

REFERENCES

1. AVMA. AVMA Report on Veterinary Practice Business Measures. (2009). United States: American Veterinary Medical Association.

2. Bagnasco A, Galaverna L, Aleo G, Grugnetti AM, Rosa F & Sasso L. (2016) Mathematical calculation skills required for drug administration in undergraduate nursing students to ensure patient safety: A descriptive study: Drug calculation skills in nursing students. Nursing Education in Practice. 16(1),33-39. http://doi.org/10.1016/j.nepr.2015.06.006

3. Fanning, J. & Shepherd, A. (2010). Contribution of veterinary technicians to veterinary business revenue, 2007. JAVMA. 236(8), 846.

4. Jukes, L. & Gilchrist, M. (2006). Concerns about numeracy skills in nursing students. Nurse Education in Practice. 6(4), 192-198. https://doi.org/10.1016/j.nepr.2005.12.002

5. Mackie, J. & Bruce, C. (2016). Increasing nursing students' understanding and accuracy with medical dose calculations: A collaborative approach. Nurse Education Today. 40, 146-153. http://doi.org/10.1016/j.nedt.2016.02.018

6. McKenna, L., Johnson, J., Cross, R., Austerberry, J., Mathew, T. & McKenzie, G. (2022). Mathematics anxiety and associated interventions in nursing: A scoping review. Nurse Education Today. 112. https://doi.org/10.1016/j.nedt.2022.105335

7. Ouedraogo, F., Lefebvre, S. & Salois, M. (2022). Nonveterinarian staff increase revenue and improve veterinarian productivity in mixed and companion animal veterinary practices in the United States. JAVMA. 260(8), 916-922. http://doi.org/10.2460/javma.21.11.0482

8. Prendergast, H. (2023). Optimal Veterinary Team Utilization Leads to Team Retention. Veterinary Clinics of North America: Small Animal Practice. 54(2), 317-335. https://doi.org/10.1016/j.cvsm.2023.10.010

9. Ramjan, L., Stewart, L., Salamonson, Y., Morris, M., Armstrong, L., Sanchez, P. & Flannery, L. (2014). Identifying strategies to assist final semester nursing students to develop numeracy skills: a mixed methods study. Nurse Education Today. 34(3), 405-412. http://doi.org/10.1016/j.nedt.2013.03.017

10. Revell, S. & McCurry, M. (2013). Effective pedagogies for teaching math to nursing students: A literature review. Nurse Education Today. 33(11), 1352-1356. https://doi.org/10.1016/j.nedt.2012.07.014

11. Wright, K. (2004). An investigation to find strategies to improve student nurses' math skills. British Journal of Nursing. 13(21), 1280-1284. https://doi.org/10.12968/bjon.2004.13.21.17114

12. Zwart, D., Goei, S., Noroozi, O.& Van Luit, J. (2021). The effects of computer-based virtual learning environments on nursing students' mathematical learning in medication processes. Research and Practice in Technology Enhanced Learning. 16(4). https://doi.org/10.1186/s41039-021-00147-x

SCNAVTA Profile:
University of Puerto Rico in Arecibo

Rebeka Sanabria-Léon, MSc, DVM
Veterinary Technology
University of Puerto Rico in Arecibo

The SCNAVTA of the Veterinary Technology (TVET) Program at the University of Puerto Rico in Arecibo (UPRA) is a student organization with 41 active members. It became a NAVTA Student Chapter in 2023 but it has been an active student organization since the foundation of the TVET Program at UPRA in the late 1980's. Our mission is to enrich future veterinary technicians through extracurricular experiences that highlight the different areas of veterinary medicine, and to positively impact our society in terms of animal care and public health. The chapter holds educational activities, and participates in community work, fundraising, and extracurricular fun activities for its members. The mentors are Kenializ Rosado-Molina, LVT (NAVTA Mentor) and Dr. Rebeka Sanabria-León (UPRA Mentor).

Figure 1: SCNAVTA of University of Puerto Rico in Arecibo and Faculty of the Veterinary Technology Program during their Initiation Ceremony.

Program Profile:
Northern College

Samantha Airdrie, RVT
Department of Veterinary Sciences
Northern College

The Veterinary Technician diploma program at Northern College is a comprehensive program designed to equip students with the knowledge and practical skills necessary for a career in the always-changing field of veterinary medicine. The program is taught from the Haileybury Campus, located in beautiful Northern Ontario, Canada. Our campus was honoured to host the Ontario Veterinary Technician Educators (OVTE) conference in May 2023, with Dr. Temple Grandin as our prestigious key-note speaker.

Our program is accredited by the Ontario Association of Veterinary Technicians (OAVT), the Canadian Veterinary Medical Association (CVMA), as well as the College of Veterinarians of Ontario (CVO). Our state-of-the-art veterinary science center includes every component you would find in a clinical practice, and then some! Our brand new 3100 square foot necropsy suite opened in 2023; this provides new and enhanced learning spaces for students, including a spacious necropsy room, an ante and gowning room and walk-in freezers with a crane hoist to house and maneuver large mammal cadavers for our Wildlife Rehabilitation program.

We house a rotating colony of canines, felines, rabbits and rats on campus to ensure students are prepared for the practical component of life as a Veterinary Technician. Students are scheduled in groups to attend kennel duty twice daily to feed

Student Photo NC: Giselle Alves and Emma Gordon (2023 graduates of the Veterinary Technician program) completing a pre-operative physical examination on a feline patient undergoing ovariohysterectomy.

NC Necropsy Lab: Interior view of newly constructed necropsy suite addition featuring our bovine dystocia simulator model.

and exercise the colony animals and are required to sign in daily for enrichment. Our enrichment program encourages students to provide socialization and numerous types of enrichment to our colony animals to keep them mentally stimulated, and to reduce stress while in our care. Students also complete an 80-hour externship in their first year of the program, and a 160-hour externship in the second year of their program.

In addition to a two-year Veterinary Technician diploma program, Northern College also offers a three-year Veterinary Technology - Wildlife Rehabilitation advanced diploma, as well as a one-year Companion Animal Physical Rehabilitation post-graduate certificate. Also included in our offerings of veterinary science programs are a one-year Veterinary Assistant Program, and a one-year Animal Grooming program that can be completed concurrently as a dual-certificate program. Our campus also launched the first of our Large Animal Medicine for Veterinary Technicians micro-credentials this year, which are asynchronous courses with an in-person "Farm School" on campus. Our first micro-credential course offering is Dairy Cattle Health Production Medicine and Software, with Beef Cattle Care and Swine Health to follow in 2025.

Veterinary Science Center: Exterior photo of newly constructed necropsy suite addition.

TOOLS TO SUPPORT AND STRENGTHEN THE ENTIRE VETERINARY TEAM

AVMA resources help the entire team deliver compassionate, high-quality veterinary care and build strong relationships with clients and coworkers.

- The Positive Pet Care Guide: Help foster healthy lines of communication and a positive partnership between staff and pet owners

- Language of Veterinary Care resources: Leverage language to strengthen relationships with clients and improve patient care

- Wellbeing toolkit: Support your personal and professional wellbeing

- Journey for Teams program: Foster diversity, equity, and inclusion in veterinary workplaces

avma.org

AVMA is a proud sponsor of the AVTE Annual Conference. See you there in August!

AVMA®
American Veterinary Medical Association

AVTE

WWW.AVTE.NET

Want to submit an article for the next issue of JAVTE?
Email your submission to Journal@AVTE.net