

Beyond NAVMEC: Competency-Based Veterinary Education and Assessment of the Professional Competencies

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ABSTRACT

The implementation of competency-based curricula within the health sciences has been an important paradigm shift over the past 30 years. As a result, one of the five strategic goals recommended by the North American Veterinary Medical Education Consortium (NAVMEC) report was to graduate career-ready veterinarians who are proficient in, and have the confidence to use, an agreed-upon set of core competencies. Of the nine competencies identified as essential for veterinary graduates, seven could be classified as professional or non-technical competencies: communication; collaboration; management (self, team, system); lifelong learning, scholarship, value of research; leadership; diversity and multicultural awareness; and adaptation to changing environments. Traditionally, the professional competencies have received less attention in veterinary curricula and their assessment is often sporadic or inconsistent. In contrast, the same or similar competencies are being increasingly recognized in other health professions as essential skills and abilities, and their assessment is being undertaken with enhanced scrutiny and critical appraisal. Several challenges have been associated with the assessment of professional competencies, including agreement as to their definition and therefore their evaluation, the fact that they are frequently complex and require multiple integrative assessments, and the ability and/or desire of faculty to teach and assess these competencies. To provide an improved context for assessment of the seven professional competencies identified in the NAVMEC report, this article describes a broad framework for their evaluation as well as specific examples of how these or similar competencies are currently being measured in medical and veterinary curricula.

Key words: professional competencies, assessment, veterinary curricular development

INTRODUCTION

The changing environment within higher education, as well as in the veterinary profession, continues to present both challenges and opportunities for veterinary medical education. In response to these challenges the American Association of Veterinary Medical Colleges (AAVMC) convened the North American Veterinary Medical Education Consortium (NAVMEC), which organized a series of three meetings in 2010. These meetings brought together a broad spectrum of stakeholders who were charged with identifying how veterinary medical education should evolve to produce veterinarians who meet current and future societal needs. The resultant NAVMEC Report¹ outlines five strategic goals, including the recommendations that admissions, curricula, accreditation, and testing/licensure be competency-driven, and that veterinary colleges and schools graduate career-ready veterinarians who are proficient in, and have confidence to use, an agreed-upon set of core competencies. The nine core competencies identified in the NAVMEC report include multispecies and One Health knowledge, as well as seven professional or non-technical competencies: communication; collaboration; management (self, team, system); lifelong learning, scholarship, value of research; leadership; diversity and multicultural awareness; and adaptation to changing environments. A comparison of the NAVMEC competencies with those currently required by the American Veterinary Medical Association Council on Education (AVMA COE) for graduating students (Standard 11: Outcomes Assessment)² is outlined in Table 1.

Competency-based education represents a paradigm shift in medical curricula, moving away from traditional time-based training, which focuses on the time a learner spends on an educational unit, to a focus on the learning that actually occurs (outcomes) with an emphasis on abilities and the promotion of learner-centeredness.³ Several national frameworks have identified the competencies required for medical doctors^{4–6} and have provided medical educators with guidelines to develop educational and assessment programs centered on relevant professional tasks⁷ that are derived from an analysis of societal and patient needs⁸ and are frequently linked to accreditation standards.⁹ The nine competencies identified in the NAVMEC report offer a similar framework to aid North American veterinary colleges in developing competency-based curricula.

Although competency-based curricula are now well established in health sciences education, their implementation was not without delays. During the initial shift to competency-based medical education much attention was given to identifying the specific competencies required of physicians. Little attention, however, was devoted to defining the benchmarks of specific competencies, the means by which to attain them, or the subsequent evaluation of competence.¹⁰ This lack of assessment strategies was likely one of the factors responsible for the three-decade lag between the initiation of the movement and its widespread adoption.¹⁰ If veterinary educators wish to avoid a similar delay in adopting competency-based

Table 1: Comparison and alignment of core competencies recommended in the NAVMEC report¹ to the competencies required by the AVMA COE for graduating veterinary students (Standard 11)²

Competencies recommended in NAVMEC report	Competencies required by AVMA COE for graduating veterinary students
Multispecies knowledge plus clinical competency in one or more species or disciplines	Comprehensive patient diagnosis (problem solving skills), appropriate use of clinical laboratory testing, and record management Comprehensive treatment planning including patient referral when indicated Anesthesia and pain management, patient welfare Basic surgery skills, experience, and case management Basic medicine skills, experience, and case management Emergency and intensive care case management
One Health knowledge: animal, human, and environmental health	Health promotion, disease prevention/biosecurity, zoonosis, and food safety
Communication	Client communication and ethical conduct
Lifelong learning, scholarship, value of research	Critical analysis of new information and research findings relevant to veterinary medicine
Collaboration	
Management (self, team, system)	
Leadership	Client communication and ethical conduct
Diversity and multicultural awareness	
Adapt to changing environment	

NAVMEC = North American Veterinary Medical Education Consortium; AVMA COE = American Veterinary Medical Association Council on Education

curricula, it is imperative that the competencies be clearly defined and that they be partnered with valid and reliable mechanisms for their evaluation. This need is particularly relevant for the seven professional or non-technical competencies identified in the NAVMEC report, as these competencies have traditionally been taught and assessed infrequently in veterinary curricula. This paper seeks to offer a discussion on competency-based education, focusing on the issues associated with assessment of professional competencies. Methods currently used in medical and veterinary education to assess professional competencies will be reviewed, concentrating on processes applicable to the seven professional competencies recommended in the NAVMEC report.

PROFESSIONAL COMPETENCIES AND THEIR ASSESSMENT

The group of abilities called “professional competencies” within the NAVMEC report have been described in the literature using a variety of alternate terms including non-technical competencies, non-cognitive competencies, medical professionalism, emotional intelligence, and skills, knowledge, aptitudes, and attitudes (SKAs).¹¹ For the sake of consistency with the NAVMEC report, the term professional competencies will be used throughout this article when discussing those competencies that go “beyond the medical, surgical, and technical knowledge and skills traditionally emphasized in veterinary training.”^{12(p.238)}

Beginning with the Pew report in the late 1980s,¹³ many articles and reports have called for a greater focus on the development of professional competencies within DVM programs.^{7,14–19} These calls were in response to studies demonstrating that professional competencies are positively and significantly associated with employer satisfaction,²⁰ and are correlated with, and may be essential to, the economic and professional success of the individual veterinarian as well as the veterinary profession.^{14–18} In reply, many veterinary programs have made significant progress toward the inclusion of the professional competencies either within their curricula, or in admissions, orientation, co-curricular, and “other” categories.^{7,18,21–23} The professional competencies specifically integrated into curricula include communication, business management, personal finances, marketing, teamwork, professionalism and interpersonal skills, law/ethics, entrepreneurship, and life skills (including reflection and leadership). However, the extent to which each of these professional competencies is being incorporated into veterinary curricula is not clear²⁴ and it is likely that many are included only sporadically. Furthermore, there are few reports in the veterinary literature that describe the processes that evaluate their attainment.

There are several reasons that the professional competencies may be taught and assessed infrequently in veterinary curricula. Lane suggested that veterinary educators are generally more comfortable with teaching and evaluating the technical realm of practice rather than the nuances

associated with these more elusive qualities, despite their necessity to function as a competent clinician.¹¹ In addition, it has been anecdotally reported that faculty often presume that students somehow acquire the professional competencies as they complete the technical aspects of the curriculum,^{23,25} or that professional competencies cannot be taught, but rather are inherently or inextricably woven into an individual's personality or psychological makeup.²⁵ Concern has also been expressed regarding an already overloaded veterinary curriculum,²³ and the requirement of acquiring species-specific knowledge and technical skills may be considered more important than the professional competencies by students, faculty, and administrators.²⁶

Despite this, the importance of the professional competencies is being increasingly recognized by veterinary faculty, and in a recent survey of five veterinary colleges more than 90% of respondents reported a personal responsibility to teach or cultivate several professional competencies including communication skills, self-development skills, and ethical skills.¹² Furthermore, more than 85% of faculty also saw themselves as having a role in developing competencies such as interpersonal skills, creativity, and self-management. The faculty surveyed reported a parallel preparedness to assess these competencies. It is, however, important to note that although faculty may have perceived they were responsible for cultivating, teaching, and assessing these competencies, specific teaching and assessment activities were not reported; therefore it is not known if perceptions translated into reality. Furthermore, "the placement of a concept in a curriculum does not mean that the student will become competent in this area."¹⁹ Additional surveys that determine the types and frequency of teaching and assessment of the professional competencies in veterinary curricula would help clarify this matter.

Issues with the Assessment of Professional Competencies

Assessment of the professional competencies has several specific challenges that need to be addressed if they are to be successfully incorporated in veterinary programs. One of the current struggles with all existing competency frameworks is the definition of competency itself, as well as definitions of any specific competencies being considered. This is important for the assessment of any competency as the two are integrally linked. A recent review of the health sciences education literature found 14 different definitions of competence or competency⁹ consistent with the broad perceptions of this term that currently exist. While a single, unified definition of competence and/or competency may not be achievable (or even desirable, considering the different frameworks to which the term is applied), there needs to be agreement within participating institutions that curricula will be competency-based and an agreement about what might constitute a broad framework for their development.

It is essential to this process that the definitions created for specific competencies allow them to be both teachable and assessable. If we examine the current definitions as well as the key objectives of the seven professional competencies outlined in the NAVMEC report (Table 2) it

could be argued that some meet neither of these requirements, thus negating one of the strengths of a competency-based approach. Although these definitions and objectives were only offered as a starting point, it is important in future iterations that they are framed in terms that allow for critical evaluation of their achievement. Alternatively, it could be argued that the definition and/or key objectives are best determined at the level of the individual colleges and schools of veterinary medicine, so the competency can be defined, taught, and assessed within both the broad framework provided and the local context and resources. This approach is currently used by the AVMA COE with regard to the clinical competencies,²⁷ and linking outcomes for the professional competencies with accreditation could serve to strengthen their inclusion in curricula.

As mentioned, the definition of a professional competency is integrally linked with its assessment. This point is central to another of the controversies regarding competency-based education: the trade-off between the problems with overly broad descriptions of a competency, and the risks associated with reducing a complex, multi-dimensional competency to a list of specific elements related to performance. The problem with broad descriptions is that they negatively affect the ability to define discrete outcomes for a competency, which are required for the development of valid assessment tools.²⁸ On the other hand, reducing complex competencies to a list of specified objectives or tasks may not allow complete assessment of the intellectual proficiency with which the knowledge and skills are applied²⁹ and which is necessary for the evaluation of competent clinicians.³⁰ Furthermore, while it is tempting to reduce these complex competencies to simple, individual elements to aid their assessment, evaluating only what students "know" about these skills frequently means ignoring the essential, holistic nature of the original competency,³¹ and it cannot be assumed that mastery of its parts will automatically lead to a competent performance of the integrated whole.³² This tension between reducing complex competencies to increase assessment reliability versus retaining their complexity to increase assessment validity remains one of the quandaries regarding their use in veterinary curricula.

In medical education this difficulty is being addressed through the use of multiple integrated assessment tasks that additively evaluate a student's attainment of a competency.³³ As with learning, where achieving a competency often requires reiteration and deepening of skills through practice in a variety of contexts,³⁴ assessment should revisit the learning achieved in a spiral manner, hopefully evaluating a higher order of accomplishment with each successive activity. In this way, assessment is based on a coherent and comprehensive series of different activities, interspersed throughout a curriculum and applied in authentic contexts.^{32,35} These assessment programs can cover the entire competency pyramid initially described by Miller²⁹ and expanded by Mehay and Burns to a "competency prism" that includes the types of assessment that may be used for Miller's levels of competence (Figure 1). The assessment programs may deliberately incorporate "hard" (qualitative) measures in some instances on reliability grounds and "softer" (quantitative) measures to improve validity and deliberately steer

Table 2: Professional (non-technical) competencies, their definition, and suggested key objectives as outlined in the NAVMEC report¹

Competency	NAVMEC definition	Suggested key objectives and supporting competencies that underpin the primary competency
Communication	<i>"Veterinarians sustain effective professional relationships and skillful, sensitive, and appropriate communications with clients, colleagues, other healthcare professionals, and the public. They communicate effectively, using various methods in a variety of settings with the purpose of achieving the best outcomes/ results."</i>	<ol style="list-style-type: none"> 1. Facilitate the doctor-patient-client relationships 2. Communicate effectively with clients, producers, the lay public, professional colleagues, and responsible authorities 3. Accurately elicit and synthesize information from multiple sources 4. Professionally and confidently convey oral and written information, including reports, case records, and therapeutic plans, by all necessary means, including electronic, to clients, colleagues, the public, and the media 5. Use effective communication techniques to educate clients and present treatment options 6. Communicate difficult issues such as bad news, or disclose errors or adverse events
Collaboration	<i>"Veterinarians serve integral roles in interdisciplinary teams to achieve success in business and optimal societal outcomes. They work as effective team members in interdisciplinary, multi-professional, and multicultural environments."</i>	<ol style="list-style-type: none"> 1. Work effectively as a member of a multi-disciplinary team in the delivery of veterinary services and make necessary compromises to accomplish a common goal 2. Recognize and explain the diverse roles, responsibilities, perspectives, and resources of others 3. Manage conflict and employ collaborative negotiation skills 4. Perform both peer- and self-assessment and discuss the strengths and weaknesses of collaboration
Management (self, team, system)	<i>"Veterinarians make effective choices to manage their professional and personal lives. They are aware of the challenges and the importance of making good work/life balance decisions. They are able to prioritize, coordinate, and effectively execute tasks and manage resources."</i>	<ol style="list-style-type: none"> 1. A working knowledge of business and financial concepts on a personal and professional level 2. An understanding of administrative and leadership roles 3. The ability to supervise, delegate, and communicate appropriately within groups 4. The ability to work cooperatively and effectively in a multidisciplinary team environment, including consensus building and conflict resolution 5. The ability to identify business and personal priorities and apply time management skills to balance professional and personal lives 6. A working knowledge of laws and regulations pertaining to their chosen discipline or career
Lifelong learning, scholarship, value of research	<i>"Veterinarians recognize that research, which is based on the scientific method, leads to generation of new knowledge that underpins the veterinary medical profession. They demonstrate a lifelong commitment to learning. They regularly ask questions & are able to review and analyze the validity of research findings. They apply new knowledge to problem solving & take an evidence-based approach to practice. They are committed to improving their knowledge, skills & judgment. They participate in the creating, dissemination, translation, & adaption of new knowledge to their work in order to maintain delivery of the highest quality service."</i>	<ol style="list-style-type: none"> 1. An understanding of the importance of self-reflection and assessment 2. The ability to effectively accomplish self-directed learning 3. The ability to evaluate information critically and make evidence-based decisions 4. The ability to explain how research is created, disseminated, interpreted, and applied

Table 2: Continued

Competency	NAVMEC definition	Suggested key objectives and supporting competencies that underpin the primary competency
Leadership*	<i>"Veterinarians are proactive leaders in the profession & are recognized voices of authority in important areas, such as animal welfare and One Health medicine. They are committed to the health & welfare of animals and the protection of human health through ethical practice, professional self-regulation, legal compliance, & high personal standards of behavior & practice. They are guided by a code of ethics and law & a commitment to professional competence, appropriate attitudes & behavior, integrity, personal well-being, and the public good."</i>	<ol style="list-style-type: none"> 1. Explain the importance of maintaining professional behaviors, including honesty, integrity, reliability, compassion, respect, altruism, and commitment to animal health and welfare, and to public health 2. Explain the importance of maintaining appropriate professional boundaries and effectively managing conflicts of interest 3. Motivate and coach others
Diversity and multicultural awareness†	<i>"Veterinarians demonstrate an understanding of the manner in which cultures and belief systems impact delivery of veterinary medical care while recognizing and appropriately addressing biases in themselves, in others, and in the process of veterinary medical care delivery."</i>	<ol style="list-style-type: none"> 1. Demonstrate an understanding of <ol style="list-style-type: none"> a. societal diversity in its various dimensions b. working in diverse teams c. the varying societal roles of animals among diverse population groups d. how to provide the most appropriate veterinary medical advice to a diverse clientele 2. Explain how the strengths and benefits of diversity within veterinary medical communities and communities that veterinarians serve influence veterinary medical decisions
Adapt to changing environment	<i>"Veterinarians recognize that they function within continually changing physical, technological, economic, and societal environments. They demonstrate curiosity and flexibility when challenged with changing priorities and situations. A key attribute for veterinarians is their ability to quickly acquire technological expertise."</i>	<ol style="list-style-type: none"> 1. Knowledge of coping skills to handle stress in positive ways 2. The ability to critically evaluate emerging technologies relating to veterinary medicine and discuss their potential benefits to the profession and society

NAVMEC = North American Veterinary Medical Education Consortium

* Leadership is the ability to take direct action and influence others to take action.

† Diversity refers to differences among people with respect to race, gender, age, ethnicity, sexual orientation, mental/physical ability, religion, job level, personality traits, education, health, stature, culture, language, and other human differences.

learning in certain directions.³² In this way, the inherent shortcomings of each individual method of assessment will be compensated for by the inclusion of alternate methods of assessment within the program.

A final issue associated with the teaching and assessment of professional competencies within veterinary curricula is the role of faculty, where Lane and Bogue^{36(p.245)} noted that a "gap in faculty involvement may lead to a compartmentalization of non-technical skill development in professional schools and loss of integration of the art and science of professional practice." Importantly, they also observed that "when few faculty, or only adjunct experts, are engaged in development of non-technical skills, the possibility of mixed messages becomes great." This argument lends credence to the concern that students are getting subtle (and sometimes less than subtle) messages suggesting that professional competencies are not of high importance and that they can be taught and assessed in isolation from the development of other, more traditional veterinary competencies (multispecies

knowledge and technical skills). A preferred approach would be teaching activities where professional competencies are taught by a range of faculty, are integrated with other Day One competencies, and are assessed in parallel.

METHODS FOR THE ASSESSMENT OF PROFESSIONAL COMPETENCIES

While competency-based education, by definition, necessitates a robust and multifaceted assessment system,³⁷ the fundamental goal of assessment remains the development of reliable measurements of student performance which, as well as having predictive value for subsequent competence in a clinical setting, have a formative, educational role.³⁸ Along with these broader considerations, Van der Vleuten³² describes five criteria for determining the usefulness of methods of assessment: reliability (the degree to which the measurement is accurate and reproducible); validity (whether the assessment measures what

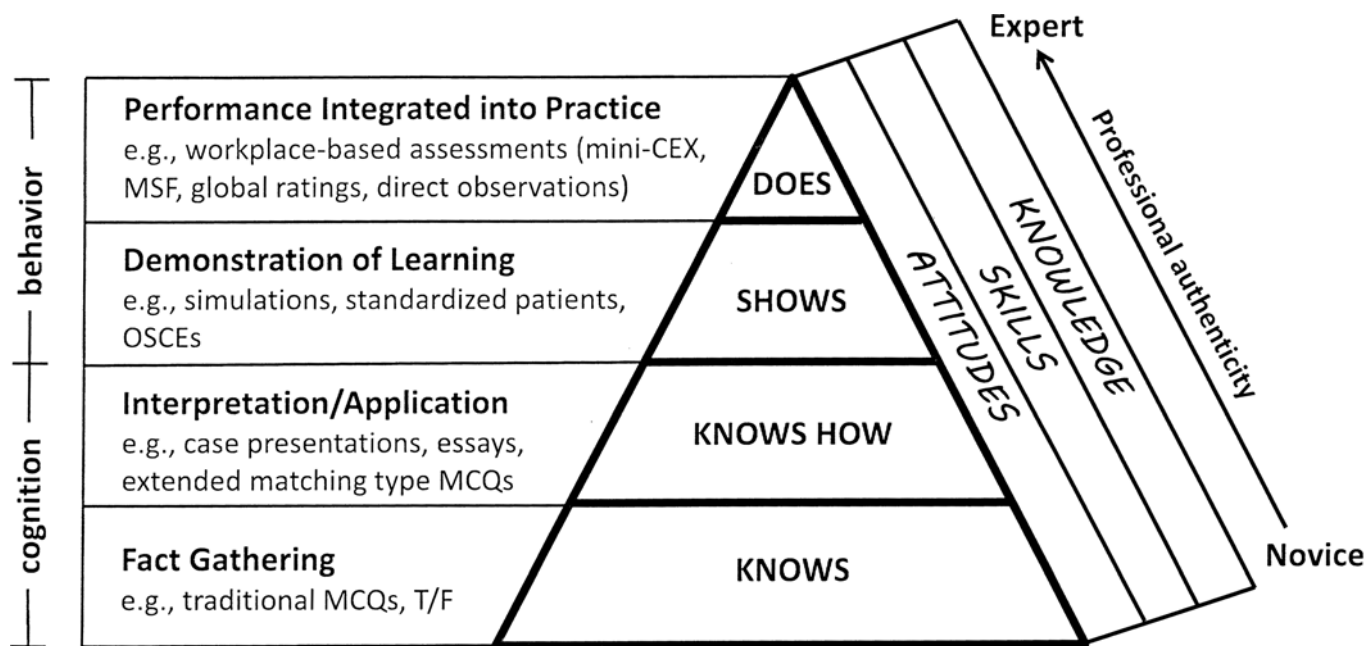


Figure 1: Miller's prism of clinical competence (i.e., Miller's Pyramid). Based on work by Miller GE. The assessment of clinical skills/competence/performance. *Acad Med.* 1990;65(9):s63–s67 and adapted by Drs. R. Mehay & R. Burns. UK (Jan 2009). Available from: http://www.gp-training.net/training/educational_theory/adult_learning/miller.htm. CEX = Clinical Evaluation Exercise; MSF = Multisource Feedback; OSCE = Objective Structured Clinical Examination; T/F = True/False

it claims to measure); impact on future learning and practice; acceptability to learners and faculty; and cost to the individual trainee, the institution, and society at large. These latter criteria are particularly relevant to the assessment of professional competencies in veterinary medical education, where resources are scarcer and faculty buy-in an issue.

Several newer methods of assessment are gaining popularity for evaluating professional competencies in the classroom as well as in clinical settings. Epstein³⁹ categorized the broad methods used for assessment as written exercises, assessment by supervising faculty, clinical simulations, and multisource ("360 degree") assessments (including feedback from peers, clients, and self). He further described their learning domains, type of use, limitations, and strengths. These categories are also useful for grouping the general techniques that may be used for assessment of the NAVMEC professional competencies in a veterinary context (Table 3).

Whenever professional competencies are being evaluated in a classroom setting, it is important to remember that "shows how" on one occasion does not necessarily predict "does" in a clinical setting, the highest level of Miller's pyramid (Figure 1).^{27,29} This higher level implies a behavior that a student does habitually, when not observed, and assessment of this level of competence requires extensive use of incognito clients and clinicians and/or multiple assessments over time. However, both these assessment methods can be costly in terms of faculty time and clinical resources, and may not be feasible in a veterinary teaching hospital. Alternate methods for the assessment of professional competencies in a clinical or workplace-based setting include mini-clinical evaluation exercises

(mini-CEXs), direct observation of procedural skills (DOPS), multisource feedback (MSF), and pooling evaluations by faculty, staff, and junior officers through multiple global ratings.⁴⁰ These methods are perceived to be some of the most valid assessment tools for professional competencies such as collaboration, leadership, and communication.³¹ However, issues regarding the credibility of these tools remain, and their usefulness may be hampered by a lack of standardization, infrequent observations, and "clinical impressions."^{29,41} Therefore, these tools should only be used for formative rather than summative assessment, unless they are carefully incorporated into a comprehensive assessment program using multiple sampling in different workplace encounters in different settings with different observers, and with standardized grading (such as via the inclusion of a rubric).

THE NAVMEC PROFESSIONAL COMPETENCIES: EXAMPLES OF ASSESSMENT

Seven of the nine competencies identified at the NAVMEC meetings as being essential for the development of career-ready veterinarians can be classified as professional competencies (Tables 1 and 2). Traditionally, assessment of the professional competencies has occurred less frequently in health sciences curricula due to difficulties with their evaluation. However, these competencies are increasingly the focus for the development of newer, reliable, and valid assessment tools in medical as well as veterinary education. A discussion of the assessment methods presently used in medical and veterinary education to assess equivalent or similar competencies is included below.

Table 3: Methods used for assessment of professional competencies (adapted from Epstein, 2007)³⁹

Method	NAVMEC competency	Type of use	Limitations	Strengths
Written exercises				
MCQs in either single-best answer or extended matching format	Communication management (business/practice management)	Summative assessments within courses or clerkships; national licensing exams	Difficult to write, especially in certain competency areas; can result in cueing; can seem artificial and removed from real situations	Can assess in many content areas in relatively little time; can be graded by computer; can have high reliability
Short-answer questions		Summative and formative assessments in courses and clerkships	Reliability dependent on training of graders	Avoid cueing; assess interpretation and problem solving ability
Structured essays		Pre-clinical courses	Time-consuming to grade; must work to establish inter-rater reliability; long testing time to encompass a variety of content	Avoid cueing; use higher cognitive processes
Clinical simulations				
Standardized clinical settings (e.g., OSCEs)	Interpersonal behavior including empathy, communication skills, and management (self, team)	Formative and summative assessment in courses, clerkships	Timing and settings may seem artificial, requires suspension of disbelief, checklists may penalize examinees who use shortcuts, expensive	Tailored to educational goals, reliable and consistent case presentation and ratings, can be observed by faculty or standardized patient, realistic
Incognito standardized patients or actors	Communication	Formative and summative assessment	Requires prior consent, logistically challenging, expensive	Very realistic, accurate way of assessing students behavior
High-technology simulations	Communication, collaboration, management, leadership	Formative and some summative assessment	Timing and setting may be artificial, requires suspension of disbelief, expensive, checklists may penalize examinees who use shortcuts	Tailored to educational goals, can be observed by faculty, often realistic and credible
Direct assessment by supervising faculty or clinicians				
Global ratings with behavioral anchors	Communication, collaboration, management (self, team, system), leadership (ethics), adapt to changing environment	Summative and sometimes formative assessment in clinical rotations	Often based on second-hand reports and case presentations rather than direct observation, subjective	Use of multiple independent raters can overcome some variability due to subjectivity
Structured direct observations with checklists for ratings (e.g., mini-CEXs)	Communication, collaboration, leadership	Limited use in clerkships	Selective rather than habitual behaviors observed, relatively time-consuming	Feedback provided by credible experts
MSF ("360-degree" feedback)				
Peers assessments	Collaboration, diversity and multicultural awareness, leadership	Formative feedback in courses	Confidentiality, anonymity, trainee buy-in is essential	Ratings encompass habitual behaviors, credible source, correlates with future academic and clinical performance
Client assessments	Communications skills	Formative and summative	Provide global impressions rather than analysis of specific behaviors, ratings generally high with little variability	Credible form of assessment
Self-assessments	Lifelong learning (reflection)	Formative	Do not accurately describe actual behaviors unless training and feedback provided	Foster reflection and development of learning plans
Portfolios	All aspects of competence; especially appropriate for practice-based learning and improvement	Formative and summative	Learners select best case material, time consuming to prepare and review	Displays projects for review, foster reflection and development of learning plans

NAVMEC = North American Veterinary Medical Education Consortium; MCQ = Multiple Choice Question; OSCE = Objective Structured Clinical Examination; CEX = Clinical Evaluation Exercise; MSF = Multisource Feedback

Communication

Of the seven professional competencies cited in the NAVMEC report, communication is arguably the best integrated, taught, and assessed competency within current veterinary curricula. The call for inclusion of this competency within curricula has been based on research evidence suggesting the importance of veterinarian-client communication in companion-animal practice^{7,34} as well as studies in human medicine linking communication skills with important health outcomes including improved patient (and clinician) satisfaction, relief of patient distress, adherence to treatment plans, reduced attrition, fewer patient complaints, and reduced likelihood of lawsuits.⁴²

Assessment of communication skills in medical education has risen to the level of licensing. Beginning in 2004, medical students taking the United States Medical Licensing Exam (USMLE) Step 2 have been required to demonstrate proficiency in clinical and communication/interpersonal skills, as well as English proficiency in encounters with standardized patients of diverse racial and ethnic backgrounds.⁴² Although similar requirements do not exist for veterinary students, one of the AVMA COE's required competencies is client communication, and veterinary colleges and schools are expected to implement relevant measures to provide evidence that graduating students have attained this competency.²

In the development of assessment tasks for communication it must be remembered that the successful outcome of an interaction between individuals is not contingent on the demonstration of separable behaviors, but on the ability to integrate and communicate verbal and non-verbal elements. This creates a multi-faceted environment in which to unambiguously assess and measure communication skills as all participants potentially influence the results of the interaction. Due to the complexity of these interactions, the evaluation of oral communications skills does not lend itself to the standard assessment tools commonly used in medical and veterinary education such as multiple choice questions or essays, but requires the observation of learners performing these skills, both live and on video. Furthermore, it is recommended the evaluator (or coach) provide well-intentioned, detailed, descriptive feedback (guided reflection) in order for the assessment to progress student learning.³⁴

Specific methods described for the assessment of client communication in medical and veterinary colleges include the completion of a minimum number of communication training laboratories (modules), assessment during simulated client interviews, assessment of observed communication during clinical rotations using a rubric, objective structured clinical examination (OSCE) stations using standardized clients, evaluation of a student history-taking or patient-visit video, mini-CEXs, repeated patient video sessions with self-assessment and expert feedback, formal assessment of sample discharge instructions, and formal evaluation of phone conversations.^{27,43,44} The evaluators in these assessments have included faculty, staff, clients, peers, and self, and they have provided both formative and summative feedback to the learner.²⁴ In many programs these assessment tasks are integrated in an helical or reiterative model where assessment is repeated throughout the curriculum, evaluating higher-

order learning with successive assessments.³⁴ More recently a model of a contextualized or patient-focused simulation was described which combined a simulator (i.e., body part model) with a simulated client.⁴³ In human medicine this approach was found to be practical and valued by trainees and, when compared with practicing technical skills in isolation, has been shown to increase realism and improve veterinarian-client communication without a detrimental effect on technical skill development.⁴³

Finally, it is important to note that although there is currently much enthusiasm for the inclusion of communication skills training and assessment within veterinary curricula, critical evaluation of the attainment of these skills, particularly in the "real world" of veterinary practice, is still developing.³⁴ The context and methods used for teaching and assessing communication skills differs considerably from the usual veterinary classroom or clinical situation, and therefore significant faculty development may be required to ensure that high quality skills are being taught and assessed consistently within a DVM program.⁴⁵ Alternatively, and potentially preferably, experts in the field of communication could be hired by colleges to design evidence-based approaches to systematically evaluate communication competence within entire veterinary curricula.

Collaboration

There is considerable overlap between the NAVMEC competency identified as collaboration and some of the other NAVMEC competencies such as management (self, team, system) and leadership, particularly when the key objectives are appraised (Table 2). Where assessment practices used to evaluate these skills also overlap, these practices will be discussed in this section; the assessment of other key objectives of the management and leadership competencies identified in the NAVMEC report will be discussed under these competencies respectively.

The importance of being able to work effectively both individually as well as within interdisciplinary teams is being increasingly recognized in human and veterinary medicine.^{42,46} The determinants of successful team performance include a variety of professional skills exhibited by the individual as well as the team. The individual skills include task management, teamwork, decision making, situational awareness, and stress management, while team skills include cooperation, coordination, communication, and leadership.^{47,48} Recent studies have shown that clinical experience is not a guarantee of competence in this area⁴⁹ and that these professional skills need to be learned and evaluated in a sequential, regulated manner involving practice in safe, simulated settings, with their further development in clinical or work-based settings.⁴⁷ Furthermore, studies have shown that methods of assessment that include written exercises, particularly multiple choice questions (MCQs), are not optimal for measuring cooperative learning skills.⁵⁰

In medical education, the professional competencies involved in management of self and teams have traditionally been evaluated based on self- and subordinate ratings of performance.⁴⁷ Recently, a wide variety of assessment tools have been developed to more rigorously evaluate

collaboration and management of self and teams in specific circumstances including: specialist-team rating scales that measure teamwork for patient safety,^{51,52} a global assessment of clinical and teamwork skills for crisis resource management,⁵³ a combined assessment for technical and non-technical (professional) trauma team skills,⁴⁸ assessments for anesthesiologists⁵⁴ and surgeons^{55,56} non-technical (professional) skills, and an assessment for leadership in resuscitation teams.^{57,58} The assessment tools developed have been given a variety of names and acronyms including Non-Technical Skills (NOTECHS)^{48,56}, Non-Technical Skills for Surgeons (NOTSS)^{55,56}, Observational Teamwork Assessment for Surgery (OTAS),⁵⁶ Team Emergency Assessment Measure (TEAM),⁴⁷ Crisis Avoidance and Resource Management for Anesthesiologists (CARMA)⁵⁶ and Anesthesiologists Non-Technical Skills (ANTS).⁵⁴ What each of these tools does is identify the required professional skill categories and then further divide these into a variable number of assessable elements with either numerical ratings or example behaviors for good or poor practice.

An example of one of these tools is TEAM,⁴⁷ which rates 11 behavioral aspects of a whole team on Likert scales (0–4) with an additional overall team score rated from one to ten. The behaviors that are measured are broken down into leadership, task management, and teamwork (including communication, cooperation, and monitoring/situational awareness). This tool, as well as others that have been developed to evaluate teamwork, have been shown to identify behaviors that can be directly observed in both simulated and clinical settings, have content, construct, and concurrent validity, and can be rated with acceptable levels of agreement and accuracy.^{47,54,56,58} In addition, they provide opportunities for constructive debriefing of students on these professional skills to further enhance learning.

Management (Self, Team, System)

In addition to the development of skills focused on teamwork and collaboration as discussed above, other specific objectives identified in the NAVMEC report for this core competency include a working knowledge of laws and regulations pertaining to chosen disciplines or careers, and the development of business and financial skills (Table 2). Colleges of veterinary medicine have been identified as a critical leverage point in addressing these issues, but veterinary faculty rate the importance of their institutions in providing skills in personnel management, business management, and leadership lower than either alumni or employers.⁵⁹ Furthermore, in a recent survey of faculty regarding the teaching of professional competencies almost half the faculty respondents did not perceive a responsibility to teach or assess business skills.¹²

Several resources have been developed for teaching this competency including a recommended model curriculum for career development and success designed by veterinary practice management educators and consultants,⁶⁰ and a variety of required or elective courses aimed at increasing students' exposure to hospital and business management.^{59,61} In addition, several veterinary colleges and schools have implemented combination degrees involving veterinary training together with a Master of Business

Administration (DVM-MBA),⁶² including veterinary colleges at the University of Pennsylvania, Colorado State University, North Carolina State University, Iowa State University, and Texas A&M. While the implementation of these programs is described in the veterinary literature,^{59–62} there is a lack of specific assessment tasks evaluating the attainment of competencies related to business management, including those assessing the development of best practices for managing employees, and tools for assessing the application of concepts such as operating costs and accounting systems, target markets, competition, pricing strategies (goods and services), cost markup, and mission statements. Furthermore, there is evidence that veterinarians in 2005 used fewer of the 19 standard business practices identified by Brakke than were used in 1998,⁶³ suggesting that the attainment of this competency is not progressing.

Although business skills can be assessed using more “traditional” assessment methods, there may be benefits to the development of additional tasks such as writing mission statements, developing business plans, determining and performing basic demographic analysis of a target market, developing a customer profile, and determining minimum pricing per procedure to cover expenses and salaries. Furthermore, due to current concerns with student debt load, graduates must be able to budget personal finances, a skill which may be assessed through personal budget plans.

Lifelong Learning, Scholarship, Value of Research

Along with the paradigm shift toward competency-based education in the health sciences there has been a corresponding shift toward lifelong learning, which emphasizes the need for physicians in practice to be able to critically evaluate new information and reflect on their own performance long after they graduate.⁸ Likewise, the rapid development and accumulation of veterinary knowledge and technology calls for veterinary professionals who are able to engage in lifelong learning in order to keep up to date with new developments and provide evidence of sustained professional competence through peer assessment and evaluation of self-performance in practice.⁷ Development of this competency should begin during DVM training, and lifelong learning has been shown to be closely associated with the concepts of critical thinking, problem-solving, decision making, and reflection.⁵⁰ Furthermore, the motivation of practitioners to engage in lifelong learning has been shown to be related to their learning preferences as a student, where graduates who engage in continuing education after graduation were more likely to have been students with more complex preferences for learning.⁶⁴

In medical education, reflection is understood as purposeful, critical analysis of knowledge and experiences to achieve deeper meaning and understanding,⁶⁵ while a “reflective practitioner” has been defined as one who uses reflection as a tool for revisiting experiences both to learn from them and to frame the complex problems of professional practice.⁶⁶ In this way, reflective practice is seen as a potential means for enabling lifelong learning, facilitating self-improvement through everyday clinical encounters, and promoting an up-to-date knowledge

base.⁶⁷ Furthermore, the human medical literature suggests that reflection and self-awareness help physicians improve their case-solving abilities⁶⁸ and capacity for critical examination⁶⁹. As a result, critical reflection has been included in many health-professional curricula based on the belief that reflective thinking is something that can be developed rather than being a stable personality trait.⁷⁰ Incorporation of assessment is also essential in this context, as reflective tasks that are not assessed may be viewed as unimportant by students, effectively becoming part of the “null curriculum”⁶⁷ or a part of the curriculum that is not perceived as being either valued or significant.

To this end several methods of assessment have been trialed and validated in health sciences education to assess reflective practice, including critically reflective essays and the use of portfolios.^{65,71,72} In these assessment tasks students are graded on their ability to demonstrate learning based on past personal experiences in a clinical setting. However, several concerns have been identified with the assessment of reflective practice; these include (a) inconsistent definitions of reflection, (b) a lack of standards for determining (in)adequate reflection, (c) factors that complicate assessment, and (d) internal and external contextual factors affecting the assessment of reflection.⁷⁰ Furthermore, the subjective nature of a reflection’s content and difficulties in the verification of reflective statements can confound assessment for student and examiner alike. For example, students may fabricate events for the benefits of the assessment or task completion; a recent study found that 68% of students, when asked about honesty of their reflections, stated they were only 80% truthful about their experiences.⁶⁷ Therefore, while assessment of reflective practice is acknowledged to be a valuable addition to the clinical education of health care professionals, this value may be diminished if assessment tasks are not carefully designed and implemented. To counter these validity threats it has been recommended that assessment of critical reflection should focus on the generic process skills of reflection rather than on the actions or subjective content of reflections and, where possible, should consider objective information about the triggering situation to verify described reflections.⁷⁰

In contrast to the medical education literature, few organized activities have been described in the veterinary education literature that deliberately foster and assess the process of critical reflection. Adams and co-workers⁶⁹ outlined two case studies, one in human medicine and one in veterinary medicine, where critical reflection was incorporated in curricula and was assessed objectively. The authors noted that identifying valid, reliable, and transparent approaches to assessing reflective practice should be a priority in veterinary education, and that if cultivating reflective practice and lifelong learning is a priority, then critical reflection provides a framework with which to achieve this. Furthermore, broadening the focus of critical reflective skills to areas outside communication, where it is most commonly assessed currently, is likely to be beneficial. In medical curricula, the emerging emphasis on team work and collaboration to ensure patient safety and appropriate responses in critical incidents is providing additional opportunities to promote skills of reflective practice.

In addition to reflective practice, an appreciation of research and evidence-based medicine is seen as a core competency for medical^{73–76} and veterinary graduates,^{77–81} and a recent revision of the accreditation standard of the AVMA Council on Education now requires graduates to be able to provide “critical analysis of new information relevant to veterinary medicine.”⁷² Evidence-based medicine can be defined as the conscientious, explicit, and judicious use of current best evidence when making decisions about the care of individual patients.⁷⁵ This clinical decision-making relies on information literacy, awareness of the major medical databases, understanding of how to search them, and the ability to critically review scholarly information to make informed decisions.^{23,77,82} Several activities have been described in the medical and veterinary literature that assess student competence in evidence-based medicine, including the Fresno test,⁸³ Knowledge of Research Evidence Competencies (K-RECs),⁸⁴ detailed checklists for students to evaluate exemplars of studies in the scientific literature,⁸² and development of critically appraised topics (CATs) using collaborative teams.⁷⁷

To undertake critical appraisal of literature, it is also argued that graduates need to understand how this evidence is derived, and therefore to appreciate the principles of research. It is therefore argued that all medical and veterinary graduates need to understand research and the research process, even if they do not intend to be actively engaged in research themselves. To this end, several medical schools have developed either required or elective scholarly programs for their students which specifically focus on the development of research skills. It is hypothesized that medical students who participate in research training are more comfortable with questioning dogma, are more likely to reflect on the underlying mechanisms of disease, and are better prepared to participate in the development of novel approaches to solving complex health problems.⁸⁵ However, critical evaluation of the development of research skills in medical students is not described, nor is the attainment of the above assertions. In addition, a recent study in medical education suggested that students struggle to recognize opportunities to develop research skills during their education, and that educators need support in recognizing and meeting the need for explicit research skills development and assessment within medical curricula.⁸⁶

A strong appreciation for the role of research in furthering the practice of veterinary medicine has also been the focus of some veterinary medical programs, and several activities have been described in the veterinary medical literature for teaching the role of research to veterinary students, as well as for assessing the attainment of this competency.²⁷ These assessment activities include: assessment of specific research skills during clinical rotations using a rubric; completion of a research-related task such as undertaking a summer research program at an approved institution; writing and submitting a research proposal to an extramural funding agency; attending a research-related conference and supplying a report on the experience; and evaluating a manuscript, poster, and/or seminar on a research project. In addition, others have described activities where students were required to provide critical analysis of journal articles using evidence-based medicine or to participate in small-group journal

club sessions led by clinical faculty and house officers and critique primary literature in both written and oral formats.²³

Leadership

The demand for more effective leadership is heard throughout the health professions, including veterinary medicine. However, as pointed out by Swanwick and McKimm, "leadership is like the abdominal snowman whose footprints are everywhere but who is nowhere to be seen."^{87(p.23)} This quotation encapsulates some of the primary problems with teaching and assessing leadership: the literature on this topic is vast, the concepts of leadership are greatly contested, and ultimately it means different things to different people.⁸⁷

Historically, leadership has been vested in positions, while today leadership is seen as a role one moves continuously into and out of, depending on the circumstances.⁸⁸ Furthermore, ideas about leadership have evolved from the concept of a charismatic individual leader to incorporate newer leadership characteristics, including being a team builder, possessing creative and strategic thinking skills, demonstrating honesty and integrity, and having the ability to motivate others to action.⁸⁸ These characteristics are also seen to be distinctive from the practice of management; where leadership is concerned about setting direction, influencing others, and managing change, management is concerned about maintaining stability and marshaling and organizing resources.⁸⁷ These two activities are seen as individual but complementary, with both being required for success.

Although some programs in medical education specify leadership or management as integral to their graduate outcomes or competencies, these learning outcomes have not been widely included in medical curricula other than implicitly, through statements about teams, inter-professionalism, and collaborative working.⁸⁹ However, in response to a need for improved leadership and management training in healthcare professionals, several national competency frameworks for leadership have recently been produced for use in developing training and assessment programs. In the US, the National Center for Healthcare Leadership (NCHL) has developed the NCHL Health Leadership Competency Model,⁹⁰ and other frameworks have been developed for medical education in countries including Canada, the UK, Denmark, and Australia.⁸⁹ Furthermore, it has been noted by medical educators that "it is important that leadership learning is incorporated within the mainstream curriculum rather than regarded as something additional or even peripheral to that core."^{89(p.183)}

Although there has been a move to better define competency frameworks upon which leadership curricula may be built, it is also acknowledged that assessment of leadership remains a key challenge for educators and clinicians.⁹¹ As described in the section on collaboration, several assessment tools for the assessment of "leadership" have been developed and evaluated in medical education, but these are predominantly assessing leadership within the context of a team environment.^{47,48,51-55} This approach brings with it the risk that addressing leadership

competencies without a wider perspective may result in limited, mechanistic, and "checklist" approaches aimed at improving short-term individual competence rather than developing sustained leadership potential and performance within organizations or systems.⁸⁹ Therefore, as with the other professional competencies, which are complex, multi-dimensional, and context-specific, the development of multiple and variable assessments tasks across a range of contexts is considered essential for evaluating leadership.^{33,92} This favors a portfolio approach that combines activities including theoretical learning, work-based assignments, and self-development activities, and assessments such as OSCEs or mini-CEXs, multi-source 360° feedback, and reflective writing on critical incidents.^{91,92} The assessments are then triangulated to build a representative picture of a student's performance in leadership over time and across different contexts.

As with medical education, a call for improved leadership skills in veterinary professionals has been made, including for the development of this competency during DVM training. In response, the Skills, Knowledge, Aptitudes, and Attitudes (SKAs) working group of the National Commission on Veterinary Economic Issues (NCVEI) recommended that trained facilitators conduct leadership seminars in veterinary schools and that teaching leadership skills becomes a part of veterinary curricula.⁹³ As a result, several colleges and schools have implemented leadership training in their curricula as well as in extracurricular activities such as during orientation and the Veterinary Leadership Experience (VLE).^{21-23,25,94} While these activities no doubt enhance the professional development of students involved, it is not clear how specific leadership traits are assessed during these activities, and it is acknowledged by those describing these programs that the evaluation of the quality of leadership demonstrated by students is difficult.⁹⁴ A more-in depth and critical analysis of the development of leadership as a competency and its subsequent assessment is clearly required in veterinary medical education.

Diversity and Multicultural Awareness

The evolving multiracial, multicultural, and multilingual society within the United States has been a key driving force behind a call for strengthening the cultural competence curricula within the health sciences, including veterinary medicine. By embracing racial and cultural diversity and differences across practice settings, and showing respect for the patients and populations they are attending, health care teams achieve multiple benefits for both themselves and the communities they serve.

For several years, schools of medicine have undertaken efforts to include cultural competence in their curricula, largely based on a detailed list of content elements determined to be essential for teaching this subject in these settings. These key content areas were incorporated into a Tool for Assessment of Cultural Competence Training (TACCT),⁹⁵ which medical schools could use to assess the inclusion of cultural competency content in their curricula, as well as to evaluate the attainment of specific competencies by students. More recently, an expert panel built on these existing, discipline-derived competencies

and determined a new set of competencies that reflect the nexus of medicine and public health in an interdependent and holistic fashion.⁹⁶ In this new tool the cultural competencies common to medical and public health students are extensively described. However, it was also acknowledged that the proposed competency set was not intended to be implemented in its entirety; rather, schools of medicine and public health would have ample flexibility to tailor curricula anchored by specific competencies, while assuring opportunities to benchmark student performance.

In this discussion, it is important to note that faculty development regarding how to create, adapt, implement, and evaluate this competency was seen as essential for the successful implementation of a cultural competency curriculum. The panel noted that most faculty members have been trained in traditional lecture-style formats, but that competency-based education is best achieved through more interactive, student-centered, pedagogical principles.⁹⁶ In addition, it was noted that faculty may require additional support in evaluating student acquisition of this competency, as objective evaluation of attitudinal change is particularly challenging. One example of an assessment tool that faculty may find helpful is the Health Beliefs Attitude Survey (HBAS), which was used in one study to evaluate changes in medical student's attitudes toward cultural competency issues.⁹⁷ The HBAS consists of 15 items, scored on a 6-point Likert-type scale, assessing various aspects of student's attitudes toward how cultural competency relates to health care quality. In this study, medical students were asked to complete the survey before and after an "intervention" that included a course which used problem-based learning to investigate issues relating to racial, cultural, and linguistic differences, and a second course focusing on cultural competency in clinical settings. The study demonstrated that the HBAS reliably measured four cultural competency concepts. Furthermore, the HBAS demonstrated that students' attitudes regarding the importance of assessing patient opinions and determining health beliefs improved significantly following the courses.

Additional examples of specific assessment activities used to evaluate cultural competency can be found in the medical educational literature; these include reflective writing,⁹⁸ a cultural standardized patient examination that integrates cross-cultural care issues with the core competency of surgery,⁹⁹ and a web-based survey tool, Cultural Competence Health Practitioner Assessment (CCHPA-129), that can be used to evaluate practitioners' (or students') cultural and linguistic competence.¹⁰⁰ Clearly, further valid and reliable methods for assessing this important competency are required, particularly as they relate to veterinary medical education.

Adapt to Changing Environment

The Global Commission on Education of Health Professionals for the 21st Century poses a demanding question to medical schools, asking whether their graduates are trained to quickly and effectively mobilize knowledge and to engage in critical reasoning and ethical conduct so that they are competent to participate in patient and population-centered health systems as members of locally

responsive and globally connected teams.¹⁰¹ The same could be asked of graduates from veterinary colleges, and the question is particularly relevant at a time when the veterinary profession is calling for greater involvement in One Health and global medicine. However, to educate veterinary professionals that are able to respond to this need we must first explore, define more precisely, and agree upon the nature of the components of this competency, paying attention especially to those attributes which allow flexibility and ability to evaluate and respond to emerging situations and technologies.

One such framework that could be used to teach and assess this competency was developed for preparedness and disaster response training. Several colleges and schools of veterinary medicine have created either independent curricula, or ones immersed in other courses such as Public Health, to train and assess students in this area. In their review of the medical and veterinary literature concerning disaster preparedness, Dunning and colleagues¹⁰² noted that competency-based programs were the preferred method for this training, as it ensures a focus on proficiency and cross-discipline capability that is not specific to one particular event or emergency. Furthermore, in several of the curricula they reviewed the non-technical competencies such as leadership, project management, effective communication, and psychological first aid (PFA) training were included, and demonstrated the interconnectedness of many of the professional competencies.

To better define and evaluate the attainment of this competency in their students, the program at North Carolina State University established a Veterinary Credentialed Responder Training Program that included training and assessment of core competencies in disaster preparedness.¹⁰² This program uses a multifaceted series of lectures, simulations, and case-based response exercises, interspersed throughout the third-year curriculum, to provide the training required to achieve entry-level federal credentials in emergency response. Furthermore there is an expectation that students demonstrate proficiency at all levels of Bloom's taxonomy (describe, demonstrate, evaluate, analyze) in identified key objectives indicating development of critical thinking skills in this competency. This provides a good example of how a professional competency may be taught and assessed in an articulated manner in a veterinary program.

CONCLUSIONS

The inclusion of seven professional or non-technical competencies among the nine competencies recommended as essential for all graduate veterinarians by the NAVMEC report emphasizes, again, the importance of these skills to the veterinary profession. While it is acknowledged that further studies are required to better demonstrate positive outcomes associated with these professional competencies after graduation, evidence is accumulating in the medical literature that strongly suggests that they provide crucial graduate attributes beyond the knowledge and skills taught in traditional curricula. However, for these competencies to have a tangible impact on the professional success of veterinary graduates they must

be clearly defined, taught in a comprehensive manner, and assessed using valid and reliable measures. For too long many of the professional competencies have been included as an afterthought in veterinary programs, with their assessment lacking a systematic and evidence-based approach. If we are to truly promote the development of the professional or non-technical competencies in our graduates, colleges and schools of veterinary medicine would do well to adopt the best assessment practices described in the medical and veterinary literature to more methodically evaluate them. Furthermore, for each of the professional competencies we should implement multiple assessment activities, applied in authentic contexts, and interspersed longitudinally throughout the curriculum to create a coherent and comprehensive assessment program, as is currently recommended in medical education³³ and is currently being undertaken in some veterinary curricula for communication. Only in this way will veterinary students develop a sophisticated skill level with the professional competencies in the same way we expect for the multispecies and One Health competencies.

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