

## **Lessons and Implications Derived From an Assessment of the Problem-Solving Competency of Fourth-Year Veterinary Medical Students**

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### *Abstract*

*Fourth-year veterinary medical students in the Texas A&M University, College of Veterinary Medicine & Biomedical Sciences, Class of 2008, participated in a research study to assess their clinical problem-solving skills. The assessment compared the faculty clinician's post-clinical assessment to the student's pre- and post-clinical self-assessments of problem-solving skills. The research design included the development of a rubric to quantify scores of tasks that are descriptive of problem-solving skill. Overall, the student's scores reflected an increase in their perceived problem-solving skill. This paper discusses the outcomes of the study and evolving application of the findings by the College of Veterinary Medicine & Biomedical Sciences.*

### **Introduction**

In January, 2009, the College of Veterinary Medicine & Biomedical Sciences (CVM-BS) at Texas A & M University (TAMU) hosted a professional curriculum accreditation site visit conducted by the American Veterinary Medical Association-Council On Education (AVMA-COE). The site visit included a comprehensive review and evaluation of the veterinary college's clinical and academic programs with specific emphasis applied to assessment of clinical competency outcomes using evidence-based direct measurement. In anticipation of the accreditation site visit, preparations were initiated and actions taken to identify and apply evidence-based direct measurement to the fourth-year clinical rotations to collect data and validate assumptions that graduating veterinary medical students have the "...basic scientific knowledge, skills and values to practice veterinary medicine, independently, at the time of graduation" (AVMA-CVEA Std. 21.11.3, 2007). A key qualification of the COE's guidance for validating student competency was that the measurements should be taken with instrumentation and methods other than those that are traditionally reported, i.e. other than national or state board licensing examinations.

The AVMA-COE identified nine specific competencies required to be measured and data collected to provide assurance that new graduates were prepared to meet entry-level standards for professional veterinary medical practice. First among the total nine competencies was comprehensive patient diagnosis (problem-solving skills). This competency became the topic of interest for study because it had a wide scope of

application in everyday veterinary medicine and is a topic of interest across professional disciplines and clinical services, it presented an interesting challenge for measurement and research design that could satisfy acceptance criteria of the faculty clinicians in the CVM-BS, and it possessed the academic rigor deemed suitable for study as a dissertation topic.

The study required the development of an instrument that enabled the faculty clinician to assess student competence without interfering in the clinical teaching and learning experience, and which was adaptable to the natural clinical setting to maximize student participation. The final form of the instrument was a rubric designed with the input of a five-member faculty advisory committee. The rubric was placed on-line in a Web-page supported by the Measurement and Research Services at Texas A & M University. The Web-page allowed 24 hour asynchronous access by students and faculty. This feature permitted students to complete their self-assessments without obligating them to additional work or generating cumbersome requirements competing for time away from clinical responsibilities. Participating students were required to complete a pre-clinical and a post-clinical self-assessment of their problem solving process. The attending faculty clinician (surgeon) completed a comparison post-clinical assessment that was paired with the student's self-assessment. The pre- and post-clinical assessments were completed at the beginning and the end of a two week service rotation in the General Surgery block of instruction. The final tally, adjusted for completed paired samples, resulted in  $n = 26$ .

### **Instrument and Measurements**

The rubric was designed with consideration of the cognitive and affective domains of learning (Dooley, Lindner, & Dooley, 2005). The rubric contained 12 performance measures for skills involving cognition and personal values and beliefs in the clinical problem solving process. Contained within each of the 12 performance measures was a sub-listing of associated performance tasks (total 43) that defined and qualified the student's competency level. Each performance task was scored across a graduated scale representing four levels of increasing competency. The four competency levels were identified as a (a) Less Than Minimally Competent Student, (b) Minimally Competent Student, (c) Fully Competent Student, and (d) Among The Most Competent Students. Each competency level was assigned a three-point range to quantify the student's skill strength. The entire range was anchored between one and 12 points total.

### **Results**

The results of the assessment reflected an increase in the mean between the pre-clinical ( $M = 8.43$ ,  $SD = 1.36$ ) and the post-clinical ( $M = 9.10$ ,  $SD = 1.32$ ) self-assessments. The increase was determined to have been statistically significant; however, it was not sufficient to change the qualitative level of competency. Students entered the clinical service rotation believing they were "Fully Competent Students" and completed the rotation with the same perception. The disaggregated means, however, reflected that students perceived they had strengthened their intrinsic values and beliefs in the affective

domain and began to evaluate their competency rank on the post-clinical self-assessment at the highest level of “Among The Most Competent Students.” The faculty post-clinical comparison assessment also rated the five highest means in the affective domain.

### **Lessons Learned**

The lessons gleaned from this study were meaningful to the researcher as they helped validate the design of the rubric, and strengthen confidence in the method for selecting and measuring the population sample. The primary purpose of this paper is to address the lessons learned that could be applied to improving the instrument and quality of results in subsequent trials.

The rubric design, which included 12 performance measures that capped 43 tasks, required more effort (time to complete) than was desirable and had some measure of redundancy in the cells describing competency measures. The faculty surgeon post-research critique suggested that the descriptive narrative could be revised and the cells consolidated to reduce the total number needed to complete the assessment. Editing and revision of the cells would also serve the equally important function of focusing the descriptions and improving the detail of the performance outcome expected for each task, thereby lessening perceived ambiguity or blurring of lines separating one competency level from another. Some readers commented that they experienced the most ambiguity at the margins of the interior cells separating the borders between the “Less Than Minimally Competent Student” from the “Minimally Competent Student.”

While the rubric was deemed to have been reliable as an exploratory instrument and warranted confidence in continuing its development to the next stage (it was sufficiently stable and sensitive to provide statistical significance), the results suggest that it was not applied in the clinical setting that was most appropriate for a prototype trial. This conclusion was derived from the descriptive statistics which revealed that a little over half of the competency task measures failed to generate a significant difference between the pre-clinical and post-clinical experience. A plausible explanation for this observation is that the trial was conducted in the General Surgery service, which is inherently a service with low variability in case type or challenge. The predictable nature of the case type is viewed as an attenuator of the clinical stimulus and problem-solving challenge. The case type then became the condition limiting the stimulus in the assessment rather than the rubric lacking the sensitivity to detect the stimulus. If this trial were to be repeated it would be important to select a clinical service that naturally receives clinical cases of complex medical etiologies, preferably with multiple causes and acceptable courses of treatments.

The value of a pilot study was reinforced as the trial got under way. The original design plan included provision for conducting a pilot study but unfortunately circumstances developed late in the academic year that prevented the pilot study from moving forward. It is believed that if the pilot had proceeded as planned then certain technical and logistical problems would have been uncovered and corrected prior to the start of the actual study. Problems that did arise included software limitations on the number of

characters that could be included in the descriptive narratives of the rubric cells, problems associated with user identification and log-on to the Web-page, and program limitations that prevented the researcher to identify incomplete data fields contained in student assessments which ultimately lead to the need to discard the student assessment because they were rendered incomplete as a paired sample.

## **Discussion**

One of the primary objectives of this study was to contribute to the body of knowledge supporting the AVMA-COE requirement to provide evidence-based direct measurement of fourth-year veterinary student clinical competency. That objective was successfully met with the inclusion of the results and implications in the final accreditation report filed by the CVM-BS. Specific components of the study that were included were derived from the data and statistics generated by the student and faculty assessment of student values and beliefs measured in the affective domain of learning.

Subsequent discussions with the faculty and Associate Dean for Academic Programs in the College of Veterinary Medicine & Biomedical Sciences have considered the recommendations of the AVMA-COE in the accreditation review post-site visit citing the need for the college to continue to develop evidence-based direct measurements of clinical competency. Discussion has included advancing this study in a revised form to incorporate an edited rubric and assessment sampling in a clinical service receiving more complex and clinically challenging cases, and expanding the faculty evaluator component to establish inter-rater reliability with the instrument. The discussion considered the long term planning for improving direct measure assessment in anticipation of the next accreditation site visit by the AVMA-COE.

Other discussions have recently emerged considering the potential for revising and improving the performance evaluation form used to track the clinical performance of faculty residents and interns assigned within the Department of Small Animal Clinical Sciences. In this discussion the performance measures and theoretical foundation applied in the clinical competency rubric was considered as a start point for revising the faculty evaluation form, with emphasis on the values and beliefs identified within the affective domain.

## **Conclusion**

The research described in this paper was successfully accepted in completion of the academic requirements for a dissertation leading to the conferring of the degree for Doctor of Philosophy in Agricultural Education. The rubric and theory described in the research are not considered a final product but it does contribute an important first effort towards improving the measurement of the clinical competency of senior veterinary students prior to graduation.

## REFERENCES

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