



Competency Based Veterinary Education (CBVE) Assessment Toolkit

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Introduction

Competency Based Veterinary Education (CBVE) represents an adoption of the medical education competency model which focuses on learner-centered education with outcomes-based assessments. One of the most commonly-asked questions about CBVE is: What evaluative or assessment tools should we use in various circumstances? To that end, here we have collated informative summaries and references for several evaluative tools. Each tool is described and has pertinent domains and competencies listed. Examples, documented uses, evidence for efficacy (pro and con where available), and selected references are provided for each tool. When available, links to examples in use are provided.

Each tool could employ a variety of scales, including conventional scales related to levels of performance (excellent to poor) or competence (developing to proficient). The CBVE approach has contributed an additional scale type, referred to by ten Cate et al. (2020) as “entrustment - supervision scales,” which reference the extent to which the supervisor has confidence in the learner’s ability to complete a task without assistance. Such scales are not assessment tools but can be used with practical assessment tools such as mini-CEXs, ITERs, or others. Because entrustment-supervision scales are still novel, we have included a description of them in the “practical examinations” section of this document.

Tools

Assessment tools in the toolkit include:

Written (selected and constructed response) examinations:

- Multiple choice questions (MCQ)
- Extended matching questions (EMQ)
- Fill in the blank (FITB) questions
- Short answer questions
- Essay questions
- Script concordance (SCT)

Practical examinations:

- In training evaluation report (ITER)
- Case-based discussion
- Directly observed procedures (DOPs)
- Objective structured clinical examination (OSCE)
- Clinical evaluation exercise (CEX)
- Mini clinical evaluation exercise (mini-CEX)
- Longitudinal evaluation of performance (LEP)
- 360 degree (multiple sources)
- Portfolios
- Entrustment-supervision scales

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Multiple Choice Questions

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Description:

Multiple choice questions (MCQs) are commonly written as one-best-answer items. One-best-answer MCQs have a stem that is followed by a series of response options. The response options include one correct answer and a series of “distractors” that are incorrect. True-false items are another MCQ type. True-false MCQs have a lead-in question and a series of response options where the number of “true” responses varies from one to all of the set of responses.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.2
- 3.1-3.3
- 4.1-4.2
- 5.3
- 8.1-8.3
- 9.1 - 9.2

Documented Uses and Examples:

The National Board of Medical Examiners (NBME) Item-Writing Guide on constructing written test questions for the health sciences provides detailed guidelines for and examples of well-written MCQs. The guide can be downloaded from: <https://www.nbme.org/publications/item-writing-manual.html>.

Haladyna et al. (2002) provides a structured taxonomy of item-writing guidelines.

MCQs are used commonly for formative and summative assessment in veterinary and medical school curricula. MCQs are used in the North American Veterinary Licensing Examination (NAVLE), and National Board of Medical Examiners (NBME) student progress and licensure examinations.

Pros and Cons:

Positive Aspects/Pros:

Well-written MCQs can produce high item discrimination and reliability, and so are commonly used for high-stakes licensing veterinary and medical licensing examinations. MCQs can be

used broadly to sample curricular content in assessment blueprinting. Depending on how they are targeted and written, MCQs can assess several levels of Bloom's hierarchy of learning objectives in the cognitive domain. This use enables assessment of a variety of foundational and clinical knowledge and problem-solving skills using fact-oriented or scenario-oriented assessment. Test-takers are generally familiar with the MCQ format. MCQs can be efficiently graded using computer-based testing and student performance statistics readily evaluated.

Negative Aspects/Cons:

MCQs are not well suited to evaluating performance of procedural skills or performance in the workplace. Other forms of assessment are more effective for evaluating the psychomotor or attitudinal domains of Bloom's taxonomy. Training and time are required to write high quality MCQs without flaws.

References:

Cook AK, Lidbury JA, Creevy KE, Heseltine JC, Marsilio S, Catchpole B, Whittlestone KD. Multiple-choice questions in small animal medicine: An analysis of cognitive level and structural reliability, and the impact of the characteristics on student performance. *J Vet Med Educ* 47(4):497-505, 2020.

Haladyna TM, Downing SM, Rodriguez MC. A review of multiple-choice item-writing guidelines for classroom assessment. *Appl Measurem Educ* 15(3):309-334, 2002.

National Board of Medical Examiners. *NBME Item-Writing Guide: Constructing Written Test Questions for the Health Sciences*. 6th Edition, February 2021.

Royal K, Dorman D. Comparing item performance on three- versus four-option multiple choice questions in a veterinary toxicology course. *Vet Sci* 5(2):55, 2018.

Extended Matching Questions

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Description:

Extended matching questions (EMQs) are a type of selected-response (multiple choice) question. They are similar in format to simple one-best-answer multiple choice questions, but differ in that they involve large potential option sets, with multiple question stems per item. There are two varieties of extended matching questions, including one-best-answer and pick-N-options (in which there are more than one correct answer) formats.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.2
- 3.1-3.3
- 4.1-4.2
- 5.3
- 8.1-8.3
- 9.1-9.2

Note: Any application in which multiple choice questions are appropriate is also appropriate for extended matching. Well-written selected-response questions can measure a variety of relevant outcomes including conceptual knowledge, principles, and problem solving (diagnostic and clinical reasoning).

Documented Uses and Examples:

A good source of information regarding EMQs is Chapters 6 and 7 of Case and Swanson's "Constructing Written Test Questions for the Basic and Clinical Sciences (3rd Edition). This resource is available for free download:

https://www.researchgate.net/publication/242759434_Constructing_Written_Test_Questions_For_the_Basic_and_Clinical_Sciences

EMQs have been used in high stakes examinations including US Medical Board examinations (Case and Swanson 1993), Obstetrics and Gynecology board examinations (Duthie et al. 2006), and Psychiatry board examinations (Samuels 2006).

Pros and Cons:

As of 2021, no systematic reviews or meta-analyses of EMQs were found in the literature. However, available studies (Bhakta et al. 2005, Buellens et al. 2005, Swanson et al. 2008) and

the prevalent use of EMQs in high-stakes professionally designed examinations suggest that EMQs demonstrate good psychometric properties and are considered valuable items in valid assessments of abilities such as clinical reasoning.

Positive Aspects/Pros:

- EMQs provide superior item discrimination when compared to one-best-answer selected-response questions.
- Like well-written one-best-answer selected-response questions, EMQs can produce high item discrimination and reliability when compared to many other item formats.
- EMQs are well suited to measuring conceptual knowledge, principles, and problem solving (e.g. diagnostic and clinical reasoning).

Negative Aspects/Cons:

- EMQs are not well suited to evaluation in workplace-based settings, measurement of psychomotor skills, memorization of verbal information, or evaluation of procedures.
- Training is required to write effective questions.
- Learners who are not familiar with the format may find it confusing.

References:

Beullens J, Struyf E, Van Damme B. Do extended matching multiple-choice questions measure clinical reasoning? *Med Educ* 39: 410-417, 2005. <https://doi.org/10.1111/j.1365-2929.2005.02089.x>

Bhakta B, Tennant A, Horton M, et al. Using item response theory to explore the psychometric properties of extended matching questions examination in undergraduate medical education. *BMC Med Educ* 5:9, 2005. <https://doi.org/10.1186/1472-6920-5-9>

Burton JL. How to write and how to answer EMQs. *Obst, Gynaec & Reprod Med* 19(12):359-361, 2009.

Case SM, Swanson DB. Extended-matching items: A practical alternative to free-response questions. *Teach Learn Med* 5(2):107-115, 1993. <https://doi.org/10.1080/10401339309539601>

Duthie S, Hodges P, Ramsay I, Reid W. EMQs: a new component of the MRCOG Part 2 exam. *Obstet & Gynaec* 8(3):181-185, 2006.

Samuels A. Extended matching questions and the Royal Australian and New Zealand College of Psychiatrists written examination: an overview. *Australasian Psych* 14(1):63-66, 2006.

Swanson DB, Holtzman KZ, Allbee K. Measurement characteristics of content-parallel single-best-answer and extended-matching questions in relation to number and source of options. *Acad Med* 83(10):S21-S24, 2008. <https://doi.org/10.1097/ACM.0b013e318183e5bb>

Fill in the Blank Questions

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Description:

Fill in the blank (FITB) questions are a type of assessment best used when testing for one or several explicitly correct responses. Fill in the blank questions are best designed using clear, explicit instructions to specify the answer format and acceptable variation. They should be clearly worded using correct and neutral grammar to avoid extraneous clues and so that students understand the nature of information being requested. They should be phrased so that the answer is brief and specific. The blank to be completed should be at or near the end of the question. When a numeric response is required, it should specify the degree of precision expected or units of measurement. For best practices in scoring, the question should be phrased so that there is only one answer, or a limited range of possible answers and use pre-established scoring rubrics.

Suggested CBVE Competencies and Domains Assessed:

- 1.1-1.7
- 2.1-2.2
- 3.1-3.3
- 4.1-4.2
- 5.3
- 8.1-8.3
- 9.1 - 9.2

Documented Uses and Examples:

Example: A patient is receiving dopamine at 12 ml/hr. The solution hanging indicates "D5W 250 ml/200 mg dopamine." The patient weighs 70 lbs. What dosage (mcg/kg/min) is the patient receiving? _____

European College of Veterinary Pathologists. Example Exam Questions. 2021.
<https://www.ecvpath.org/example-exam-questions/>

Pros and Cons:

Positive Aspects/Pros:

- Assesses cognitive domain for assessing who, what, where, and when information
- Limited to knowledge and comprehension questions
- Reduced rote memorization by not using direct quotes in the stem of the question

- Easy to administer
- Possible to identify questions on the entire curriculum
- Requires students to fill in the important term or phrase
- Promotes more in-depth study to recall answers
- Quicker for students to complete than multiple choice (consider having to read through all options prior to making an informed response)
- More comprehensive and reliable than essay questions
- Provides diagnostic information when looking at types of errors
- Improved reliability if there are structured marking schemes, clear outline answers, and independent double scoring used
- Less likely for scores to be influenced by guessing

Negative Aspects/Cons:

- Encourages rote memorization
- Unable to assess skills and attitude
- Inability to measure linguistic skill and power of expression
- Inability to measure higher mental faculties (e.g., logic)
- Inability to measure insight and foresight
- Although evaluation of short answer questions is more objective than essay questions, short answer questions are neither fully valid, reliable, nor objective.
- Handwriting and spelling skills may influence assessment.
- Difficult to write items that have only one clear answer
- Not suitable for item analysis
- Subjective scoring takes more time and is more difficult.

References:

Jacobs LC. How to write better tests: A handbook for improving test construction skills. Evaluation Services and Testing, Indiana University-Bloomington.

<https://www.uky.edu/Ag/CLD/CETL/files/f09workshop/IU%20How%20to%20write%20better%20tests.pdf>

Park University, Faculty Development website, Writing Test Items.

http://captain.park.edu/facultydevelopment/writing_test_items.htm

Schuwirth L. ABC of learning and teaching in medicine: Written assessment. *Brit Med J* 326(73-90): 643-645, 2003.

Schuwirth L, Van der Vleuten C. Different written assessment methods: what can be said about their strengths and weaknesses? *Med Educ* 38(9):974-979, 2004.

Short Answer Questions

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Description:

Although some conflate short answer questions with fill-in-the-blank (FITB) questions, the education literature is fairly clear that these are separate question types that assess different levels of thinking and learning. Short answer questions are open-ended questions requiring students to respond with a brief written answer, generally a paragraph or less but often restricted to one to three sentences. Because they require students to recall information rather than select from a list of potential responses, short answer questions are better for testing higher order thinking skills and separating out those students who have achieved deep learning from those who have obtained only surface level learning. In general, students should earn more credit for these types of questions as they are more demanding than those requiring recognition of answers (MCQs, FITB, T/F).

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.2
- 3.1-3.3
- 4.1, 4.2
- 5.3
- 7.3
- 8.1, 8.2
- 9.1, 9.2

Documented Uses and Examples:

<https://unmc.instructure.com/courses/6155/pages/short-answer-and-essay-answer-questions>

<https://www.csu.edu.au/division/learning-teaching/assessments/assessment-types/exams/short-answer-questions>

Pros and Cons:

Positive Aspects/Pros:

- Relies on recall vs recognition
- Differentiates deep vs surface learning of students
- Easier to write well than MCQs, FITB
- Good for testing higher order thinking skills

Negative Aspects/Cons:

- Less efficient than MCQ, FITB exams
- Cannot cover as much breadth of material due to length
- Poor validity and reliability unless multiple graders
- Can be demotivating to students

References:

Haynie WJ. Effects of multiple-choice and short-answer tests on delayed retention learning. *J Technol Educ* 6(1): Fall 1994. <https://doi.org/10.21061/jte.v6i1.a.3>

Rademakers J, ten Cate T, Bar P. Progress testing with short answer questions. *Med Teach* 27(7):578-582, 2005.

Schuwirth LWT and van der Vleuten CPM. Abc of teaching and learning in medicine: Written assessment. *BMJ* 326(7390):643-645, 2003. <https://www.jstor.org/stable/25453994>

Schuwirth LWT and van der Vleuten CPM. Different written assessment methods: What can be said about their strengths and weaknesses? *Med Educ* 38: 974-979, 2004.

Stunden A, Jefferies D. The effectiveness of short answers test papers in evaluating academic nursing programs: A review of the literature. *Nurse Educ Pract* 33:94-101, 2018. <https://doi.org/10.1016/j.nepr.2018.09.004>

van Hoeij MJW, Haarhuis JCM, Wierstra RFA, and van Beukelen P. Developing a classification tool based on Bloom's taxonomy to assess the cognitive level of short essay questions. *J Vet Med Educ* 31(3): 261-267, 2004.

Essay Questions

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Description:

Essay questions allow for different or original responses or patterns of responses and elicits responses that must consist of more than one sentence. Essay questions also provide learners with an indication of the types of thinking and content to use in responding to the essay question and require learners to compose rather than select a response option. These types of questions require subjective judgment by a competent specialist to assess the accuracy and quality of responses and where double marking might be recommended to improve reliability.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.2
- 3.1-3.3
- 4.1, 4.2
- 5.2, 5.3
- 7.3
- 8.1, 8.2
- 9.1, 9.2, 9.3

Documented Uses and Examples:

European College of Veterinary Pathologists. Example Exam Questions. 2021.
<https://www.ecvpath.org/example-exam-questions/>

Pros and Cons:

Positive Aspects/Pros:

- Can assess higher-order or critical thinking skills
- Can evaluate student thinking and reasoning
- Provides authentic experience closer to real practice
- Written feedback possible (+) but also time consuming (-)
- May provide practice to improve poor or unpolished writing

Negative Aspects/Cons:

- Assesses a limited sample of the range of content
- Difficult and time consuming to grade

- Reliability often low as sampling across content tends to be low, unless a large number of essays are used
- Labor intensive scoring
- The word “essay” can be confusing to students in their interpretation of the format.
- Not recommended for high-stakes assessment
- Techniques to detect plagiarism should be considered.

References:

Christian CM, Bothell TW, Sudweeks RR, Wood B. Preparing effective essay questions: A Self-Directed Workbook for Educators. New Forums Press, 2002.

<https://testing.byu.edu/handbooks/WritingEffectiveEssayQuestions.pdf>

Schuwirth L, van der Vleuten C. Different written assessment methods: What can be said about their strengths and weaknesses? Med Educ 38(9):974-979, 2004.

Schuwirth, L. ABC of learning and teaching in medicine: Written assessment. Brit Med J 326(73-90):643-645, 2003.

[Veterinary Medicine Essays: Examples, Topics, Titles, & Outlines \(paperdue.com\)](#)

Script Concordance (SCT)

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Description:

The SCT is a written test designed to evaluate examinees' ability to interpret clinical information in ill-defined situations and then compares their judgment to experts. The test is based on illness script theory. Examinees are presented with a brief case vignette, followed by an initial hypothesis. The second step presents new information that may affect the likelihood of the hypothesis. In the third step, examinees are asked to indicate the effect of the new information on the original hypothesis. There is no single correct answer. Instead, scores are determined based on the proportion of experienced clinicians selecting a particular answer (Lubarsky et al. 2013; Ramaekers, 2010).

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.6

Documented Uses and Examples:

There are limited examples showing the use of SCTs in veterinary education. The first reference illustrates the use of an SCT to assess the clinical reasoning of practicing food-animal clinicians. Highlights of this example include a description of the process used to create the scoring key and validate the SCT (Dufour et al. 2012).

A more recent publication illustrates the use of a modified SCT (3 response options instead of 5) as a teaching tool, instead of a true assessment (Tayce and Saunders 2021).

Pros and Cons:

Positive aspects/pros (Carriere et al. 2009; Charlin et al. 2000; Lubarsky et al. 2011; Nouh et al. 2012; Subra et al. 2017):

- Studied in many health professions
- Assesses a specific domain of clinical reasoning – ability to interpret medical information under ill-defined conditions
- Good construct validity
- Compares examinees to clinicians
- Written test – easy to administer, 60-90 minutes
- Requires students to apply their knowledge

Negative aspects/cons (Lineberry et al. 2013; Lineberry et al. 2019; Steinberg et al. 2020):

- Items difficult to construct
- Minimum of 25 cases with 3 items each for optimal reliability
- Requires a panel of experts (10-15) to review/score proposed questions
- Not useful for evaluating content-area knowledge
- Considerable concerns about test validity:
 - Process validity (concerns about whether examinees share the same view of constructs under examination as experts)
 - Aggregate scoring of SCT may not be valid.
 - Potential bias against examinees who select extreme options.

References:

Carrière B, Gagnon R, Charlin B, Downing S, Bordage G. Assessing clinical reasoning in pediatric emergency medicine: Validity evidence for a script concordance test. *Annals of Emerg Med* 53(5):647-652, 2009.

Charlin B, Roy L, Brailovsky C, Goulet F, van der Vleuten C. The Script Concordance test: a tool to assess the reflective clinician. *Teach Learn in Med* 12(4):189-195, 2000.

Dufour S, Latour S, Chicoine Y, Fecteau G, Forget S, Moreau J, Trépanier A. Use of the script concordance approach to evaluate clinical reasoning in food-ruminant practitioners. *J Vet Med Educ* 39(3):267-275, 2012. <https://jvme.utpjournals.press/doi/full/10.3138/jvme.0112-13R>

Lineberry M, Kreiter CD, Bordage G. Threats to validity in the use and interpretation of script concordance test scores. *Med Educ* 47(12):1175-1183, 2013.

Lineberry M, Hornos E, Pleguezuelos E, Mella J, Brailovsky C, Bordage G. Experts' responses in script concordance tests: A response process validity investigation. *Med Educ* 53(7):710-722, 2019.

Lubarsky S, Charlin B, Cook DA, Chalk C, van der Vleuten CP. Script concordance testing: A review of published validity evidence. *Med Educ* 45(4):329-338, 2011. <https://doi-org.prox.lib.ncsu.edu/10.1111/j.1365-2923.2010.03863.x>

Lubarsky S, Dory V, Duggan P, Gagnon R, Charlin B. Script concordance testing: From theory to practice: AMEE Guide No. 75. *Med Teach* 35:184-193, 2013.

Nouh T, Boutros M, Gagnon R, Reid S, Leslie K, Pace D, Pitt D, Walker R, Schiller D, MacLean A, Hameed M. The script concordance test as a measure of clinical reasoning: A national validation study. *Am J Surg* 203(4):530-534, 2012.

Ramaekers S, Kremer W, Pilot A, Beukelen PV, Keulen HV. Assessment of competence in clinical reasoning and decision-making under uncertainty: The script concordance test method. *Assessm & Eval in Higher Educ* 35(6):661-673, 2010. doi:10.1080/02602938.2010.500103

Steinberg E, Cowan E, Lin MP, Sielicki A, Warrington S. Assessment of emergency medicine residents' clinical reasoning: Validation of a script concordance test. *Western J Emerg Med* 21(4):978, 2020.

Subra J, Chicoulaa B, Stillmunkès A, Mesthé P, Oustric S, Rougé Bugat ME. Reliability and validity of the script concordance test for postgraduate students of general practice. *Eur J Gen Pract* 23(1):209-214, 2017.

Tayce JD, Saunders AB. The use of a modified script concordance test in clinical rounds to foster and assess clinical reasoning skills. *J Vet Med Educ*, 2021 Nov 16:e20210090.
<https://jvme.utpjournals.press/doi/epub/10.3138/jvme-2021-0090>

DRAFT

In Training Evaluation Report (ITER)

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Description:

Historically, ITERs are the most commonly used evaluation form in the veterinary medicine clinical training environment (and the one with the least published about it). They are often used in a summative manner to provide a learner with feedback during or following a learning experience (typically a clinical rotation). Scoring in an ITER usually includes rating on a Likert or numerical scale and qualitative comments. ITERs are often heavily focused on professionalism, work ethic, knowledge, and communication. Written comments may be most helpful in identifying struggling learners but are often criticized for being vague and hard to interpret. ITERs are also referred to in the literature as clinical performance reports, performance assessment forms, clinical performance progress reports, or end-of-clinical rotation reports.

Suggested CBVE Domain and Competency Assessed:

- All CBVE domains and competencies can be assessed using this format.

Documented Uses and Examples:

Read EK, et al. Comparing entrustment and competence: An exploratory look at performance-relevant information in the final year of a veterinary program. *J Vet Med Educ* 2021. doi: 10.3138/jvme-2019-0128.

Weijts C, et al. Final-year students' and clinical instructors' experience of workplace-based assessments used in a small-animal primary-veterinary-care clinical rotation. *J Vet Med Educ* 2015. doi: 10.3138/jvme.1214-123R1.

Pros and Cons:

Positive aspects/pros:

- Used broadly across the health professions training settings
- Recent research from medicine has focused on completing ITERs more effectively, especially the qualitative comments.
- Can assess the quality of the ITER using the Completed Clinical Evaluation Report Rating (CCERR)

Negative aspects/cons:

- Evidence suggests that the final assessment (i.e. pass versus fail) marked on the ITER is not always consistent with the evaluator's judgment of a trainee's performance, especially for poorly performing residents.
- May be difficult to recall events that occurred earlier in the training period, resulting in criticism of this method as focusing on the more recent events only
- Some negative perception from faculty related to the amount of time needed to complete these forms

References:

Bismil, et al. In-training evaluations: developing an automated screening tool to measure report quality. *Med Educ* 48(7):724-732, 2014. doi: 10.1111/medu.12490

Ginsburg, et al. Do in-training evaluation reports deserve their bad reputations? A study of the reliability and predictive ability of ITER scores and narrative comments. *Acad Med* 88(10):1539-1544, 2013. doi: 10.1097/ACM.0b013e3182a36c3d.

Ginsburg, et al. Reading between the lines: Faculty interpretations of narrative evaluation comments. *Med Educ* 49(3):296-306, 2015. doi: 10.1111/medu.12637.

Ginsburg, et al. Cracking the code: resident's interpretation of written assessment comments. *Med Educ* 51(4):401-410, 2017. doi: 10.1111/medu.13158. Epub 2017 Jan 16.

Hatala, et al. Using in-training evaluation report (ITER) qualitative comments to assess medical students and residents: A systematic review. *Acad Med* 92(6):868-879, 2017. doi: 10.1097/ACM.0000000000001506.

Kassam A, et al. Validity and reliability of an in-training evaluation report to measure the CanMEDS roles in emergency medicine residents. *Can J Emerg Med* 16(2):144-150, 2014. doi: 10.2310/8000.2013.130958.

Case Based Discussion

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Description:

This evaluation is a formal discussion between a student and clinician/professor about a case for which a student has had direct responsibility. The discussion includes all case records. The instructor asks questions to determine the student's depth of understanding, decision-making and clinical judgment. The instructor should be determining the quality of all aspects of the student's case management skills (e.g., record-keeping, client communications). The student is offered the chance to explain their decision-making throughout the discussion. A consistent rubric should be used and discussed with the student, followed by a short feedback session to help the student improve on the next case. This tool is used primarily for formative assessment (versus summative).

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.1, 2.2
- 3.1, 3.2
- 4.1, 4.2
- 5.1, 5.3
- 7.2, 7.3, 7.5
- 8.2, 8.3

Documented Uses and Examples:

<https://www.youtube.com/watch?v=14b8yZy-6Zo>

<https://www.youtube.com/watch?v=8LtC5AqnV9M>

Pros and Cons:

Positive Aspects/Pros:

- Evidence for efficacy
 - Cunningham JPW, Hanna E, Turnbull J, Kaigas TB, Norman GR. Defensible assessment of the competency of the practicing physician. Acad Med 72(1):9-12, 1997.
 - Jyothirmayi, R. Case-based discussion: Assessment tool or teaching aid? Clin Oncol 24:649-653, 2012.
- Lower stakes for student
- Helps elucidate critical thinking and reasoning skills

- Provides opportunity for quality feedback and mentorship

Negative Aspects/Cons:

- Time consuming
- Can be intimidating to student
- Not valid/reliable for summative assessments

References:

A rubric commonly used in the UK can be found at: Intercollegiate Surgical Curriculum Website:
<http://www.iscp.ac.uk/Assessment/WBA/CBD.aspx>)

*information paraphrased from Baillie's and Rhind: A guide to assessment methods in veterinary medicine, version 1.1 (September 2008)

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Direct Observation of Procedural Skills (DOPS)

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Description:

This evaluation format is specifically designed to assess practical skills in a workplace setting. A trainee is observed and scored by an assessor while performing a routine practical procedure during normal clinical work. A standardized DOPS form is used to score the technique. Based on studies in medical education, for any specific skill the trainee must pass a number of repeated assessments; typically 6, though more recent studies suggest fewer (3) may be needed to be signed off as competent at that skill with a reasonable level of reliability.

Suggested CBVE Domains and Competencies Assessed:

- 1.1, 1.7
- 2.1
- 5.1

Documented Uses and Examples:

Siau K, Crossley J, Dunckley P, Johnson G, Feeney M, Hawkes ND, Beales ILP, Joint Advisory Group on Gastrointestinal Endoscopy (JAG). Direct observation of procedural skills (DOPS) assessment in diagnostic gastroscopy: Nationwide evidence of validity and competency development during training. *Surg Endosc* 34(1):105-114, 2020. doi: 10.1007/s00464-019-06737-7.

Note: similar article by these authors for Paed Gastrosc (doi: 10.1097/MPG.0000000000002089), Colonoscopy (doi: 10.14309/ajg.0000000000000426) and sigmoidoscopy (doi: 10.15403/jgld.2014.1121.281.nov)

Specific Example for Veterinary Education: Magnier K, Dale V, Pead M. Workplace-based assessment instruments in the health sciences. *J Vet Med Educ* 39(4):389-395, 2012.

Pros and Cons:

Positive Aspects/Pros:

- High authenticity
- Evidence for validity and reliability in specific settings e.g., gastroscopy in medical education (Siau et al. 2020)
- Multiple assessments of the same skill can be evaluated using standardized form.
- Valuable opportunity for formative feedback

Negative Aspects/Cons:

- Time consuming to administer
- Requires the availability of a dedicated observer for an entire clinical encounter
- Multiple observations over time are needed for reliability.

References:

Dabir S, Hoseinzadeh M, Mosaffa F, Hosseini B, Dahi M, Vosoughian M, Moshari M, Tabashi S, Dabbagh A. The effect of repeated direct observation of procedural skills (R-DOPS) assessment method on the clinical skills of anesthesiology residents. *Anesth Pain Med* 11(1):e111074, 2021. doi: 10.5812/aapm.111074

Erfani K, Ebadi FA. Direct observation of procedural skills (DOPS) evaluation method: Systematic review of evidence. *Med J Islam Repub Iran* 32:45, 2018. doi: 10.14196/mjiri.32.45

Lorwald AC, Lahner FM, Nouns ZM, Berendok C, Norcini J, Greif R, Huwenediek S. The educational impact of mini-clinical evaluation exercise (Mini-CEX) and direct observation of procedural skills (DOPS) and its association with implementation: A systematic review and meta-analysis. *PLoS ONE* 13(6):e0198009, 2018. doi: 10.1371/journal.pone.0198009

Magnier K, Dale V, Pead M. Workplace-based assessment instruments in the health sciences. *J Vet Med Educ* 39(4):389-395, 2012.

Magnier K, Pead M. Performance and workplace-based assessment. *In: Veterinary Medical Education: A Practical Guide*. Hodgson J, Pelzer J (eds), Wiley Blackwell, Iowa, pp 255-272, 2017.

Naeem N. Validity, reliability, feasibility, acceptability and educational impact of direct observation of procedural skills (DOPS). *J Coll Phys Surg Pak* 23(1):77-82, 2013. PMID 23286629.

Magnier K, Dale V, Pead M. Workplace-based assessment instruments in the health sciences. *J Vet Med Educ* 39(4):389-395, 2012.

McLeod R, Mires G, Ker J. Direct observed procedural skills assessment in the undergraduate setting. *Clin Teach* 9(4):228—232, 2012.

Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: A systematic review. *J Am Med Assoc* 302(12):1316-1326, 2009. doi: 10.1001/jama.2009.1365

Wilkinson J, Crossley J, Wragg A, Mills P, Cowan G, Wade W. Implementing workplace-based assessment across the medical specialties in the United Kingdom. *Med Educ* 42(4):364-373, 2008.

Schuwirth L, van der Vleuten C. Different written assessment methods: what can be said about their strengths and weaknesses? *Med Educ* 38(9):974-979, 2004.

Schuwirth L. ABC of learning and teaching in medicine: Written assessment. *British Med J* 326(73-90):643-645, 2003.

Siau K, Crossley J, Dunckley P, Johnson G, Feeney M, Hawkes ND, Beales ILP, Joint Advisory Group on Gastrointestinal Endoscopy (JAG). Direct observation of procedural skills (DOPS) assessment in diagnostic gastroscopy: Nationwide evidence of validity and competency development during training. *Surg Endosc* 34(1):105-114, 2020. doi: 10.1007/s00464-019-06737-7.

Wragg A, Wade W, Fuller G, Cowan G, Mills P. Assessing the performance of specialist registrars. *Clin Med* 3(2):131-134, 2003.

DRAFT

Objective Structured Clinical Examination (OSCE)

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Description:

OSCEs have been used in medical education over the past 4 decades and are now widely accepted in health professions education to assess hands-on technical skills or communication skills. They consist of a timed circuit of multiple mini stations with different skills or tasks being assessed in each station. OSCEs use a standardized form for grading – a binary checklist or global rating scale (GRS). Assessments are at the level of “Shows” on Miller’s Pyramid of Clinical Competence. The pass mark or minimum performance level (MPL) is set in advance using standard setting techniques such as modified Angoff, Ebel, or borderline regression.

CBVE Domain/Competency Assessed:

- 1.1-1.7
- 2.1-2.2
- 3.1, 3.2
- 4.1, 4.2
- 5.1-5.3

Documented Uses and Examples:

Annandale, et al. Ability of a bovine transrectal palpation objective structured clinical examination to predict veterinary students' pregnancy diagnosis accuracy. *Vet Rec* 185(6):171, 2019. doi: 10.1136/vr.105022. Epub 2019 Jun 7.

Bark H, Cohen R. Use of an objective, structured clinical examination as a component of the final-year examination in small animal internal medicine and surgery. *J Am Vet Med Assoc* 221(9):1262-1265, 2006. doi: 10.2460/javma.2002.221.1262.

Davis MH, et al. The objective structured clinical examination (OSCE) as a determinant of veterinary clinical skills. *J Vet Med Educ* 33(4):578-587, 2006. doi: 10.3138/jvme.33.4.578.

Hecker, et al. Assessment of first-year veterinary students' clinical skills using objective structured clinical examinations. *J Vet Med Educ* 37(4):395-402, 2010. doi: 10.3138/jvme.37.4.395.

Hecker, et al. Assessment of first-year veterinary students' communication skills using an objective structured clinical examination: The importance of context. *J Vet Med Educ* 39(3):304-310, 2012. doi: 10.3138/jvme.0312.022R.

Hunt JA, Anderson S. Remote assessment of veterinary clinical skills courses during the COVID-19 pandemic. Mar 3;e20200084, 2021. doi: 10.3138/jvme-2020-0084.

Read, et al. The use of global rating scales for OSCEs in veterinary medicine. Plos ONE 10(3):e0121000, 2015. doi: 10.1371/journal.pone.0121000. eCollection 2015.

Tan J, et al. Video Recording in Veterinary Medicine OSCEs: Feasibility and inter-rater agreement between live performance examiners and video recording reviewing examiners. J Vet Med Educ 48(4):485-491, 2021. doi: 10.3138/jvme-2019-0142. Epub 2020 Aug 6.

Pros and Cons:

Positive Aspects/Pros:

- Considered gold standard for assessment of technical and communication skills across the health professions training settings outside of the clinical workplace
- Widely used in veterinary medicine for clinical skills and communication skills training – goes by many names such as OSPEs (objective structured practical exams), OSPVEs (objective structures practical veterinary exams)
- Near-peer assessment has been used.
- Generalizability theory can help determine where the source of variation between student performance comes from. Ideally the only source of variation would be from the students' ability, but often there are many factors to consider – different animals, different raters, different sites, or different days, for instance. The more variables that can be controlled for, the better.
- Piloting stations before the OSCE can improve reliability.
- Assessors should be trained in advance and repeat rater volunteers should have their training refreshed on a regular interval. Consistency amongst raters is important regarding what elements of student performance are critical and this should be based upon how the skill was taught in the skills center.

Negative Aspects/Cons:

- Can be anxiety-inducing for novice learners
- Poorly designed OSCEs can have low reliability so quality assurance and review of evaluation of reliability are essential as part of the examination process. Cronbach's alpha is a commonly used method of internal consistency (reliability assessment).

References:

Dunne, et al. Evaluation of a coaching workshop for the management of veterinary nursing students' OSCE-associated test anxiety. Irish Vet J 71:15, 2018. doi: 10.1186/s13620-018-0127-z. eCollection 2018.

Hecker K, Violato C. Validity, reliability, and defensibility of assessments in veterinary education. *J Vet Med Educ* 36:271-275, 2009.

Khan KZ, Gaunt K, Ramachandran S, et al. The objective structured clinical examination (OSCE): AMEE guide no. 81. part II: Organisation & administration. *Med Teach* 35:e1447-e1463, 2013.

Lee CB, Madrazo L, Khan U, et al. A student-initiated objective structured clinical examination as a sustainable cost-effective learning experience. *Med Educ Online* 23: 1440111, 2018.

May S, Head S. Assessment of technical skills: best practices. *J Vet Med Educ* 37(3):258-265, 2010. doi: 10.3138/jvme.37.3.258.

McKinley DW, Norcini JJ. How to set standards on performance-based examinations: AMEE guide no. 85. *Med Teach* 36:97-110, 2014.

Miller G. The assessment of clinical skill/competence/performance. *Acad Med* 65:63-67, 1990.

Pell, G., Fuller, R., Homer, M., et al. How to measure the quality of the OSCE: a review of metrics—AMEE guide no. 49. *Med Teach* 32:802-811, 2010.

Royal and Hecker. Rater errors in clinical performance assessments. *J Vet Med Educ* 43(1):5-8, 2016. doi: 10.3138/jvme.0715-112R. Epub 2015 Nov 11.

Clinical Evaluation Exercise (CEX)

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Description:

The CEX is used to evaluate a student's (or resident's) clinical skills in a workplace setting. In the predecessor "long case evaluation," students took a history and performed a physical examination, and then reported their findings to one or more supervising evaluators who questioned the student about the case in order to perform an evaluation (Norcini 2001). The evaluation was therefore indirect in that the student self-reported to the examiner(s) and the examiner(s) did not directly observe the student interacting with the patient. Ultimately, long case evaluation inter-examiner reliability proved poor (Wilson et al. 1969). The CEX was developed as a tool where the examiner directly observes the student's history taking and physical examination, completes a standardized evaluation, and provides immediate feedback to the candidate.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.1-2.2
- 3.1-3.3
- 4.1-4.2
- 5.1-5.3
- 6.1, 6.2, 6.4
- 7.1-7.2, 7.4
- 8.2, 8.3
- 9.1-9.3

Documented Uses and Examples:

https://www.iscp.ac.uk/curriculum/surgical/assessment_cex.aspx

Pros and Cons:

Positive Aspects/Pros:

- Evidence for efficacy: Veterinary educational efficacy remains unproven but this observational technique is used often in veterinary teaching hospitals. The potentially cumbersome length and impracticality have led to the development of the mini-CEX to improve efficiency.
- Evaluations can be quick: 15-20 minutes for a specific technique or procedure, but that focused evaluation could be considered a mini-CEX instead of a typically lengthier CEX.

- Feedback is immediate for the student.
- Scoring of the CEX is more standardized than the previous long case evaluation, so the CEX should be more consistent between students and between evaluators.
- Inter-rater scoring can be made more reliable with more than one rater simultaneously observing the same patient interaction, and with standardization of evaluation rubrics.

Negative Aspects/Cons:

- Reliability of the CEX has been criticized (Durning et al. 2002). Different evaluators may score the same student differently.
- The original CEX was developed to be 2 hours in duration as part of a standardized certification examination, making it impractical in most clinical business settings (Searle 2008).

References:

Durning SJ, Cation LJ, Markert RJ, Pangaro LN. Assessing the reliability and validity of the mini-clinical evaluation exercise for internal medicine residency training. *Acad Med* 77:900-904, 2002.

Norcini JJ. The validity of long cases. *Med Educ* 35:720-721, 2001.

Searle GF. Is CEX good for psychiatry? An evaluation of workplace-based assessment. *Psych Bull* 32:271-273, 2008.

Wilson GM, Lever R, Harden RM, et al. Examination of clinical examiners. *The Lancet* 293:37-40, 1969.

Mini-Clinical Evaluation Exercise (mini-CEX)

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Description:

The mini-CEX is a method used to evaluate learners engaged in an authentic clinical encounter in a workplace-based setting. It is patterned after the original, longer, CEX. Originally designed to measure “a focused history and physical examination” in the training of medical residents (Norcini et al. 1995 p. 795)”, this modality is now employed to assess history taking, physical examination skills, communication skills, clinical judgment, professionalism, organization/efficiency, and overall clinical care (Norcini and Burch, 2007), and is employed in a variety of health professions including nursing, midwifery, dentistry, and veterinary medicine (Lorwad et al. 2017). In a typical mini-CEX encounter, the evaluator observes the examinee for approximately 20 minutes conducting a task or series of tasks in an authentic clinical setting. The evaluator then provides oral feedback, as well as a completed evaluation form. Students are likely to be evaluated using multiple mini-CEX encounters over time in order to increase reliability and document change/improvement.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.1-2.2
- 3.1-3.3
- 4.1-4.2
- 5.1-5.2
- 6.1-6.2, 6.4
- 8.1-8.3
- 9.2-9.3

Documented Uses and Examples:

<https://www.abim.org/Media/qlvp1fhb/mini-cex.pdf>

Ansari AA, Ali SK, Donnon T. The construct and criterion validity of the mini-CEX. Acad Med 88(3):413-420, 2013. doi: 10.1097/ACM.0b013e318280a953

Pros and Cons:

Positive Aspects/Pros:

- Evidence for efficacy: The mini-CEX has been studied in a variety of workplace-based settings, and there is evidence for its effectiveness and feasibility across a variety of

disciplines in medical sciences education (see cited literature, below). The mini-CEX has been studied less in veterinary medical education contexts than in other medical education settings, but available research suggests that it performs similarly in veterinary education settings to other medical education settings. Weijs, Coe, and Hecker (2015) found that students and instructors found mini-CEX to be beneficial for learning and assessment, and Bok and colleagues (2018) found mini-CEXs to be a valuable component of their validated programmatic assessment approach.

- As a global observation tool, the mini-CEX is suitable for evaluating learners' overall ability in broad areas of performance such as "medical interviewing", "physical examination," and "professionalism." The mini-CEX is a familiar and proven tool in medical education, and multiple exemplars exist in the literature and in common use.

Negative Aspects/Cons:

- The mini-CEX does not specifically provide information at the level of subcompetencies, so inferences regarding proficiency at the level of subcompetencies must be provided through comments, or can be inferred from scores assigned at the broader competency level.
- Like other work-place based assessment tools, the mini-CEX is time-consuming to administer, requiring the availability of a dedicated observer for an entire clinical encounter, and multiple observations over time.

References:

Ansari AA, Ali SK, Donnon T. The construct and criterion validity of the mini-CEX. *Acad Med* 88(3):413-420, 2013. doi: 10.1097/ACM.0b013e318280a953

Bok HGJ, de Jong LH, O'Neill T, et al. Validity evidence for programmatic assessment in competency-based education. *Perspect Med Educ* 7:362–372, 2018.
<https://doi.org/10.1007/s40037-018-0481-2>

Hejri SM, Jalili M, Masoomi R, Shirazi M, Nedjat S, Norcini J. The utility of mini-clinical evaluation exercise in undergraduate and postgraduate medical education: A BEME review: BEME Guide No. 59. *Med Teach* 42(2):125-142, 2000. DOI: 10.1080/0142159X.2019.1652732

Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: A systematic review. *J Am Med Assoc* 302(12):1316–1326, 2009. doi:10.1001/jama.2009.1365

Lörwald AC, Lahner FM, Nouns ZM, Berendonk C, Norcini J, et al. The educational impact of mini-clinical evaluation exercise (mini-CEX) and direct observation of procedural skills (DOPS) and its association with implementation: A systematic review and meta-analysis. *PLoS ONE* 13(6):e0198009, 2018. <https://doi.org/10.1371/journal.pone.0198009>

Pelgrim EAM, Kramer AWM, Mokkink HGA, et al. In-training assessment using direct

observation of single-patient encounters: A literature review. *Adv in Health Sci Educ* 16, 131–142, 2011. <https://doi.org/10.1007/s10459-010-9235-6>

Weijs CA, Coe JB, Hecker KG. Final-year students' and clinical instructors' experience of workplace-based assessments used in a small-animal primary-veterinary-care clinical rotation. *J Vet Med Educ* 42(4):382-392, 2015. doi: 10.3138/jvme.1214-123R1. Epub 2015 Sep 30.

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Longitudinal Evaluation of Performance (LEP)

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Description:

The Longitudinal Evaluation of Performance (LEP) is a method that was adapted from mini-CEX where learners are observed in a clinic setting and the evaluator makes judgements regarding learner performance across several broad categories using standardized assessment forms. The primary difference with LEP is that serial observations are made over time to monitor learner progression towards achieving competency and the individual evaluations serve as formative feedback for the learners. The observations can be driven by the learner or the assessor with the former allowing learners to take greater responsibility for their own professional development. The use of multiple different evaluators to provide learners with feedback in LEP is considered advantageous to guard against bias and situations where there are professional relationship problems between the learner and evaluator.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.1-2.2
- 3.1-3.3
- 4.1-4.2
- 5.1-5.2
- 6.1-6.2, 6.4
- 8.1-8.3
- 9.2-9.3

Documented Uses and Examples:

There are few examples in the literature documenting the use of LEP in health education. The following is an example of an evaluation form that was utilized in the LEP for the Scottish Dental Assessment Programme:

Prescott L, McKinlay P, Rennie J. The development of an assessment system for dental vocational training and general professional training: A Scottish approach. *British Dental J* 190(1):41-44, 2001. <https://onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2923.2002.01099.x#f1>

Pros and Cons:

Positive Aspects/Pros:

- Evaluation forms can be flexibly adapted to assess a variety of different technical skills and professional skills.
- Allows monitoring of learner progression over time so that problems with performance can be identified earlier and remediation measures put in place to ensure learners have the opportunity to achieve competence
- Having feedback from multiple evaluators can provide a more holistic view of the student and guard against potential biases arising from problems in the professional relationship between a learner and evaluator.

Negative Aspects/Cons:

- Although each assessment form is generally quick to complete, it may generate a time burden for learners and evaluators if there are a large number of clinical events to assess.
- If students are not required to complete evaluation forms for all clinical events, they may tend to select events for evaluation that align with their strengths and avoid those with the potential to highlight their weaknesses.
- Requires a system for collating results from the evaluation form to monitor learner progress
- Requires a dedicated staff person and/or team to track the evaluations and develop remediation plans.

References:

Dickie JDR. Longitudinal clinical assessment of undergraduate dental students: Building an argument for its validity: University of Glasgow, 2021.

Newton WP, Rode K, O'Neill T, Fain R, Baxley E. Longitudinal assessment: Where we are and why it is important. Am Board Family Med 2019.

Prescott-Clements L, Van Der Vleuten CP, Schuwirth LW, Hurst Y, Rennie JS. Evidence for validity within workplace assessment: the Longitudinal Evaluation of Performance (LEP). Medical Education. 2008;42(5):488-95.

Prescott L, McKinlay P, Rennie J. The development of an assessment system for dental vocational training and general professional training: a Scottish approach. British dental journal. 2001;190(1):41-4.

Prescott L, Norcini J, McKinlay P, Rennie J. Facing the challenges of competency-based assessment of postgraduate dental training: Longitudinal Evaluation of Performance (LEP). Medical education. 2002;36(1):92-7.

Schumacher DJ, West DC, Schwartz A, Li S-T, Millstein L, Griego EC, et al. Longitudinal assessment of resident performance using entrustable professional activities. JAMA network open. 2020;3(1):e1919316-e.

360° Evaluations (Multi-Source Feedback)

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Description:

360° evaluations have traditionally been used to assess how individuals perform in the workplace environment by soliciting anonymous feedback on their behaviors and outcomes from people who are knowledgeable about their work. This group of evaluators includes raters who are hierarchically above, at the same level, and below the person being evaluated as this is thought to provide a more balanced assessment of performance than traditional top-down supervisor driven feedback. In a veterinary teaching hospital setting, potential raters could include line managers, mentors, clinicians, residents, interns, nurses, animal care assistants, receptionists, support staff, administrators, students, clients, and alumni. While 360° evaluations are often more traditionally used to evaluate faculty performance, there is potential for adapting them for use in student assessment.

Berk and colleagues (2009) identified three main purposes for 360° evaluations in a clinical teaching setting including:

- Formative decisions and feedback about teaching improvement
- Summative decisions and feedback for merit pay and contract renewal
- Formative decisions and feedback about professional behaviors in the academic setting.

Ratings from the 360° evaluations are also often compared against self-ratings to assess how well an individual can reflect on their own performance. The assessment surveys should be designed to take no longer than 5-10 minutes to complete given that raters may be asked to provide feedback on many other individuals in their work environment. Each 360° evaluation needs to include ratings from approximately 8-12 individuals in order to be effective.

Suggested CBVE Domains and Competencies:

- 5.1-5.3
- 6.1-6.4
- 7.1-7.5

Documented Uses and Examples:

Implementing 360° evaluations for clinical teaching faculty generally requires separate surveys for the 3 broad categories of raters:

- Co-workers/colleagues/administrators
- Clients/patients
- Students/alumni

Several studies have described the development and validation of surveys for specific disciplines within medicine:

- A systematic review of the quality and utility of observer-based instruments for assessing medical professionalism (Lelliott et al. 2008)
- Assessing the practicing physician using patient surveys: a systematic review of instruments and feedback methods (Evans et al. 2007)
- Developing specialty-specific multisource feedback tools (Bindels et al. 2019)
- Evaluation of physicians' professional performance: An iterative development and validation study of multisource feedback instruments (Overeem et al. 2012)
- Validation of the INCEPT: A multisource feedback tool for capturing different perspectives on physicians' professional performance (van der Meulen et al. 2017)

Pros and Cons:

Positive Aspects/Pros:

- Good for evaluating professionalism, communication, and interpersonal skills. Rubrics can easily be adapted to collect information on different attributes of performance
- Having feedback from multiple individuals with different professional relationships to the person being evaluated can provide a more holistic view of performance and is less prone to positive bias (“halo effect”) and negative bias (“millstone effect”).
- It can provide an anonymous means for individuals to provide feedback on their colleagues, particularly since many faculty have never been trained to give effective feedback and are uncomfortable discussing performance issues with students or residents.

Negative Aspects/Cons:

- It can be difficult to get faculty to make positive behavioral changes in response to feedback received through 360° evaluations (Lockyer et al. 2003).
- Collecting feedback can be time and resource intensive. There is often a need to purchase or subscribe to specialized software, which can be expensive for smaller programs.
- Some individuals experience strong negative emotional reactions to receiving negative feedback, particularly if they have higher self-ratings of their own performance (Sargeant et al. 2008; van der Meulen et al. 2021).

References:

Archer J, McGraw M, Davies H. Republished paper: Assuring validity of multisource feedback in a national programme. *Postgrad Med J* 86:526-531, 2010.

Berk RA. Using the 360 multisource feedback model to evaluate teaching and professionalism. *Med Teach* 31:1073-1080, 2009.

Bindels E, Boerebach B, van der Meulen M, Donkers J, van den Goor M, Scherpbier A, Lombarts K, Heeneman S. A new multisource feedback tool for evaluating the performance of specialty-specific physician groups: Validity of the group monitor instrument. *J Contin Educ Health Prof* 39:168-177, 2019.

Donnon T, Al Ansari A, Al Alawi S, Violato C. The reliability, validity, and feasibility of multisource feedback physician assessment: A systematic review. *Acad Med* 89:511-516, 2014.

Evans R, Elwyn G, Edwards A. Review of instruments for peer assessment of physicians. *BMJ* 328:1240, 2004.

Evans RG, Edwards A, Evans S, Elwyn B, Elwyn G. Assessing the practising physician using patient surveys: A systematic review of instruments and feedback methods. *Family Pract* 24:117-127, 2007.

Kwan YH, Png K, Phang JK, Leung YY, Goh H, Seah Y, Thumboo J, Ng APSC, Fong W, Lie D. A systematic review of the quality and utility of observer-based instruments for assessing medical professionalism. *J Grad Med Educ* 10:629-38, 2018

Lelliott P, Williams R, Mears A, Andiappan M, Owen H, Reading P, Coyle N, Hunter S. Questionnaires for 360-degree assessment of consultant psychiatrists: Development and psychometric properties. *Brit J Psych* 193:156-160, 2008.

Lockyer J, Violato C, Fidler H. Likelihood of change: A study assessing surgeon use of multisource feedback data. *Teach Learn Med* 15:168-174, 2003.

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Portfolios

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Description:

A portfolio is a cumulative body of work demonstrating a student's learning and achievements. Each individual piece or the entire body of work may be assessed as a demonstration of the cumulative learning for a course, semester, year, or program. The process of putting the portfolio together and receiving feedback on the individual pieces serves as a great formative assessment tool because it provides multiple opportunities for student-instructor interaction. Incorporation of checklists and/or specific tasks to be mastered are helpful to students and instructors, with suggestions for types of documentation to be included that would demonstrate attempts at and final mastery of skills also recommended.

Content may be paper-based, electronic (e-portfolio), or a mixture, and may include materials selected by the student with or without guidance from the instructor. Materials should be diverse and might include written assignments, instructor feedback, case write-ups (including SOAP notes, documentation of client communications), links to videos of client/peer interactions, resumes/CVs, budgets, and the like.

Suggested CBVE Domains and Competencies Assessed:

- 1.1-1.7
- 2.2
- 3.1-3.3
- 4.1. 4.2
- 5.3
- 6.1, 6.3, 6.4
- 7.2, 7.3, 7.4
- 8.1-8.3
- 9.1-9.3

Documented Uses and Examples:

Numerous examples can be found at: <https://uwaterloo.ca/centre-for-teaching-excellence/resources/integrative-learning/eportfolios/examples-student-eportfolios>

<https://jvme.utpjournals.press/doi/full/10.3138/jvme.0113-016R>

<https://jvme.utpjournals.press/doi/full/10.3138/jvme.0917-128r1>

https://www.squarespace.com/websites/create-a-portfolio/?channel=pnb&subchannel=go&campaign=pnb-go-us-en-verticals_portfolio_tier1-

[e&subcampaign=\(portfolio_portfolio-examples e\)&&utm_source=google&utm_medium=pnb&utm_campaign=pnb-go-us-en-verticals_portfolio_tier1-e&utm_term=portfolio%20examples&gclid=Cj0KCQjw7MGJBhD-ARIsAMZ0eesrSG8AXB6PhpytVP1wi1dFoU7EoESDHePmiz8ud7Qer88y_iFPK18aAmq_EALw_wcB&gclsrc=aw.ds](https://www.aavmc.org/competency-based-veterinary-education/assessment/assessment-strategies/e-portfolios/e-portfolio-examples)

Pros and Cons:

Positive Aspects/Pros:

- Thorough
- Longitudinal
- Requires a variety of skills and student reflection
- Actively promotes metacognition
- Can be formative and summative

Negative Aspects/Cons:

- Time-consuming
- Can be challenging to grade
- Requires excellent rubrics and/or multiple graders

References:

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Entrustment-Supervision Scales

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Description:

An entrustable professional activity (EPA) is a unit of professional practice that can be entrusted to a learner, once the student has demonstrated the necessary level of competence to perform the activity with minimal supervision. EPAs should feature legitimate activities that are part of everyday veterinary practice and are those activities that can be completed only in a clinical setting or context. The main purpose of EPAs is to operationalize competency-based education through safe engagement of a learner in an actual practice setting. They link progressive development of the trainee alongside progressive autonomy from the supervisor. Terminology is critical to describing EPAs and entrustment correctly. A number of different entrustment scales exist for assessing EPAs.

- Schumacher et al. Clarifying essential terminology in entrustment. *Med Teach* 43(7): 737-744, 2021. DOI: 10.1080/0142159X.2021.1924365
- ten Cate et al. Assessing trainees and making entrustment decisions: On the nature and use of entrustment-supervision scales. *Acad Med* 95:1662–1669, 2020. doi: 10.1097/ACM.0000000000003427

Suggested CBVE Domains and Competencies Assessed:

CBVE features 8 EPAs in booklet 2.

Documented Uses and Examples:

A veterinary degree should guarantee safety and readiness for individual practice but the total scope of assessing that is more than one evaluator can do alone. EPAs are snapshots that can be summed to form a complete picture – programmatic assessment (ten Cate 2013; ten Cate et al. 2015).

In the health professions, there are five main levels of entrustment scale that have been described (ten Cate et al. 2021, Entrustment decision making: Extending Miller’s pyramid. DOI: 10.1097/ACM.0000000000003800):

- Level 1: the learner is allowed to be present and observe, not to enact an EPA.
- Level 2: the learner is allowed to execute the EPA with direct, pro-active supervision, present in the room.
- Level 3: the learner is allowed to carry out the EPA without a supervisor in the room, but quickly available if needed, i.e. with indirect, reactive, supervision.
- Level 4: the learner is allowed to work unsupervised.
- Level 5: the learner is allowed to provide supervision to more junior learners.

Veterinary examples include:

- Salisbury et al. Collaborative development of core entrustable professional activities for veterinary education. *J Vet Med Educ* 47(5):607-618, 2020. doi: 10.3138/jvme.2019-0090.
- Favier et al. Identifying entrustable professional activities for surgical skills training in companion animal health. *Vet Rec* 186(4):122, 2020. doi: 10.1136/vr.105386.
- Duijn et al. The development of entrustable professional activities for competency-based veterinary education in farm animal health. *J Vet Med Educ* 46(2):218-224, 2019. doi: 10.3138/jvme.0617-073r.
- Molgaard et al. Development of core entrustable professional activities linked to a competency-based veterinary education framework. *Med Teach* 41(12):1404-1410, 2019. doi: 10.1080/0142159X.2019.1643834.
- Favier et al. Bridging the gap between undergraduate veterinary training and veterinary practice with entrustable professional activities *J Vet Med Educ* 48(2):136-138, 2021. doi: [10.3138/jvme.2019-0051](https://doi.org/10.3138/jvme.2019-0051)

Pros and Cons:

Positive Aspects/Pros:

- EPAs are currently employed across health professions – nursing, dentistry, pharmacy, physiotherapy, and medicine.
- EPAs are observable in process and measurable in outcome.
- Assesses at the “does” or “is” level of Miller’s pyramid of clinical competence (ten Cate et al., 2021)
- EPAs require application of knowledge, skills, and attitudes acquired in training which creates observable examples of competencies being performed.
- EPAs draw on multiple competencies but not necessarily equally. EPAs can be mapped against a competency framework to show how competencies are assessed.
- Can be used summatively or formatively. Summative decisions should be made on multiple sources of information.

Negative Aspects/Cons:

- Became very popular in a short time so perhaps there is less evidence to date for support than other assessment methods. Mostly descriptive publications to date.
- EPAs can sometimes be confused with competencies. Learners can possess competencies, knowledge, or skills (all abilities that the learner brings to the role) but a learner cannot possess an EPA (this is the professional work to be done).
- Entrustment, trust, and competence are also not readily distinguished (Melvin et al. 2020)
- Suitable for helping with assessment of work-place based activities, but current EPAs do not include evaluation of all competencies in the CBVE framework.

References:

Bok et al. Validity evidence for programmatic assessment in competency-based education. *Perspect Med Educ* 7:362-372, 2018. <https://doi.org/10.1007/s40037-018-0481-2>

Dujin et al. Qualified but not yet fully competent: Perceptions of recent graduates on their day-one skills. *Vet Rec* 186(7):216, 2020. doi: 10.1136/vr.105329

Melvin et al. Tensions in assessment: The realities of entrustment in internal medicine. *Acad Med* 95:609-615, 2020. Doi: 10.1097/ACM.0000000000002991

Read EK, et al. Comparing entrustment and competence: An exploratory look at performance-relevant information in the final year of a veterinary program. *J Vet Med Educ* Mar 4:e20190128, 2021. doi: 10.3138/jvme-2019-1028

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