

PEDAGOGICAL MERIT OF LIVE ANIMAL-BASED TEACHING AND TRAINING

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The following is a selection of frequently asked questions (and their respective answers) concerning the *CCAC policy: Pedagogical merit of live animal-based teaching and training*.

1. What is the purpose of this policy?	1
2. Which activities fall within this policy?	1
3. Who can participate in pedagogical merit review?	1
4. How often should a pedagogical merit review be undertaken?	1
5. What implementation resources are available from the CCAC?	2
6. What is the process for pedagogical merit review?	2
7. What would be an appropriate approach for conducting a pedagogical merit review?	2
8. What is an expedited pedagogical merit review?	8
9. My institution is asking for instructors to rule out all non-animal alternatives before animals are permitted to be involved in teaching or training. Is this an appropriate approach?	8
10. Where can I find information and resources on replacement alternatives?	9
11. Who makes the final decision with regard to animal involvement in teaching and training protocols?	10
12. Why not combine the pedagogical merit review process with the ethical merit review process?	10
13. What is the relationship between pedagogical merit review, ethical review, and the Three Rs?	10
14. How will assessment panels ensure the appropriate implementation of this policy?	11
APPENDIX 1: Pedagogical Merit Review Process Flowchart	12

1. WHAT IS THE PURPOSE OF THIS POLICY?

The purpose of this policy is to ensure that Canadian Council on Animal Care (CCAC) certified institutions have a formal process for the pedagogical merit review of live animal-based teaching and training. This policy sets out objectives and CCAC expectations with regard to implementation of the policy by institutions (see the “Key Considerations in the Review of Pedagogical Merit” section of the policy). The principal objective is to assess whether live animals are, or remain, essential in achieving successful learning outcomes.

2. WHICH ACTIVITIES FALL WITHIN THIS POLICY?

All animal-based teaching and training activities that require an animal protocol must undergo a pedagogical merit review (see the [Requirement for submitting an animal protocol: Addendum to the CCAC policy statement on terms of reference for animal care committees](#)). These include teaching in academic institutions, training activities/programs for research, and testing team members (e.g., graduate students, principal investigators, technicians in contract research organizations), as well as non-degree/diploma/certificate credit courses (e.g., professional development or continuing education workshops) provided by faculty or other institutional personnel under the aegis of a certified institution. This policy does not apply to activities that do not require a protocol, such as third-party animal-based activities conducted on campus (e.g., clubs using college facilities), or off-campus student practicums. If you are still not sure if an activity requires pedagogical merit review, [contact the CCAC](#).

3. WHO CAN PARTICIPATE IN PEDAGOGICAL MERIT REVIEW?

Ideally, at least two independent referees with knowledge of pedagogy and replacement alternatives to animal-based teaching or training should be involved in the pedagogical merit review (see also the “Key Considerations in the Review of Pedagogical Merit” section of the policy). Reviewers must not sit on the animal care committee nor be involved with the course. There is no requirement for the same individual to possess knowledge in both areas as long as both areas are covered. Reviewers do not have to be “in-house”, as in faculty, staff or other personnel at the institution, although knowledge of an institution’s curriculum would most likely be found at the institution. The same cannot always be said about knowledge of replacement alternatives. The CCAC understands that identifying people with knowledge of pedagogy and/or replacement alternatives may take some time, especially in smaller institutions. In the interim, institutions are expected to develop an approach that assesses the necessity of animal-based teaching and training, based on the best learning model (see Question 7).

Animal care committee members who have knowledge of replacement alternatives in teaching and training should share that knowledge with the individuals responsible for pedagogical merit review. Until separate-of-animal-care-committee replacement alternatives expertise is in place, knowledgeable animal care committee members may participate in pedagogical merit review as long as they recuse themselves from the ethical review of the same animal-based teaching or training project.

4. HOW OFTEN SHOULD A PEDAGOGICAL MERIT REVIEW BE UNDERTAKEN?

The pedagogical merit review of live animal-based teaching and training should be undertaken for every new teaching or training course, and reviewed at least every four years for ongoing teaching or training, even if there are no changes to the course. Ongoing teaching or training can undergo a pedagogical merit

review when a new protocol is submitted. The four-year interval gives institutions enough time to identify possible replacement alternatives.

5. WHAT IMPLEMENTATION RESOURCES ARE AVAILABLE FROM THE CCAC?

In addition to the policy (with its “Key Considerations in the Review of Pedagogical Merit” section) and this FAQ, the CCAC has developed a sample [Pedagogical Merit Review Form](#). See Question 9 for more information on replacement alternatives.

6. WHAT IS THE PROCESS FOR PEDAGOGICAL MERIT REVIEW?

Although the process is at arm’s length from the animal care committee until the reviewers’ comments and conclusions are received, animal care committee coordinators are well placed to manage the administrative process, working closely with the senior administrator responsible for pedagogical merit review.

Each institution should develop two forms. The first should be completed by instructors to provide information on the course/training that will help the reviewers perform their assessment. Each institution should create its own form, adapted to its program’s needs. Any additional questions institutions feel would help reviewers reach a decision should be included on the form.

The second form is for guiding reviewers in their evaluation of the course/training (see sample [Pedagogical Merit Review Form](#)). Each institution should modify the sample form and adapt it to its program’s needs. Reviewers should receive the completed animal protocol form, the instructor’s completed form, and a blank review form to document their comments and conclusions.

The reviewers’ comments must be documented and forwarded to the instructor, who will be given an opportunity to make appropriate changes to the protocol and related documents, based on the reviewers’ comments, before resubmitting the documents to the reviewers, if necessary. Reviewers will then send their final comments and conclusion to the senior administrator responsible for pedagogical merit review who, if pedagogical merit is confirmed, will submit the following to the animal care committee:

- the final protocol
- the reviewers’ comments and conclusions

If based on the comments and conclusions of the reviewers, the senior administrator decides that there is no pedagogical merit, the ACC should not undertake ethical review of the protocol.

7. WHAT WOULD BE AN APPROPRIATE APPROACH FOR CONDUCTING A PEDAGOGICAL MERIT REVIEW?

Institutions must develop an effective process that ensures live animals are involved in teaching and training if it is essential in achieving successful learning outcomes. One appropriate approach is the constructive alignment paradigm.

In this approach, the first step in undertaking a pedagogical merit review is to ensure clear **learning outcomes** are explicitly described in a formal course outline (see [Developing Learning Outcomes: A](#)

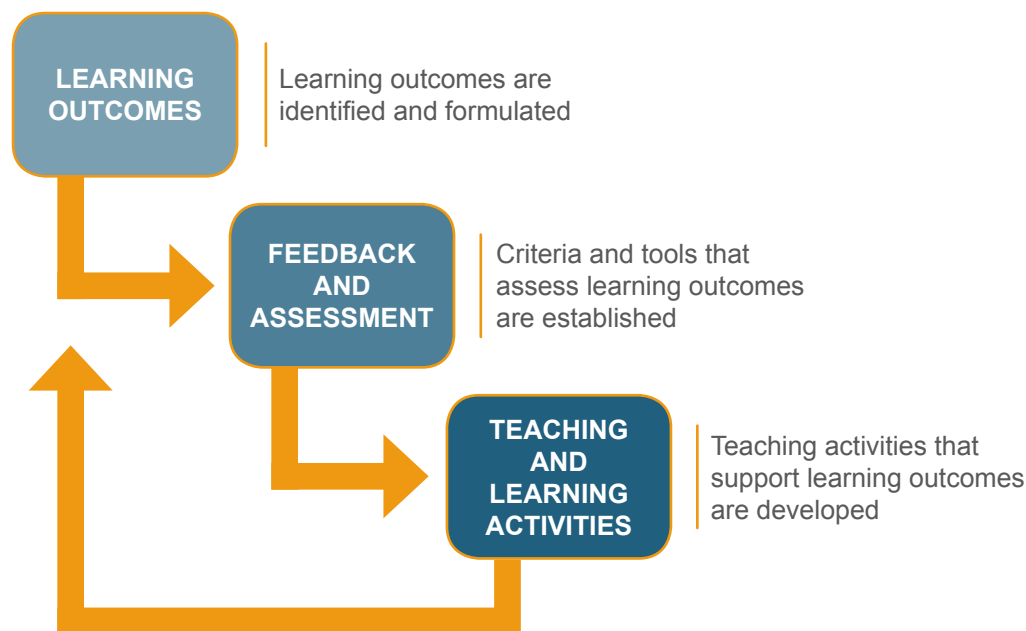
Guide for University of Toronto Faculty for a useful reference). The use of a system such as **SMART goals** (Specific, Measurable, Attainable, Realistic, and Timely) can facilitate the setting of intended outcomes.

Secondly, clear **learning assessment methods** must be described (i.e. how will students be evaluated on knowledge or skill acquisition involving animals). Methods could include essays, multiple choice questions, laboratory reports, performance of a task, etc.

The proposed **learning activities** involving a live animal model must also be clearly described (usually in the animal protocol or in a standard operating procedure). Activities could include observation, capture, restraint, anesthesia, dissection, tissue harvest, muscle preparations, etc.

Once the different learning elements have been identified, the next step is to assess if there is a clear, logical alignment between these three elements: do learning outcomes align with learning assessment methods, and do both align with learning activities in support of the outcomes? Thus, if live animals are specifically involved in proposed learning activities (the reason for conducting a pedagogical merit review), learning assessment methods directly involve animals, and learning outcomes specifically mention animals, then there is constructive curriculum alignment and potentially pedagogical merit of live animal-based teaching and training.

Figure 1. Suggested Model of an Aligned Curriculum



SOURCE: Adapted from UCD Teaching and Learning Open Educational Resources (University College Dublin).

Whichever approach is chosen, the goal of the review process is to determine if the live animal model proposed by the instructor is the best learning model in support of the intended learning outcomes. In other words, is the involvement of the proposed live animal model essential, or can replacement alternatives be used? Replacement alternatives refer to methods that avoid or replace the involvement of animals in activities where animals would otherwise have been involved. This includes both absolute replacements

(i.e. replacing animals with inanimate systems, such as computer applications or simulators) and relative replacements (i.e. replacing more sentient animals, such as vertebrates, with species that have a significantly lower potential for pain perception, such as some invertebrates, based on current expert peer advice and interpretation of scientific evidence).

Examples of the Constructive Curriculum Alignment Approach

Example 1: Evidence of Weak Constructive Curriculum Alignment

A protocol is submitted for a course on anesthesia, where students have to learn how to intubate a cat. This course is part of an animal health technology program. The following learning outcome, assessment method, and learning activities are proposed by an instructor.

- **Learning outcome:** The student will be able to competently intubate a cat.
- **Assessment method:** A checklist is used to score the students performing the technique on a cat.
- **Learning activities:** Students will practice orotracheal intubation using a live, anesthetized cat.

In this scenario, where the learning outcome, learning assessment method, and learning activities seem to align, there is potentially pedagogical merit for using live cats. However, the intended learning outcome is rather vague in that it does not include specific conditions or expectations which could only be evaluated in a live animal model, such as absence of trauma or bleeding in relation to the expected amount of time to perform the procedure. In the absence of these conditions, one could ask if learning outcomes could be achieved just as well using a different model such as a mannequin. The answer often lies in the specificity of the intended learning outcomes.

Reviewers should inform instructors in cases of weak curriculum alignment so the instructors can reevaluate their proposal.

Example 2: Evidence of Strong Constructive Curriculum Alignment

Using the example above, more specific learning outcomes that could only be evaluated in a live animal model and that align with revised assessment methods make a stronger case for using live animals, based on constructive curriculum alignment.

- **Revised learning outcome:** The student will be able to perform an orotracheal intubation on a cat within 60 seconds with no associated bleeding.
- **Revised assessment method:** A checklist is used to score the performance of the procedure. Among other measures, the presence or absence of blood will be assessed, as will the time taken to perform the procedure.
- **Learning activities:** Students will practice orotracheal intubation using a live, anesthetized cat.

In this scenario, there is strong constructive curriculum alignment and a live cat could be the best learning model.

If a live animal is identified as potentially the best learning model, the reviewers should confirm that specific live animal-based learning outcomes are, in fact, essential for the students enrolled, given the composition of student groups, their learning level, needs, and career paths, and the timing of animal use in the proposed teaching/training activity in relation to the projected timing of the expected outcome(s). In other words, is it necessary for these students at this time in their academic program to be able to intubate an anesthetized cat?

If there is strong curricular alignment, and the specific learning outcomes are essential for the students, the last step is to determine if there are any equivalent replacement models, either absolute or relative (an example of an absolute replacement model is a mannequin that displays varying degrees of tracheal trauma).

If there are no equivalent relative or absolute replacement alternatives, the instructor will be informed that the proposed live animal model has pedagogical merit and the animal care committee will also be informed through a completed [*Pedagogical Merit Review Form*](#).

If there are equivalent **absolute replacement alternatives**, the instructor will be informed that the proposed live animal model does not have pedagogical merit because the proposed live animal is not essential in achieving successful learning outcomes. The instructor can then substitute the live animal with the alternative, and no animal protocol is required since there is no longer live animal involvement.

If there are equivalent **relative replacement alternatives**, the instructor will be informed that the proposed live animal model does not have pedagogical merit because the proposed live animal is not essential in achieving successful learning outcomes.

In general, if the reviewers identify equivalent relative replacement models that fall under CCAC Category of Invasiveness A (CI A), such as invertebrates, eggs, or tissues, the instructor can then substitute the proposed live animal with the alternative. There is no CCAC requirement for the animal care committee to review or approve CIA work within a protocol (although some institutions do so) and hence, no requirement for further review of pedagogical merit.

If the reviewers identify equivalent relative replacement models that involve live vertebrates or cephalopods (e.g., zebrafish or *Xenopus* for egg production), the instructor can then substitute the proposed live animal with the alternative live animal in the protocol and request an expedited pedagogical merit review (see Question 8).

Example 3: Evidence of Strong Constructive Curriculum Alignment

A protocol is submitted for an institutional hands-on training course. This training is required before research team members can handle live animals. The following learning outcomes, assessment methods, and learning activities are proposed by the instructor.

- **Learning outcomes:** The student will be able to safely and humanely handle live mice, and will be able to successfully give a subcutaneous injection to a conscious mouse.
- **Assessment method:** The student will demonstrate an appropriate handling and injection technique in a conscious mouse.
- **Learning activities:** Students will handle conscious mice and practice subcutaneous injections.

In this scenario, there is strong constructive curriculum alignment and a live mouse could be the best learning model.

If a live animal is identified as potentially the best learning model, the reviewers should confirm that specific live animal-based learning outcomes are, in fact, essential for the students enrolled, given the composition of student groups, their learning level, needs, and career paths, and the timing of animal use in the proposed teaching/training activity in relation to the projected timing of the expected outcome(s). In other words, is it necessary for these students, at this time in their academic program or work situation, to be able to safely and humanely handle and inject mice?

If there is strong curricular alignment and the specific learning outcomes are essential for the students, the last step is to determine if there are any equivalent replacement models, either absolute or relative (an example of an absolute replacement model is a stuffed toy with a covering that mimics mouse skin).

If there are no equivalent relative or absolute replacement alternatives, the instructor will be informed that the proposed live animal model has pedagogical merit and the animal care committee will also be informed through a completed [*Pedagogical Merit Review Form*](#).

If there are equivalent **absolute replacement alternatives**, the instructor will be informed that the proposed live animal model does not have pedagogical merit because the proposed live animal is not essential in achieving successful learning outcomes. The instructor can then substitute the live animal with the alternative, and no animal protocol is required since there is no longer live animal involvement.

If there are equivalent **relative replacement alternatives**, the instructor will be informed that the proposed live animal model does not have pedagogical merit because the proposed live animal is not essential in achieving successful learning outcomes.

In general, if the reviewers identify equivalent relative replacement models that fall under CI A, such as invertebrates, eggs, or tissues, the instructor can then substitute the proposed live animal with the alternative. There is no CCAC requirement for the animal care committee to review or approve CI A work within a protocol (although some institutions do so) and hence, no requirement for further review of pedagogical merit.

If the reviewers identify equivalent relative replacement models that involve live vertebrates or cephalopods (e.g., zebrafish or *Xenopus* for egg production), the instructor can then substitute the proposed live animal with the alternative live animal in the protocol and request an expedited pedagogical merit review (see Question 8).

Example 4: No Evidence of Constructive Curriculum Alignment

A protocol is submitted for an animal physiology course. This course is part of a Bachelor's degree in Biology. The following learning outcomes, assessment methods, and learning activities are proposed by the instructor.

- **Learning outcomes:** The student will be able to understand certain mechanical and physiological properties of skeletal muscle. Students will be able to: 1) name and describe the phases of a muscle

twitch; and 2) define and explain the physiological basis of the following: (a) subminimal, minimal, maximal, supramaximal stimuli; (b) latent period; (c) wave summation; (d) tetanus; and (e) muscle fatigue.

- **Assessment method:** A multiple-choice test will be used to assess the knowledge gained in the laboratory.
- **Learning activities:** Students will observe procedures on a fresh muscle preparation in a frog.

In this scenario, animals are not specifically mentioned in the learning outcomes, the assessment method does not involve animals, but recently euthanized animals are proposed as the learning model. There is no strong case to use frogs in support of the intended learning outcomes based on the absence of constructive curriculum alignment.

Reviewers should inform instructors in cases of no curriculum alignment so the instructors can reevaluate their proposal.

Example 5: Evidence of Strong Constructive Curriculum Alignment

The previous scenario could be revised to achieve constructive alignment and potentially make a case for frogs as the best learning model.

- **Revised learning outcome:** The student will be able to demonstrate certain mechanical and physiological properties of skeletal muscle in frogs. Students will be able to: 1) name, describe, and induce the phases of a muscle twitch; and 2) define and explain the physiological basis of the following: (a) subminimal, minimal, maximal, supramaximal stimuli; (b) latent period; (c) wave summation; (d) tetanus; and (e) muscle fatigue.
- **Revised assessment method:** A laboratory report and quiz based on the procedures performed by students on a frog muscle.
- **Revised learning activities:** Students will use a muscle preparation from a pithed frog, placing it in an apparatus and taking a series of measurements. The frog muscle is used in place of mammalian muscle because of its tolerance to temperature change and handling.

In this scenario, there is constructive curriculum alignment and it would seem a recently euthanized frog could be the best model.

If a live animal is identified as potentially the best learning model, the reviewers should confirm that specific live animal-based learning outcomes are, in fact, essential for the students enrolled, given the composition of student groups, their learning level, needs, and career paths, and the timing of animal use in the proposed teaching/training activity in relation to the projected timing of the expected outcome(s). In other words, is it necessary for these students at this time in their academic program to be able to manipulate fresh frog muscle?

If there is strong curricular alignment and the specific learning outcomes are essential for the students, the last step is to determine if there are any equivalent replacement models, either absolute or relative (an example of an absolute replacement model is a non-animal model that could be manipulated by the student to obtain data).

If there are no equivalent relative or absolute replacement alternatives, the instructor will be informed that the proposed live animal model has pedagogical merit and the animal care committee will also be informed through a completed [Pedagogical Merit Review Form](#).

If there are equivalent **absolute replacement alternatives**, the instructor will be informed that the proposed live animal model does not have pedagogical merit because the proposed live animal is not essential in achieving successful learning outcomes. The instructor can then substitute the live animal with the alternative, and no animal protocol is required since there is no longer live animal involvement.

If there are equivalent **relative replacement alternatives**, the instructor will be informed that the proposed live animal model does not have pedagogical merit because the proposed live animal is not essential in achieving successful learning outcomes.

In general, if the reviewers identify equivalent relative replacement models that fall under CI A, such as invertebrates, eggs, or tissues, the instructor can then substitute the proposed live animal with the alternative. There is no CCAC requirement for the animal care committee to review or approve CI A work within a protocol and hence, no requirement for further review of pedagogical merit.

If the reviewers identify equivalent relative replacement models that involve live vertebrates or cephalopods (e.g., zebrafish or *Xenopus* for egg production), the instructor can then substitute the proposed live animal with the alternative live animal in the protocol and request an expedited pedagogical merit review (see Question 8).

8. WHAT IS AN EXPEDITED PEDAGOGICAL MERIT REVIEW?

When formal institutional training sessions for animal users are required, such as those included in standard operating procedure or syllabus-based programs, or those dictated by governing bodies (e.g., Canadian Veterinary Medical Association, provincial ministries of education, etc.), the expedited review process can be used. Ensuring curricular alignment (step 1) and that specific learning outcomes are essential for the students (step 2) has already been addressed by the prescribing organization; therefore, assessing if there are equivalent absolute or relative replacement alternatives (step 3) is the only remaining task. In this case, one reviewer with knowledge of replacement alternatives is sufficient.

The CCAC has published the [Expedited Pedagogical Merit Review for Animal-Based Training Activities](#) sample form to assist reviewers in determining if a training activity has pedagogical merit.

9. MY INSTITUTION IS ASKING INSTRUCTORS TO RULE OUT ALL NON-ANIMAL ALTERNATIVES BEFORE ANIMALS ARE PERMITTED TO BE INVOLVED IN TEACHING OR TRAINING. IS THIS AN APPROPRIATE APPROACH?

Whichever approach is chosen, the goal of the review process is to determine if the live animal model proposed by the instructor is the best learning model in support of intended learning outcomes. In other words, is the involvement of the proposed live animals essential, or can equivalent replacement alternatives be used? In certain circumstances, live animals could be the best learning model (see Question 7). The intention of this policy is to question and assess the necessity of live animal involvement in teaching and training, not to deprive students of the best learning model.

Limiting pedagogical merit review to just a search for replacement alternatives avoids ensuring constructive curricular alignment and that learning outcomes involving live animals are essential. These steps are important because if the review were to determine that there were no suitable non-animal (absolute) alternatives, the result by default might be to accept live animal involvement as proposed by the instructor, even though it may not be the best learning model. In fact, there may be occasions when no suitable non-animal model is found; however, there may be relative replacement alternatives such as eggs, tissues, etc.

10. WHERE CAN I FIND INFORMATION AND RESOURCES ON REPLACEMENT ALTERNATIVES?

- [InterNICHE Studies Database](#)
References and abstracts for academic papers on humane education and training.
- Jukes N. and Chiuia M. (2006) *From Guinea Pig to Computer Mouse: Alternative Methods for a Progressive, Humane Education*, 2nd ed. Leicester UK: International Network for Humane Education (InterNICHE).
Comprehensive information on over 500 of the latest products within the fields of anatomy, clinical skills and surgery, critical care, physiology, and pharmacology. Listed by discipline and then medium, the application, specifications, and source for each product are detailed. [Must register to download]
- [NORINA database](#) – Norecopa
This database contains more than 3,800 audio-visual aid alternatives to the use of animals in teaching and training from the elementary school level to university level. A description with comments and supplier information is provided for each alternative in the catalogue.
- Balcombe J. (2000) *The Use of Animals in Higher Education: Problems, Alternatives, and Recommendations*, Public Policy Series. Washington DC: Humane Society Press.
This book examines animal use in education from a humane and ethical perspective.
- [Sheffield Bioscience Programs](#)
Offers a range of high-quality, interactive computer-assisted learning programs aimed at enhancing the teaching of physiology and pharmacology to undergraduate medical and science students.
- [RECAL](#) – University of Edinburgh, College of Medicine and Veterinary Medicine
RECAL provides software for the development of computer-assisted learning materials. The tools provided allow the learning objects programmed (educational content) to be separated from the particular authoring application. This saves redevelopment of the educational content as authoring applications change over time.
- [Online Veterinary Anatomy Museum \(OVAM\)](#) – Wikivet
- [Education Resources](#) – Alternatives to Animal Testing Web Site (Altweb), John Hopkins Bloomberg School of Public Health
- [Alternatives in Education: An Introduction](#) – Altweb, John Hopkins Bloomberg School of Public Health
- [Search for Alternatives: Databases](#) – Altweb, John Hopkins Bloomberg School of Public Health

11. WHO MAKES THE FINAL DECISION WITH REGARD TO ANIMAL INVOLVEMENT IN TEACHING AND TRAINING PROTOCOLS?

The institutional animal care committee has the final decision with regard to live animal involvement in teaching and training protocols. The animal care committee makes an informed and ethical decision based on a number of factors including the results of pedagogical merit review, the application of the Three Rs, and societal expectations with regard to the use of the animals in teaching and training. Pedagogical merit review informs ethical review but does not supersede it. It is for that reason that pedagogical merit review should be undertaken first (see also question 13).

12. WHY NOT COMBINE THE PEDAGOGICAL MERIT REVIEW PROCESS WITH THE ETHICAL MERIT REVIEW PROCESS?

Institutions are asked to keep the two review processes separate because the processes have different objectives and require different knowledge.

Undertaken by individuals or a committee with knowledge of pedagogy and replacement alternatives in teaching and training, pedagogical merit review of live animal involvement in teaching and training should be a somewhat structured and objective exercise that evaluates if a proposed live animal model is essential to achieving expected learning outcomes, in other words, if a live animal model is “the best learning model for the student to achieve the set objective”, whereas ethical merit is more subjective and tries to balance the potential harm to the animal versus the potential benefit to the student, once the potential benefit of including a live animal is confirmed by pedagogical merit review.

By keeping the processes separate, the decision as to what is important for the student does not get confused with what is ethically appropriate for the animals.

13. WHAT IS THE RELATIONSHIP BETWEEN PEDAGOGICAL MERIT REVIEW, ETHICAL REVIEW, AND THE THREE RS?

Replacement refers to methods which avoid or replace the use of animals in an area where animals would otherwise have been used, and is an important element of the Three Rs usually considered by the animal care committee; however extensive knowledge of replacement alternatives in teaching and training is not widespread within animal care committees. Purposely building expertise outside of animal care committees is an important aspect of this policy, and lends itself more to collaborative reviews among institutions locally, regionally and nationally.

In line with the animal care committee’s decision making authority, and notwithstanding the fact that the proposed animal model was found to have pedagogical merit (including the fact that no equivalent relative or absolute replacement alternative could be found), animal care committees can choose not to approve a protocol if they decide the proposed animal model is not ethically acceptable.

Reduction, which is associated with determining the appropriate number of animals to include in a teaching or training activity, is an important element of the Three Rs usually addressed by the animal care committee. For teaching activities, Reduction starts with the evaluation of the appropriate animal/student ratio through pedagogical merit review, since the correct ratio supports successful learning outcomes. Therefore, in

addition to other factors, a proposed teaching or training activity can only be found to have pedagogical merit if the animal/student ratio is found to be appropriate.

As part of its responsibilities, the animal care committee should confirm that the animal/student ratio was initially assessed through pedagogical merit review, and is consistent with the number of animals requested in the protocol, based on student numbers. Student numbers may change in subsequent renewals, but the ratio should remain the same unless a new pedagogical merit review is undertaken.

Animal care committees should be mindful of the fact that insisting on fewer animals may have a negative effect on pedagogical merit, unless the number of students is also reduced. In line with the animal care committee's decision making authority, animal care committees can choose not to approve a protocol if they decide the number of animals proposed is not ethically acceptable.

Proposing **refinements** to a teaching or training project is solely the responsibility of animal care committees. The invasiveness of a teaching or training project or the housing conditions of animals are not elements of pedagogical merit review but are important elements of ethical review.

14. HOW WILL ASSESSMENT PANELS ENSURE THE APPROPRIATE IMPLEMENTATION OF THIS POLICY?

As of January 1, 2018, during assessment visits, panels will verify that a formal process is in place and assess its functioning. In cases where the policy is not well understood by the institution, panels may support the implementation of the policy with recommendations that will need to be addressed in an implementation report.

Questions not addressed in this FAQ should be sent to the [CCAC](#), and may potentially be added to the FAQ.

APPENDIX 1 PEDAGOGICAL MERIT REVIEW PROCESS FLOWCHART

