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Course Goals, Competencies, and Instructional Objectives

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ABSTRACT

This article describes how to compose instructional objectives for use in veterinary curricula, and describes the differences between course goals, competencies, and instructional objectives. The essential components of instructional objectives are described in detail, and guidance in choosing appropriate wording is provided. The paper concludes with a suggested framework for evaluating an instructional objective.

Key words: instructional objectives, curriculum, instructional design, veterinary education

INTRODUCTION

Instructors intuitively know what they expect their veterinary students to do in order to achieve stated course goals. Unfortunately, students may be unclear as to how to achieve what seems to be obvious to the instructor. Students and faculty also may have differing opinions about how to prepare for assessments. One of the best ways to help solve these problems is for students and instructors to understand and agree on expected course goals through clearly written instructional objectives.¹ It is important for good teachers to be familiar with best practices for writing instructional objectives, because informed, consistent practice will result in students having a much better understanding of faculty expectations and will thus improve learning outcomes. The expectations of an instructor can be stated in a well-written, instructional objective. Since professional competencies are presented in a similar manner to instructional objectives, completion of instructional objectives in pre-clinical classes can help students to be better prepared to cope with the more complex demands they will face when they are assessed on clinical competencies during their junior and senior years. Furthermore, the value of instructional objectives goes beyond course organization; instructional objectives prove to be essential for strategies involved in mapping a given course into a veterinary curriculum, allowing faculty and administrators to easily discern key student outcomes across different courses and years within the curriculum. A search for key words in objectives provides a basis for efficient horizontal and vertical integration of subject matter into the curriculum.

The purpose of this article is to introduce the need for instructional objectives and to show how to compose them. We will describe the essential components of well-written objectives and how they are arranged in the sample templates that are suggested. We will describe the relationship between instructional objectives (most specific, highly-structured statements pertaining to student mastery of materials), competencies (more broad groupings of skills), and course goals (overview of competencies). Finally, we will discuss how to evaluate the objectives that are composed.

TERMINOLOGY

Goals, competencies, and objectives can be visualized as a hierarchy of terms in which goals are all-encompassing, broad statements; competencies refer to complex professional abilities, and objectives are precise, detailed statements regarding a single ability or performance. An instructional goal is a broad statement of an intended general outcome of an instructional unit. The goal may be achieved by satisfying a set of competencies and their associated, specific instructional objectives. In some respects, goals are easiest to write because they employ plain language designed to communicate what the instructor generally wants to accomplish. There may be one or more goals stated for a course, especially if it comprises distinct sections. An example of an instructional goal for a veterinary physiology class might be, "For first-year veterinary students to learn the basic vocabulary, function, and integration of selected body systems in animals."

Several synonymous terms are commonly used when discussing instructional objectives²: behavioral objectives,³ learning objectives,⁴ terminal objectives,⁵ and performance objectives.^{6,7} Despite the minor differences in wording, all of these concepts refer to specific, tangible statements of what a learner should be able to do (i.e., a behavior to be performed) after completing the proposed instructional activity. For the sake of clarity, the term instructional objective will be used throughout this article.

An instructional objective is a written statement describing what students will be able to do, in the form of an observable behavior, when they have successfully completed the instructional activity. Because an instructional objective requires observable behavior, it should be specific (a single outcome) and measurable. Instructional objectives, thus, describe the expected behavioral outcomes, and not the processes required to reach them. Successful completion of instructional objectives indicates that students (generally speaking) can ultimately achieve competencies and, hence, the goals of instruction. The instructional objective focuses on the student's performance and

not the instructor's performance, thus instructional objectives are student-centered.

Instructional objectives can serve multiple functions for several different types of audiences. For example, students can use instructional objectives to self-assess their mastery of the content and prepare for examinations. Instructors may use performance objectives to select content, specify outcomes pertaining to skills, knowledge, or attitudes to be displayed by students, develop instructional strategies, establish criteria for evaluating student performance, and increase accuracy of communications between faculty, administrators, and students. Finally, administrators or curriculum directors can use objectives to map the curriculum and ensure integration of concepts across multiple courses and years in the veterinary curriculum, as well as evaluate programmatic strengths and weaknesses.

A competency is fundamental knowledge, ability, or expertise in a subject area or skill set. A competency shares the same language as an objective, but generally is a statement of a more complex behavior. Some say that a competency is a complex objective, that is, the ability to do something that requires integrated skills or nested objectives. Because professional competencies are interpreted as broad categories of complex and integrated activities, they can cover large segments of a clinically oriented curriculum.

In veterinary medicine, core clinical competencies are a set of integrated and harmonized abilities identified within a domain that the profession has agreed are essential to be achieved. Whereas the American Veterinary Medical Association's (AVMA) competency domains⁸ do not change from college to college, it is expected that the competencies assigned to these domains within each college may be different. Examples of clinical competencies include the following:

- "Assess and plan appropriate pain management strategies for ocular, musculoskeletal, intrathoracic and visceral pain."
- "Perform a full preanesthetic evaluation of a patient, including history, physical examination, laboratory tests, and provide guidelines for food and water restriction."

Instructional goals are broad statements of what learners should be able to do after the completion of a large unit of instruction, such as a course or semester. An instructional goal is usually an overarching term that encompasses multiple instructional objectives. Smith and Ragan summarize this distinction as

... instructional goals are generally more inclusive and less precise than instructional objectives. We generally do not write an instructional goal for a segment smaller than a lesson. However, a lesson may contain many objectives necessary to achieve the lesson goal.^{6(p.66)}

In summary, a *goal* is generally a statement of what should be accomplished in a course, *competencies* describe the ability to do something at a more complex level, and *objectives* are the specific steps of mastery needed to achieve competencies and goals.

COMPOSING INSTRUCTIONAL OBJECTIVES

Based on Mager's guidelines,² instructional objectives are composed of three components: (1) terminal behavior, (2) conditions of performance, and (3) performance standards or criteria. All three components are based on what and how the student is expected to perform. The terminal behavior is a performance that can be observed, for example "choose the correct instrument" or "outline the steps in a procedure," or "explain the underlying mechanism for the process." Since the behavior needs to be a manifestation that can be observed and quantified by an instructor, intangibles such as "understand," "appreciate," or "know" are not acceptable as stand-alone instructional objectives without specifying what the student must be able to do to show understanding, appreciation, or knowledge. The conditions of demonstration describe the situation in which the student will be required to demonstrate the learning, that is, the resources, tools, environment, and so on, that are provided for the student to perform the specified behavior. Finally, the performance standard or criterion is a statement of how well the learner must perform the task; this tells both the instructor and the student that the objective has been successfully accomplished. Using Mager's approach, the following is an example of an instructional objective for a veterinary clinical skills course:

Given a live cat, a student will be able to successfully demonstrate proper restraint techniques for at least two of the following procedures: cystocentesis, jugular venipuncture, and subcutaneous fluid administration.

If followed correctly, Mager's three-component method yields objectives that are precise enough for most instructional uses in a veterinary curriculum, such as course planning and curriculum mapping/integration. However, there may be some unique situations where a higher degree of specificity is desirable, such as when instruction is being designed to simultaneously serve multiple audiences. The following four- and five-component systems are examples of templates that can be used to suit these purposes.

Knirk and Gustafson's four-component (Audience-Behavior-Condition-Degree of Measurement) model⁹ has also been used by novice designers due to the ease of recalling the A-B-C-D mnemonic. While it makes sense to use this model in situations where instruction is being designed for multiple audiences with differing instructional needs, an in-depth discussion of this model is not provided in this article because of the assumption that the instructional objectives are being developed for use in professional veterinary medical programs. Thus, the audience for each objective will always be students. In the preceding example, the audience would be "a veterinary student," the behavior would be "demonstrate restraint techniques," the condition would be "given a live cat," and the degree of measurement would be "successfully demonstrate at least two of the following procedures."

Gagne, Briggs and Wager^{7(p.127-136)} present a five-component system for writing objectives. This method requires stating the following:

1. Situation: stimulus and environment presented to the student.
2. Learned capability verb: a verb chosen from a list of 9 options, designed to describe the type of learning taking place.
3. Object: states the content of the learner's performance (similar to the terminal behavior described above).
4. Action verb: "how the performance is to be completed," usually phrased as an observable behavior.
5. Tools, constraints or special conditions: items provided to the student or specific constraints placed on the performance.

While their system is incredibly precise, writing objectives in this format can be very time consuming and requires more detail than necessary for routine course planning.

Returning to Mager's three-component approach, a detailed description of each segment of an objective and a description of how to utilize it for veterinary education is presented below.

TERMINAL BEHAVIOR

When formulating a terminal behavior, faculty should begin by considering what they want their students to be able to do after completing an instructional unit. To help refine these statements, it is useful to consider why the chosen behavior is important. For example, does it represent an essential patient-care task? Is it a necessary step to prepare students for subsequent learning? Also, the chosen behavior needs to be a performance or activity that can be observed, assessed, and recorded. The verb chosen for the objective is a very important term because it indicates how the behavior will be observed. For this reason, there are many sources for glossaries that list active verbs. A few examples of appropriate, action-focused verbs include select, solve, apply, assemble, align, and adjust. Examples of potentially ambiguous verbs that should be avoided when writing behavioral objectives include know, understand, appreciate, and be aware of. These ambiguous verbs should be avoided because they do not specify a measurable, observable behavior.

Other considerations when choosing a verb for the desired behavior of an objective are the knowledge dimension and cognitive process domains being taught.¹⁰ Bloom's taxonomy has been widely used in education since 1956 as a basis for curriculum development and test design.³ Bloom et al define three broad domains of learning: cognitive, affective, and psychomotor. The cognitive domain refers to knowledge and intellectual skills, that is, knowing facts and being able to perform intellectual abilities. The affective domain encompasses skills and growth in emotional areas, such as attitudes, and the psychomotor domain includes skills relating to manual or physical skills. Within the cognitive domain, Bloom et al identified six levels of learning, which build upon each other. In order from simplest to most complex, the levels are: (1) Knowledge, (2) Comprehension, (3) Application, (4) Analysis, (5) Synthesis, (6) Evaluation.

Following the work of Bloom et al, Anderson and Krathwohl¹⁰ created a two-dimensional framework to further refine the categories used to classify instructional objectives. They revised the verbs used in describing each of Bloom's levels to reflect more active, student-centered outcomes, and changed the order of the two highest levels, resulting in the following list of cognitive processes and definitions:

1. Remember: Retrieve relevant knowledge from long-term memory.
2. Understand: Construct meaning from instructional messages, including oral, written and graphic communication.
3. Apply: Carry out or use a procedure in a given situation.
4. Analyze: Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose.
5. Evaluate: Make judgments based on criteria and standards.
6. Create: Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure.^{10(p.67-68)}

The second dimension of Anderson and Krathwohl's taxonomy,¹⁰ knowledge, refers to the type of content to be learned. The four major categories are factual, conceptual, procedural, and meta-cognitive, and each can be further divided into sub-types.

- Factual knowledge "contains the basic elements students must know to be acquainted with a discipline or solve any of the problems in it."^{10(p.45)}
- Conceptual knowledge can be broadly defined as "the interrelationships among the basic elements within a larger structure that enable them to function together."^{10(p.46)}
- Procedural knowledge is described as knowing how to do something. This includes "methods of inquiry and criteria for using skills, algorithms, techniques and methods."^{10(p.46)}
- Meta-cognitive knowledge describes an understanding of cognition, in general, as well as the ability to think about one's own thinking.

When the two dimensions are cross-mapped to create a matrix, or taxonomy table, each cell of the matrix results in a type of learning and the cognitive process used to achieve that learning outcome. Table 1 illustrates how these concepts intersect with each other and can be organized into a two-dimensional matrix. This matrix is useful for precisely classifying instructional objectives. If an objective is properly written, the verb can be used to classify it into a specific cognitive process, while the noun will determine which type of knowledge is being presented.

Building on Anderson and Krathwohl's taxonomy table, Fisher¹¹ has supplied an example verb for each of the resulting categories, which can (and perhaps should) serve as a starting point for creating instructional objectives. A glossary of active verbs, compiled from multiple sources,^{12,13} is included in Appendix 1.

Table 1: Cross-mapping of knowledge dimensions and cognitive processes, with an example verb for each type of objectives*

The knowledge dimension	The cognitive process dimension					
	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Factual	List	Summarize	Classify	Order	Rank	Combine
Conceptual	Describe	Interpret	Experiment	Explain	Assess	Plan
Procedural	Tabulate	Predict	Calculate	Differentiate	Conclude	Compose
Meta-Cognitive	Appropriate use	Execute	Construct	Achieve	Action	Actualize

* The complexity of the knowledge dimensions increases from top to bottom. The cognitive processes are arranged in ascending order from left to right, based on the levels of Anderson and Krathwohl's taxonomy.¹⁰ The verbs inside each cell were supplied by Fisher.¹¹

Conditions of Demonstration

The conditions of demonstration describe the situation in which the student will be required to demonstrate the learning. These can be aids or tools, such as a calculator, or they can be restrictions placed on students or type of environment (e.g., without the aid of a textbook). An example of a terminal behavior and the given conditions of demonstration is the following:

Given a clinical description and relevant radiographs for a patient, be able to successfully describe the radiographic abnormalities and give a radiographic and clinical diagnosis.

Performance Standards

Performance standards specify the minimal level of performance that will be acceptable as evidence that the learner has successfully achieved the objective. Various types of standards can be used in writing objectives. A common way of indicating acceptable performance is occurrence, which is the number of times that the learner must perform the desired behavior. An acceptable performance of "once" may equate to mastery of the objective. Other standards used to assess mastery include accuracy (e.g., 95% of the time); number of errors (e.g., no more than one missed step in the protocol), or comparison to a known reference (e.g., Given the results of a complete blood count [CBC] for a canine patient, be able to identify and characterize anemia in 90% of the cases in which it occurs.)

TEMPLATES FOR CREATING INSTRUCTIONAL OBJECTIVES

As long as all three of the aforementioned components are included, there is no specific format for phrasing instructional objectives. Two generic templates are listed below, to facilitate the process.

1. Perform (terminal behavior) when given (condition 1) and (condition 2). The learners must be trained to (standards). The student must perform a pupillary light reflex (PLR) when given a normal dog and a pen light. The student must be able to correctly perform the procedure.

2. Given (condition 1), (condition 2), and (condition 3), perform (terminal behavior). The task must be performed as (standards). Given a normal dog, a pen light and a room with controlled lighting, the student must be able to perform a pupillary light reflex (PLR) successfully.

USE OF INSTRUCTIONAL OBJECTIVES

Instructional objectives constitute a common language that allows faculty to communicate with each other regarding course organization, especially in team-taught courses. Objectives clarify expected student outcomes and are the basic elements of detailed curriculum maps, where integration of content among courses can be examined. Course objectives answer the questions of "when," "how much," and "who," for accurately tracking specific content and for tracking how students are expected to demonstrate mastery. In an ideal situation, course design should begin with the construction of instructional objectives (i.e., setting the destination). Once the objectives are determined, the next step is to select the appropriate learning activities (i.e., choosing the vehicle) to best support the desired type of learning. Finally, the instructional objectives themselves should be used to construct the course evaluation (i.e., was the destination reached). When they are properly written, instructional objectives can also be used as a content guide for constructing examination questions. From the student's perspective, behavioral objectives provide a framework for knowing what to expect during a lecture or laboratory, and also serve as a study-guide for self-assessing mastery of content. Writing objectives aimed at lower-order thinking skills (e.g., recall) are easy compared to writing objectives aimed at higher-order skills. Thus, objectives describing lower-order skills can be a potential hazard because they can inadvertently create a ceiling effect on course content.

EVALUATING OBJECTIVES

The need for a paradigm to evaluate the effectiveness of objectives written in a business setting was documented by Doran,¹⁴ who developed the SMART (specific, measurable, achievable, realistic, timely) system as a means to help managers assess the usefulness of their business

objectives. This system has subsequently been modified for use in the health care arena¹⁵ and could be applied by asking five questions related to five keywords:

1. **Specific.** Does the objective target a specific outcome of instruction?
2. **Measurable.** Is the objective phrased in measurable, quantifiable terms? The first two criteria are a direct evaluation of the writing process.
3. **Achievable.** Does the objective specify an end point that can actually be achieved in practice? For example, very few experts are able to achieve 100% accuracy in patient diagnosis. An objective with this level of expected performance would not be useful.
4. **Realistic.** Is it feasible or reasonable for students to be expected to perform the objective at the stated level, given their stage of professional development?
5. **Timely.** Is the period during which the objective is to be satisfied realistic? For example, while it would be good to specify that a student must successfully complete 1,000 castration procedures without breaching sterile technique, it would be unreasonable to expect a student to complete that many procedures within the time restrictions of a professional veterinary curriculum. Thus, instructional objectives must specify what is to be accomplished, taking into consideration the constraints under which the instruction will be provided and assessed.

The following checklists can be used as a starting point for assessing instructional objectives individually or collectively. These checklists relate to the format of the objectives, and are designed to be used in concert with the SMART criteria listed above.

Checklist for Evaluating a Single Objective

- Is it student-centered (i.e., will a student be performing the stated behavior)?
- Does it specify an observable behavior?
- Is the behavior measurable or quantifiable by a third party?
- Is the objective target specific?
- Does it contain an action verb targeting the desired type of performance?
- Does the objective specify appropriate conditions for performance?
- Does it include a performance standard?

Checklist for Evaluating a Set of Objectives

In addition to the above criteria for each objective, does the set of objectives as a whole

- Stem from a course goal or competency?
- Match instructional activities and assessments?
- Measure a range of educational outcomes?

CONCLUSION

Well-written, clear course objectives can serve many purposes. On a day-to-day basis, instructional objectives can facilitate faculty communication with multiple audiences, including students, colleagues, administrators, and accrediting bodies; for example, they can be used to guide students in preparing for upcoming exams. Instructional objectives can facilitate course and curriculum design by allowing faculty to communicate within different sections of a course or program year (horizontal integration) or across years of the curriculum (vertical integration). Instructional objectives also provide a necessary foundation for writing the competency statements involved in the AVMA self-study documentation required for accreditation renewal. In summary, learning objectives provide the basic building blocks for curriculum development and assessment, much like individual amino acids provide the essentials necessary for protein synthesis.

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APPENDIX 1: Glossary of verbs for writing instructional objectives*^{10,12,13}

1) Remembering – Can the student recall or remember the information?	2) Understanding – Can the student explain ideas or concepts?	3) Applying – Can the student use the information in a new way?	4) Analyzing – Can the student distinguish between the different parts?	5) Evaluating – Can the student justify a stand or decision?	6) Creating – Can the student create a new product or point of view?
Acquire	Abstract	Apply	Analyze	Appraise	Argue
Arrange	Appreciate	Calculate	Arrange	Argue	Arrange
Cite	Categorize	Choose	Categorize	Assess	Assemble
Collect	Classify	Compute	Classify	Choose	Combine
Define	Convert	Demonstrate	Compare	Compare	Compose
Distinguish	Describe	Dramatize	Contrast	Conclude	Construct
Duplicate	Discuss	Employ	Criticize	Criticize	Create
Identify	Explain	Execute	Diagram	Decide	Design
Label	Express	Exhibit	Detect	Deduce	Develop
List	Extrapolate	Illustrate	Differentiate	Defend	Discuss
Match	Identify	Implement	Discriminate	Determine	Formulate
Memorize	Indicate	Interview	Distinguish	Estimate	Generalize
Name	Locate	Operate	Examine	Evaluate	Hypothesize
Recall	Paraphrase	Organize	Experiment	Infer	Imagine
Recognize	Recognize	Perform	Group	Judge	Incorporate
Record	Report	Practice	Inquire	Justify	Integrate
Relate	Represent	Relate	Inspect	Measure	Invent
Repeat	Restate	Restructure	Interpret	Predict	Originate
Reproduce	Select	Schedule	Inventory	Rate	Plan
State	Summarize	Show	Investigate	Recommend	Predict
		Sketch	Probe	Revise	Prepare
		Solve	Question	Score	Produce
		Translate	Scrutinize	Select	Propose
		Use	Survey	Support	Summarize
		Write	Test	Validate	Synthesize
				Value	Write

* Based on the levels in Anderson and Krathwohl's revised taxonomy