Developing Learning Objectives

Session 2: Designing a Course and Constructing a Syllabus
Best Practices in Teaching and Learning

Now, we're going to talk about designing course learning objectives. The S-K-A scheme can help define the learning objectives for your course by thinking about the skills, knowledge, and attitudes that you would like your students to attain by the end of your course.

Think about the answers to the following three questions. What's should your students be able to do? What should students know and understand? And what attitudes or attributes should students have? One example of an attitude or attribute is the level of confidence of your students and their ability to perform a skill.

Now we're going to talk about learning objectives. Learning objectives are statements that serve to describe a specific, observable, and measurable student behavior. They include a verb that describes the observable and measurable action, and should also include a description of the conditions under which the action takes place. For example, the learning objective may begin with the phrase "by the end of the class session you should be able to..." In addition, a learning objective should clearly indicate what will be accepted as evidence that learning took place.

Learning objectives are not simply a list of topics to be covered. Instead, learning objectives should focus on a concepts, which encompass many topics. For example, in biology, a concept is that a cell is created from other cells. But the topics that would be covered in the course include the cell cycle and myosis, amongst others. And learning objectives are simply not a list of actions to be performed by the instructor. Instead, learning objectives focus on the knowledge and skills that the students should be able to attain by the end of the course.

Lastly, learning objectives are not the list of your hopes and expectations for the course, but are rather measurable, observable, and specific statements about your goals for the students. The goal of writing and providing learning objectives is to, first, help students understand what they should learn and focus on the important material. Second, help faculty decide what content to teach to best support the learning outcome. And third, dictate what the assessment should be.

Course learning objectives should address a range of cognitive abilities. Benjamin Bloom performed seminal education research in the mid 20th century. His primary goal was to create a framework of educational objectives to be able to categorize educational materials by their cognitive level. This categorization process by teachers for many different schools would enable easier sharing of materials that require similar cognitive abilities.

Bloom published the original Taxonomy in 1956, and then it was revised in 2001. In this class, we will use the revised Bloom's Taxonomy. The revised Bloom's Taxonomy contains six levels, ranging from lower cognitive abilities, such as a remember and understand, to higher cognitive abilities of evaluating and creating.

"Remember" refers to the ability to recognize and recall information. "Understand" is the ability to explain, interpret, and infer ideas or concepts. "Apply" is the ability to use the information in another way.

When students they're able to break information into parts, to explore understandings and relationships. When students they're able to justify a decision or a course of action. In the highest cognitive level, "Create," students generate new ideas, products, or ways of viewing things.

When writing learning objectives, use concrete action words that clearly tell the student what they should be able to know and do. Let's go through examples of strong active verbs for each of the levels of Bloom's Taxonomy. The verbs recognize, list, describe, identify, and name can be used for learning objectives at the "remember" level.

Explain, summarize, and classify can be used for the "Understand" level learning objectives. Use, carry out, execute, apply, and implement can be used for "Apply" learning objectives.

Compare and differentiate can be used for "Analyze" level learning objectives. Critique and judge can be used for the "Evaluate" level. And design, construct, plan, and produce can be used for "Create" level learning objectives. A more complete list of action verbs is on the provided Bloom's Taxonomy handout.

When writing course learning objectives, it's important to address all cognitive levels. And it's important not to merely use these words, but to also take into consideration the level of cognitive ability at which you're designing the course. For example, you may be teaching an introductory level course, but you can still ask the students to "Apply," and "Create." But might use less complex situations and problems then you would use in a graduate level course.

Now, let's go through the process of rewriting a learning objective on Euler's method. Euler's method is a method to solve ordinary differential equations. Understanding Euler's method is a stepping stone to understanding more complex ways of solving differential equations. While some may argue that Euler's method is a topic, not a concept, there are many mathematicians that do refer to it as a concept.

The first learning objective is: "Students will gain an understanding of Euler's method." Is this learning objective observable, specific, and measurable? Pause the video here while you think about the answers.

This learning objective is observable, in that students will realistically be able to meet this learning objective by the end of the course. However, it isn't specific. For example, in what context would the instructor like the students to be able to understand Euler's method?

In addition, it isn't measurable. A student can't tell how a gain in understanding will be assessed. And as a result, we recommend that you do not use the verb "understand" when writing learning objectives.

This learning objective has been rewritten, and now it reads, "Students will be able to use Euler's method to solve ordinary differential equation." Is this learning objective observable, specific, and measurable? Pause the video here while you think about the answers.

This learning objective is observable. It's realistic within the framework of the course. It is specific, because the context of differential equations is provided. And it's measurable, because students know that they should be able to use Euler's method. This learning objective corresponds to the "Apply" level of Bloom's Taxonomy.

If the instructor would like the learning objective to reflect a higher cognitive level, then it can be rewritten to say, "Students will be able to describe the rationale for the use of Euler's method over other ways to solve ordinary differential equations." In this case, the learning objective is asking students to be able to rationalize the use of Euler's method over other methods of solving differential equations. Is this learning objective observable, specific, and measurable? Pause the video here while you think about the answers.

This learning objective is observable, because it's realistic within the course. Specific, because the context of the differential equations is provided. And it's measurable. Students know that they should be able to rationalize their use of a particular method.

Now, it's your turn to write learning objectives for your course or a course you would like to teach. Work on your own to identify the underlying concepts and skills, and write learning objectives for your course. Then work with one other person from a similar discipline to share your learning objectives and refine them.

When creating your learning objectives, make sure that each learning objective covers a concept and not a topic that is disguised as a concept. In addition, be sure to write down your learning objectives, as they can be used to complete the post-session assignment. Pause the video now when you complete this activity.

Now, we will go through the revision process of learning objectives using two examples. These learning objectives are from an example lesson plan on teaching statistical analyses and experimental variation in an introductory genetics course. These two examples demonstrate the revision process that is needed to ensure that the learning objectives are observable, specific, and measurable.

The first example is, "By the end of the course, you should be able to explain the effect of sample size." Is this learning objective observable, specific, and measurable? Pause the video here while you think about the answer.

This learning objective is observable and measurable, but it is not specific. The context in which students should be able to explain the effect of sample size is not clarified.

In the next draft, the learning objectives states, "Explain the effect of sample size on the observed phenotypic ratios and corresponding genotypic ratios." This learning objective is now specific, because it is very clear that students should be able to explain the learning objective in the context of phenotypic and genotypic ratios. This learning objective is now observable, specific, and measurable.

Through this revision process, we realize that we would really like students to reach a higher cognitive level of thinking with this objective. But this was not reflected with the verb "explain", which is in the "Understand" level of Bloom's Taxonomy. As a result, we rewrote this learning objective one more time. The learning objective now reads, "Compare and assess the effect of sample size on the difference between observed and expected phenotypic ratios."

This learning objective is observable, specific, and measurable. This learning objective is now a level-four learning objective, which corresponds to the "Analyze" level in Bloom's Taxonomy.

Now, let's revise another learning objective for our lesson plan on statistical analyses. "Explain why you would use a Chi-Square test and how it can be used to reject a hypothesis." This learning objective is observable and measurable, but it's not specific. The context for using the Chi-Square test is not clear.

To make this learning objective observable, measurable and specific, it was rewritten. "Describe how the Chi-Square statistical test is used to determine the probability that the observed data lend support to the null hypothesis." This rewritten learning objective is now specific, because it indicates to students the context in which the Chi-Square test will be used to determine whether their experimental data lend support to their hypothesis.

Now that we've gone through the process of rewriting two different learning objectives, I hope you'll be able to use this process to help yourself write learning objectives that are observable, specific, and measurable. In this session, we discussed the components of a well-written syllabus and effective course design using the backward design process, content prioritization, and learning objectives to focus on increasing student understanding and students' ability to transfer knowledge to new situations.

Do you have any questions or comments? Take a moment to write any lingering questions or comments that you may have on the discussion forum. The post-session assignment for this session is to create five to 10 learning objectives for a course that you teach or would like to teach. Make sure that your learning objectives are observable, specific, and measurable.

Please, see the instructions on the course website for information regarding the submission of your assignment. Immediately following your viewing of this session, please follow the link to the online survey for the mud card.