Hands on solutions to everyday teaching challenges in Medical Physics: Panel session

Mariela A. Porras-Chaverri, PhD, Laura Padilla, PhD, Lonie R Salkowski, MD PhD

Learning objectives

Effective teaching is a very difficult task that requires a broad scope of knowledge, as well as good communication and interpersonal skills. Although there are many strategies and tools available to help improve our teaching, the implementation of well-crafted and thought-out learning objectives can yield the largest impact.

Ideally, you want to strive to have congruence between your *learning goals and objectives*, your *instructional strategies*, and your *feedback and assessment* tools. This talk focuses on developing the first portion.

Utilize learning objectives as a communication tool between you and your students to make your expectations well-understood from the start. Learning objectives are clear, specific, measurable outcomes that describe what you want your students to achieve through your class. They typically state the "who", "what", "how much/how well" and "by when" of each task.

Typical format for well-written learning objectives:

"By when", "who" will do "how much/how well" of "what".

Learning objectives should not describe what YOU are teaching, they should describe what you want THE STUDENTS to know or be able to do as a result of your class. When creating these, use action verbs that precisely define what you are expecting of the learner.

Examples of strong action verbs:

Describe	Calculate	Measure	Formulate	Judge	Construct	Analyze	Create

The use of Bloom's taxonomy can help you identify what verbs best describe what you want your learners to do:

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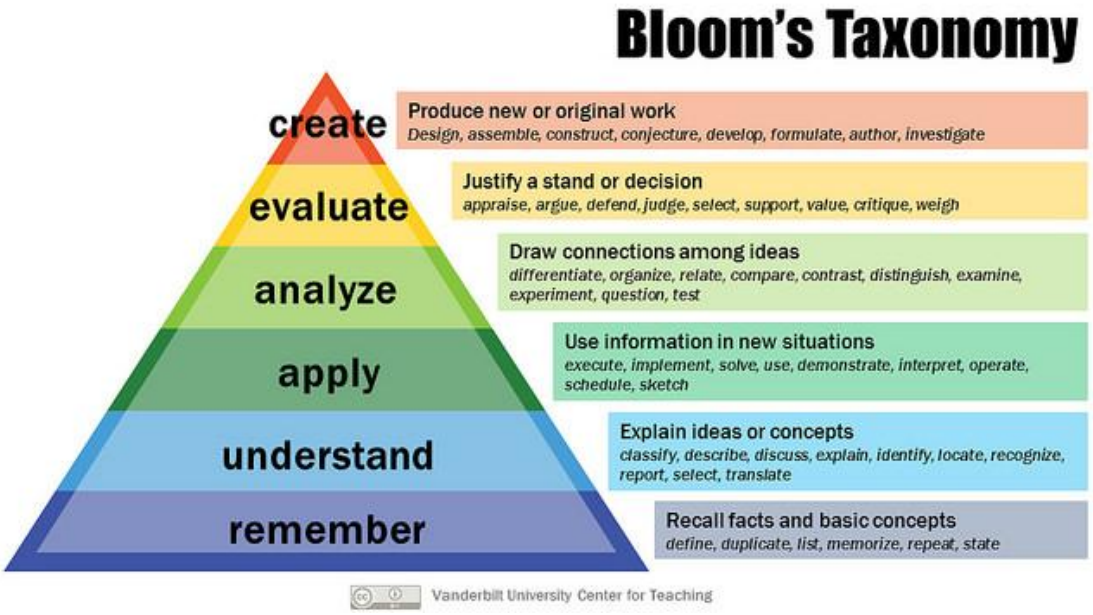

Figure from Vanderbilt University Center for Teaching (CC BY 4.0). https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Example of learning objectives:

Use this:

By the end of this course, learners will be able to correctly identify the appropriate detector to use and justify their choice for a given scenario.

Instead of this:

The students should know the detection concepts presented in class by the end of the semester.

The first statement, although still general, gives the students more direction on what will be expected of them as a result of the information presented in class. The second statement is too vague and does not provide any specifics on what the purpose of concepts presented is. Although it might be obvious to an instructor that the goal of teaching detection is for the students to eventually be able to identify what detector to use in a given situation, a student who is seeing this information for the first time might think that it is sufficient to just memorize the characteristics of each detector. "Know" can be interpreted in many different ways by the students, especially depending on their background and experience.

Creating learning objectives will force you to take the time to think through what the purpose of your class is and what the students need to take away from it to make your instruction successful. This, in turn, will give you a better idea of what your instructional strategy and assessment tools should be to achieve your goals.

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Short guide to making rubrics

1- Identify the task to assess
2- Identify the component to assess and assign a grade percentage (or point value) to each
3- Determine the assessment criteria
4- Determine a standard scale for the level of achievement
5- Determine the descriptor for each achievement level
6- If using this to grade a course or a project, it is also helpful to provide the ranges (percentage or points) that apply to a given grade. For example: 50-45 points = A, 44-40 points = B, etc. This further provides transparency in the rubric.

Descriptors: qualities required to demonstrate achievement of each criterion. They must be short, explicit and unambiguous. Modulate quantitatively or qualitatively for each level. Careful consideration and reflection are needed!

Example rubric

Standard → ↓ Criteria	**Above average**	**As expected**	**Almost as expected**	**Clearly below average**
Criterion 1: Formulation of hypotheses (1 point)	All hypotheses are clear and pertinent to the problem	Most hypotheses are clear and pertinent to the problem	Some hypothesis are not clear or lack pertinence to the problem	Many hypotheses are not clear or lack pertinence to the problem
Criterion 2: (percentage or point value)	…	Descriptors		…
…	…			…
Criterion (N):	…	…	…	…

Make your own!

Use the template attached to develop a rubric draft for one of your classes. Change the number of levels and criteria as needed.

Useful links

https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/
http://www.personal.psu.edu/bxb11/Objectives/ActionVerbsforObjectives.pdf
https://www.utica.edu/academic/Assessment/new/Blooms%20Taxonomy%20-%20Best.pdf
https://www.uow.edu.au/curriculum-transformation/aqc/components/index.html
http://jfmueller.faculty.noctrl.edu/toolbox/whatisit.htm

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	Criteria 1	Criteria 2	Criteria 3	Criteria 4
Level 5				
Level 4				
Level 3				
Level 2				
Level 1				