How to phrase Learning Objectives

Guideline

This guideline aims to help you to phrase the learning objectives for your course using the *what-method-purpose technique* (Wunderlich, Szczyrba, 2016). Each element of the structure will be addressed below along with concrete opportunities to start phrasing learning objectives. These tasks are illustrated with an example from an actual lecture.

By the end of the document you should have a list of concrete learning objectives for your course, clearly communicating what your students are expected to do to acquire the subject knowledge on the level you determine for your course.

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Sentence structure for clear learning objectives

The students can/ are able to ____action verb (skill)_____ ***by using*** _____'method'_____ ***in order to be able to*** _____'knowledge about a topic'_____.

Getting started.

When you planned your lecture for the first time, you probably made a huge effort to cover most (if not all) important topics covered by the standard textbooks of your field. Trying to condense the breadth of all the topics that students must engage, while thinking about what students need to do in order to acquire "academic skills," can be quite overwhelming and leave you without a good idea where to start. Further, you probably already have phrased some course goals. Please feel free to skip to the different sections of this guideline if you want to start right away.

Build on what you have: course goals and topics

1. **Please list your course goals. Name 4-5 topics and 4-5 skills which the students should have acquired by the end of your course.**
2. **Name the topics of your units. They are the basis of your learning objectives. This can be a list of statements like in the example above.**

1) The What

You listed the topics you want to cover, but simply naming them often does not help students. Further, as an expert, you can easily identify the topics described in your list in subject specific terms. These topics imply different levels of complexity that are clear to experts, but not to novices—your students: They will ask themselves "What will we do? Do we have to learn new terms? Understand formulas? Apply formulas? Analyse a problem and create a solution?". Communicating this helps your students to understand what they should do.

a) Topics: concrete or abstract knowledge?

Students usually do not know the criteria for assessing the level of complexity at which they are being asked to perform. Therefore, they look for safe harbour: memorization. Please help your students follow you along:

Determine for each *unit* topic how shallow or deep the knowledge should be that students acquire in your course.

Please use the table below as a guidance for the **topics** in your unit and extend it according to the number of your topics.

Table 1 *Concrete to abstract knowledge*

	Factual	**Conceptual**	**Procedural**	**Metacognitive**
Definition	Terminology, details, elements	Categories and classifications, principles and generalizations, theories, models and structures	Subject-specific skills and algorithms, subject-specific techniques and methods, knowing criteria for when to use appropriate procedures	Knowing strategies for applying theories, methods or techniques, knowing cognitive tasks and having appropriate contextual and conditional knowledge, Knowledge about oneself
Example	*a) Properties of action potentials*	a) Mechanisms of action potentials	*Choosing the right library or algorithm for a given problem*	*Knowing what I have to know to choose the right method, i.e. defining a problem*
Your topic				

b) Skills

Now determine the **necessary actions** to acquire the above stated terminology/ principles/ classifications/ subject-specific techniques and methods or strategies for applying theories and for acquiring contextual and conditional knowledge.
Please use table 2 *Thinking skills* (further resources) as a guidance and pick a verb from the **orange box**. **Caution!** "know" and "understand" do NOT describe actions to acquire knowledge but mental states that do not enhance a student's understanding of what to do!

2) Method

Name the tools or methods students will use to acquire the terminology/ principles/ classifications/ subject-specific techniques and methods or strategies for applying theories and for acquiring contextual and conditional knowledge.

Will students use libraries, models, formulas, maps, programs?

3) Purpose

Why should students learn what you set out? Roughly sketch out *how mastering the skills and acquiring knowledge on these topics benefits them* (within the discipline, for certain modules/ projects, for a job …?). This can be on the course level, meaning that you will generate a list of learning objectives including skills and topics from all units with a summative purpose.

4) Benefits of clear learning objectives

The students can/ are able to _____ by using _____ in order to be able to _____.

Well-phrased learning objectives make expectations of experts transparent, creating a clear understanding of what would make good graduates of a subject (Wunderlich, Szczyrba, 2016).

Students use actionable learning objectives to assess their own learning progress, instead of mindlessly memorizing the material, because they *know what to strive for*. This helps them to take responsibility for their own learning.

Examples Unit level learning objectives

Poorly written learning objectives	Well written learning objectives
Vague The students know the basics of the brain.	**Clear and specific, indicating the method** The students can/ are able to correctly identify and locate the visual cortex in the brain **by using fMRI pictures** in order to be able to identify brain lesions leading to cortical blindness.
Unmeasurable Students will know the most important algorithms in Computer Vision.	**Measurable** Students are able **to identify the appropriate algorithm** for solving problems of… in Computer Vision.
Independent of Course Goal Explain the relation of number of neurons and brain size for rodents and primates.	**Tied to Course Goal** Differentiate between response properties of neurons in the primary visual cortex in radial and tangential electrode tracks by describing their preferred orientations. This will aid students in discussing orientation columns, the characteristic features of the hypothetical ice cube model, and how orientation selectivity—a major response property of visual cortical cells—could be mapped continuously across the cortex. **Course Goal:** Students can tackle higher-level topics discussed in the following sessions, which overall answer the question "how do physiological substrates of cognitive processes relate to behaviour?"

(Center for Innovation in Teaching and Learning, 2021)

Example: Learning objectives taken from an actual lecture

Here are some statements taken from slides used in an actual lecture about what students should have understood after a unit. Topics and activities can be identified, but it remains unclear to a novice what they should have understood and which activities they should have carried out in order to do so. These statements name the topics but do not communicate how these topics are going to be discussed or dealt with.

a) Explain the mechanisms and properties of action potentials. Carefully detail the sequence of events that occur.
b) Give a short discussion of the (often disputed) relation of brain size and intelligent behaviour in different species and in humans. Be precise with the terminology.
c) Explain the relation of number of neurons and brain size for rodents and primates.
d) What is the blood supply, the specific energy demand and the total energy demand of the brain compared to the body? Make a quantitative statement.

Example: Revised learning objectives for a unit

Students are able to:

- correctly explain what an action potential is through listing the phases that occur and explain the mechanisms of the sodium potassium pump.
- differentiate between the lobes and locate the four major axes when looking at a 3D model of the brain.
- correctly explain the relation of neurons and brain size for rodents and primates, by taking into account correlations between brain size and complex behaviour, correlations between intelligence and brain volume, and overall structures,
- make a quantitative statement (in percentages) on the following in relation to the body: the brain's weight, how much blood circulation it uses, and how much energy it consumes by referring to the slides.
- differentiate between response properties of neurons in the primary visual cortex in radial and tangential electrode tracks by describing the ice cube model.

This will help students to navigate within the discipline and to understand and participate in academic (written) discourses on the topics of…

Further resources

Thinking skills

Table 2

Lower-order thinking skills → **higher-order thinking skills**

Remember	Understand	Apply	Analyze	Evaluate	Create
Recognizing • Identifying • locate • pick • record • list • name Recalling • retrieve • repeat • underline	Interpreting • clarify • paraphrase • represent • translate • express Exemplifying • illustrate • instantiate • cite examples • demonstrate the use of • simulate • give your own word of • discuss Classifying • categorize • subsume • identify • differentiate • recognize • select • determine • discriminate	Executing • carry out • employ • practice • demonstrate • illustrate • operate • operationalize • Implement • practice • relate • use • utilize	Differentiating • discriminate • distinguish • focus • select • organize • find coherence • outline • parse • structure Attributing • deconstruct • Appraise Examining • Calculate • Compare • Conclude • Contrast • Correlate • Deduce • Debate • Detect • Determine • Develop	Checking • coordinating • detecting • monitoring • testing Critiquing • judge • Appraise • Assess • Choose • Compare • Critique • Estimate • Evaluate • Judge • Measure • Rate • Score • Select • Validate • Value • Test	Generating • Hypothesize • Formulate • Arrange • Propose • predict Planning • Design • assemble • collect • compose • develop • manage • organize • prepare • devise Producing • Constructing • Modify • Reconstruct • Set-up • Synthesize •

	Inferring • conclude • extrapolate • predict Comparing • contrast • map • match • review Explaining • construct models • translate • describe • tell • simulate • practice Report • restate • respond		• Distinguish • Draw conclusions • Estimate • Experiment • Identify • Infer • Inspect • Inventory • Predict • Relate • Test • Diagnose		

How knowledge and cognitive processes correspond

Table 3

Bloom's Revised Taxonomy Model

Note: These are **learning objectives** – not **learning activities**. It may be useful to think of preceding each objective with something like, "students will be able to…:"	The Knowledge Dimension **Factual** The basic elements students must know to be acquainted with a discipline or solve problems in it.	The Knowledge Dimension **Conceptual** The interrelationships among the basic elements within a larger structure that enable them to function together.	The Knowledge Dimension **Procedural** How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.	The Knowledge Dimension **Metacognitive** Knowledge of cognition in general as well as awareness and knowledge of one's own cognition
The Cognitive Process Dimension **Remember** Retrieve relevant knowledge from long-term memory.	Remember + Factual **List** primary and secondary colors.	Remember + Conceptual **Recognize** symptoms of exhaustion.	Remember + Procedural **Recall** how to perform CPR.	Remember + Metacognitive **Identify** strategies for retaining information.
The Cognitive Process Dimension **Understand** Construct meaning from instructional messages, including oral, written and graphic communication.	Understand + Factual **Summarize** features of a new product	Understand + Conceptual **Classify** adhesives by toxicity.	Understand + Procedural **Clarify** assembly instructions.	Understand + Metacognitive **Predict** one's response to culture shock.
The Cognitive Process Dimension **Apply** Carry out or use a procedure in a given situation.	Apply + Factual **Respond** to frequently asked questions.	Apply + Conceptual **Provide** advice to novices.	Apply + Procedural **Carry out** pH tests of water samples.	Apply + Metacognitive **Use** techniques that match one's strengths.

The Cognitive Process Dimension	Analyze + Factual	Analyze + Conceptual	Analyze + Procedural	Analyze + Metacognitive
Analyze Carry out or use a procedure in a given situation.	**Select** the most complete list of activities.	**Differentiate** high and low culture.	**Integrate** compliance with regulations.	**Deconstruct** one's biases.
The Cognitive Process Dimension	Evaluate + Factual	Evaluate + Conceptual	Evaluate + Procedural	Evaluate + Metacognitive
Evaluate Make judgments based on criteria and standards.	**Select** the most complete list of activities.	**Determine** relevance of results.	**Judge** efficiency of sampling techniques.	**Reflect** on one's progress.
The Cognitive Process Dimension	Create + Factual	Create + Conceptual	Create + Procedural	Create + Metacognitive
Create Put elements together to form a coherent whole; reorganize into a new pattern or structure.	**Generate** a log of daily activities.	**Assemble** a team of experts.	**Design** efficient project workflow.	**Create** a learning portfolio.

Note. Reprinted from *A Model of Revised Bloom's Taxonomy* by Rex Heer, last accessed on 06.05.2021, Center for Excellence in Learning and Teaching, Iowa State University (https://www.celt.iastate.edu/teaching/effective-teaching-practices/revised-blooms-taxonomy/). CC BY-SA 4.0.

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