



P4ELECS

Platform for
Electrification Skills
& Competences

Quicksheet

About Bloom's revised taxonomy

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About

When teaching students, **a lot of activities** are taking place in their **heads** and often also **motorically** and **affectionately**. These activities should address **specific objectives**.

To **organize these thinking processes** and to break down overall objectives into smaller steps that build upon one another, we can use a **taxonomy** — a classification of **thinking and learning activities**.

Bloom's taxonomy is the most commonly used classification in educational practice. It was developed mid-20th century and provided a **foundational framework** in education: a first attempt to develop a common language about what assessments should measure in learners.

Based on numerous reviews, Anderson and Krathwohl revised Bloom's taxonomy (2001). The revised taxonomy categorizes cognitive skills into lower-order thinking skills like remembering and understanding and higher-order skills such as analyzing, evaluating, and creating. One finds many pyramid figures of the revised taxonomy visualizing the hierarchy between the thinking skills. We prefer this figure though to indicate that there is not a strict hierarchy between the higher order thinking skills :

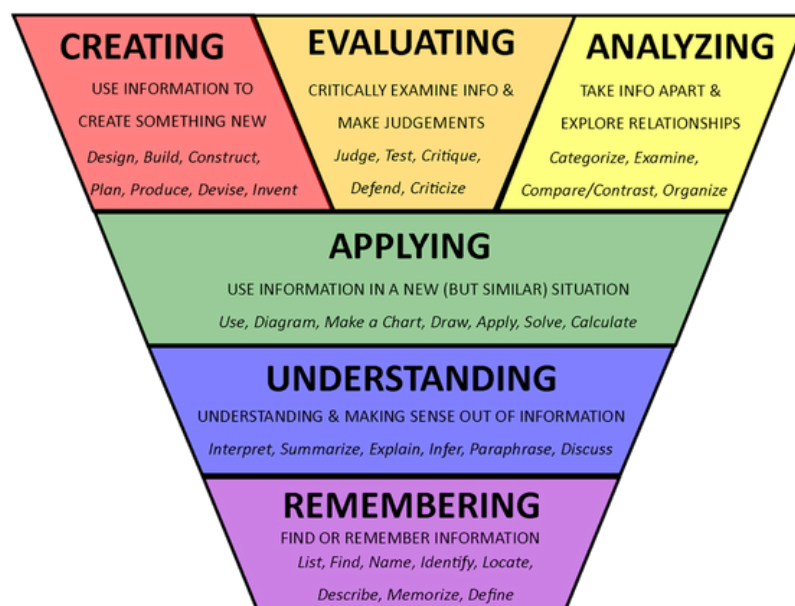


Figure 1. Revised taxonomy Bloom of the Cognitive Dimension



This progression helps educators **design curricula and assessments** that foster **critical thinking and problem-solving abilities**, essential for students in tackling complex energy challenges. Building Block (further BB) designers could use the taxonomy as a tool to formulate learning outcomes and accompanying assessment (Rombaut, e.a., 2020).

The taxonomy tries to organize thinking and, as many things in human sciences, a model or concept is far from absolute: While some thinking activities (indicated with verbs) are typically associated with their respective categories (see table with verbs in attachment down here), context may allow for flexibility: allowing some verbs to fit in multiple categories depending on how they are used in a learning scenario. Here you find an example for the verb "to differentiate" illustrates this versatility:

- Understand
 - *"Differentiate between facts and opinions."*
 - The learner is identifying distinctions conceptually.
- Analyze
 - *"Differentiate relevant from irrelevant information in a case study."*
 - Here, the learner is breaking down information into components and examining relationships.

In addition to the six cognitive levels of thinking (remember, understand, apply, analyze, evaluate, and create), Anderson and Krathwohl's Revised Bloom's Taxonomy (2001) also distinguishes between four types of knowledge: factual knowledge, conceptual knowledge, procedural knowledge, metacognitive knowledge.

When designing effective lesson blocks, it's important not only to target a cognitive level but also to consider the type of knowledge students are expected to acquire or apply.



Here we give some examples for different combinations for three types of knowledge:

- **Factual knowledge** at the level of remembering:
 - students can recall resistor color codes to identify resistance values.
- **Conceptual knowledge** at the level of understanding:
 - students explain how a parallel circuit differs from a series circuit in terms of current distribution and voltage.
- **Procedural knowledge** at the level of applying:
 - students build an electrical circuit based on a schematic and correctly use a multimeter to measure voltage.

By deliberately combining levels of thinking with types of knowledge, you can create more meaningful and targeted learning experiences. Another example for the verb 'to differentiate' on different cognitive skills with different types of knowledge :

- Understand & Conceptual Knowledge
 - "Differentiate between AC and DC currents."

→ The student explains conceptual differences — relatively basic cognitive engagement.
- Analyze & Procedural/Conceptual Knowledge
 - "Differentiate between signal noise and useful signal components in a circuit diagram."

→ The student is required to deconstruct a situation and identify components, showing deeper analysis skills.
- Evaluate & Metacognitive/Procedural Knowledge
 - "Differentiate between two circuit designs based on efficiency and cost."

→ The student makes judgments based on given criteria, which goes beyond analysis to evaluation.

More information about the **cognitive processes and types of knowledge** is elaborated in this short document [here](#), complementing this quicksheet.

Besides a taxonomy for thinking domain, taxonomies have been developed for the psychomotor domain (doing) and affective domain (feeling).

This figure gives an **overview of the three taxonomies** (CEDEFOP, 2017):

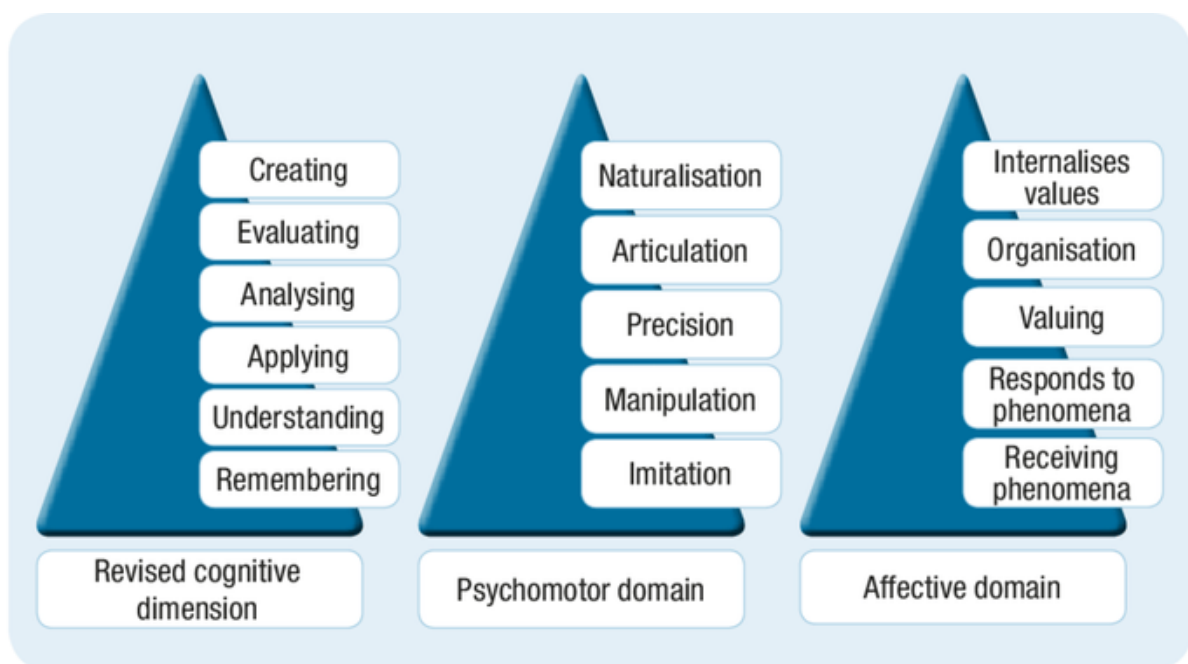


Figure 2: taxonomies of Bloom for three learning domains (CEDEFOP, 2017)

Benefits



Using a taxonomy can support the design of the BB and courses in P4ELECS. It helps:

- ✓ to plan or revise existing learning pathways or curricula
- ✓ to test the relevance of building block and course objectives
- ✓ to design instruction, assignments, and activities;
- ✓ to create effective and meaningful instruction
- ✓ to encourage deep cognitive engagement
- ✓ to procure a diverse range of thinking skills.
- ✓ to develop authentic assessments.

Step by step



1. **Define** the overall end goal of your building block or course.
2. **Break it down** by asking:
 - “What do students need to **know** or **be able to do** to achieve this end goal?”
3. **Use the taxonomy** to help define the answer more precisely.
4. **Write down the answer.**
5. **Ask the same question again** but now for that new answer.
 - This helps you go one level deeper.
6. **Repeat this process a few times** until you've identified the most essential parts (often ending with remembering knowledge) needed to build up to the end goal.
7. Check for **prerequisites**:
 - Is there anything students are expected to **know or master** beforehand?
 - → Make this explicit as **prior knowledge and skills.**
8. Pay attention!
 - The taxonomy categories (e.g. *to understand*) are not yet **observable verbs.**
 - Always ask: “*How can I observe that the learner has achieved this?*”
 - → This will help you define an **actual, measurable learning outcome.**



See also the Quicksheet on learning outcomes.

Tips



Do not interpret the hierarchy too rigidly

- The revised taxonomy (cognitive domain) is **not a strict ladder**.
 - In **Figure 1**, the **top three levels** are shown **side by side**, not hierarchically.

The taxonomy organizes thinking

- Like many tools in human sciences, this **categorization is not absolute**.
 - Some verbs are typically linked to certain categories. But: context matters – verbs can fit into multiple categories depending on how they're used.
- 👉 (See example above)

Make prior knowledge explicit

- The taxonomy can help identify **what students should already know or be able to do before** starting the building block or course.

Use the “Asking Questions” quicksheet

- The P4ELECS quicksheet proposes **specific question prompts** for each category in the revised taxonomy.
- These support student thinking and help design (self-)assessment.

A taxonomy is a tool, not a rule

- It supports defining learning outcomes, but should not lead to strictly dividing knowledge into fixed boxes.



Always keep the **overall goals and educational context** in mind

- This avoids reductionism in course or building block design.

Not finding Bloom's taxonomy helpful?

- You can explore other taxonomies in the CEDEFOP Handbook (CEDEFOP, 2017, p. 35) for more inspiration.

Useful sources

Anderson, L. W. and Krathwohl, D. R., et al (Eds.) (2001) A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon. Boston, MA (Pearson Education Group).

Cedefop, D. (2017). Writing and applying learning outcomes: A European handbook. Luxembourg: Publications Office of the European Union.

Rombaut, E., Molein, I., & Van Severen, T. (2020). De herziene taxonomie van Bloom in de klas. Pelckmans.

Figure 1 is taken from: <https://www.jackson.stark.k12.oh.us/Page/12056>

Another taxonomy used in higher education is the SOLO taxonomy. More information : <https://www.johnbiggs.com.au/academic/solo-taxonomy/>



Good luck!

Attachement 1

Level	Description	Verbs			
		Knowledge dimension			
		Factual	Conceptual	Procedural	Metacognitive
Creating	Using diverse elements to build a completely new structure. It also involves putting various parts together to form a whole.	Generate (a daily activity log).	Gather (an experts team).	Design (a workflow project).	Produce (a theory of learning style).
		Write (a short story).	Devise (a classification system).	Develop (an approach to solve the problem).	Create (a portfolio).
		Combine (the components).	Plan (the activities).	Compose (poetry).	Actualize (the plan).
		Invent, categorize, compile, compose, explain, modify, organize, plan, arrange, summarize, tell, build, choose, construct, estimate, formulate, imagine, invent, make up, originate, predict, propose, solve, discuss, modify, change, improve, adapt, minimize, maximize, elaborate, test, improve.			
Evaluating	Defending your own opinion, or presenting a new one. Judging the value and quality of work, information and ideas. The judgment is based on certain criteria and standards.	Check (the consistency of sources).	Define (the relevance of an outcome).	Judge (the efficiency of a process).	Reflect (on the progress).
		Criticize (an article).	Review (the objectives).	Evaluate (the rightness of a technique).	Rate (the effectiveness of a strategy).
		Rank (the current issues).	Assess (the likelihood of a result).	Conclude (the system's working mechanism).	Prioritize (the use of programs).
		Appraise, compare, conclude, defend, describe, discriminate, explain, justify, relate, summarize, support, award, decide, determine, dispute, measure, mark, recommend, select, agree, prove, perceive, value, estimate, influence, deduct.			
Analyzing	Examining the information and separating it into component parts. Determining and understanding the organizational structure and relation between those parts. Distinguishing facts and hypothesis.	Choose (the fullest activity list).	Distinguish (the attitudes).	Integrate (the approved framework).	Match (the learning styles).
		Classify (the words).	Identify (the levels of awareness).	Compare (the opposing approaches).	Analyze (one's prejudice).
		Order (the importance of the events).	Explain (the importance of understanding the rule).	Differentiate (the related terms).	Achieve (a level of understanding).
		Break down, contrast, deconstruct, illustrate, infer, outline, select, separate, categorize, discover, dissect, divide, examine, inspect, simplify, survey, list, assume, conclude.			
Applying	Solving problems and dealing with issues by using acquired knowledge. Applying the rules, facts and techniques to new situations and scenarios.	Use (a certain algorithm).	Give (the advice).	Carry out (the laboratory trials).	Select (the matching solution).
		Answer (the common question).	Set (the objectives).	Employ (the method).	Enhance (the professional skills).
		Classify (the principles of fundraising).	Experiment (with the reactions between components).	Calculate (the amount of possible damage).	Construct (the section of a site).
		Apply, change, compute, construct, demonstrate, manipulate, modify, operate, predict, prepare, produce, show, solve, build, choose, develop, interview, make use, organize, experiment, plan, utilize, model, identify.			
Understanding	Delivering the main ideas, as well as translating, comparing, interpreting, organizing, and describing information. Stating a problem, idea, or a fact in your own words to demonstrate your comprehension.	Interpret (a paragraph).	Categorize (the species).	Paraphrase (the definition for better understanding).	Foresee (the experiment's outcome).
		Categorize (a product's features).	Describe (the rule in your own words).	Clarify (the given instructions).	Explain (the working principles).
		Summarize (an article in your own words).	Consider (the connection between structure and its function).	Predict (the future of an industry).	Execute (a particular technique).
		Comprehend, convert, distinguish, estimate, extend, generalize, translate, compare, contrast, demonstrate, illustrate, outline, rephrase, show, classify, infer, exemplify, tag, comment, annotate.			
Remembering	Answering the questions, as well as describing terms, facts and basic concepts through retrieving or recalling previously learned information. This doesn't necessarily involve a complete understanding of the meaning.	Label (routes on the map).	Recognize (the author of a composition).	Recall (how to research keywords).	Outline (the process of finding an inspiration).
		Spell (a difficult word).	Name (the levels of Bloom's taxonomy).	Recap (the steps in reaching the agreement).	Identify (the downsides of a learning method).
		List (the European capitals).	Describe (the history of a nation).	Tabulate (the elaborate process).	Omit (the irrelevant terminology).
		Retrieve, state, define, know, match, reproduce, select, omit, choose, find, show, relate, tell, locate, point out, highlight, bookmark, search.			

Source: <https://custom-writing.org/blog/blooms-taxonomy>