RISE

RIGOR | INCLUSIVENESS | SUPPORT | ENGAGEMENT

The R.I.S.E. Guide to Beyond Recall and Understanding: Assessing Student Learning at Higher Levels of Cognitive Complexity

Introduction

Assessing student learning is a fundamental necessity of any course, and it is one of the main ways to enhance rigor in course design. While instructors often focus on the format of their assessments (e.g., multiple-choice quiz, 5-page essay, midterm exam, project, etc.), at times, little attention is given to the *types* of questions and prompts used to measure student learning. As a result, many instructors assess one or two types of knowledge without pushing students to do more with the course material.

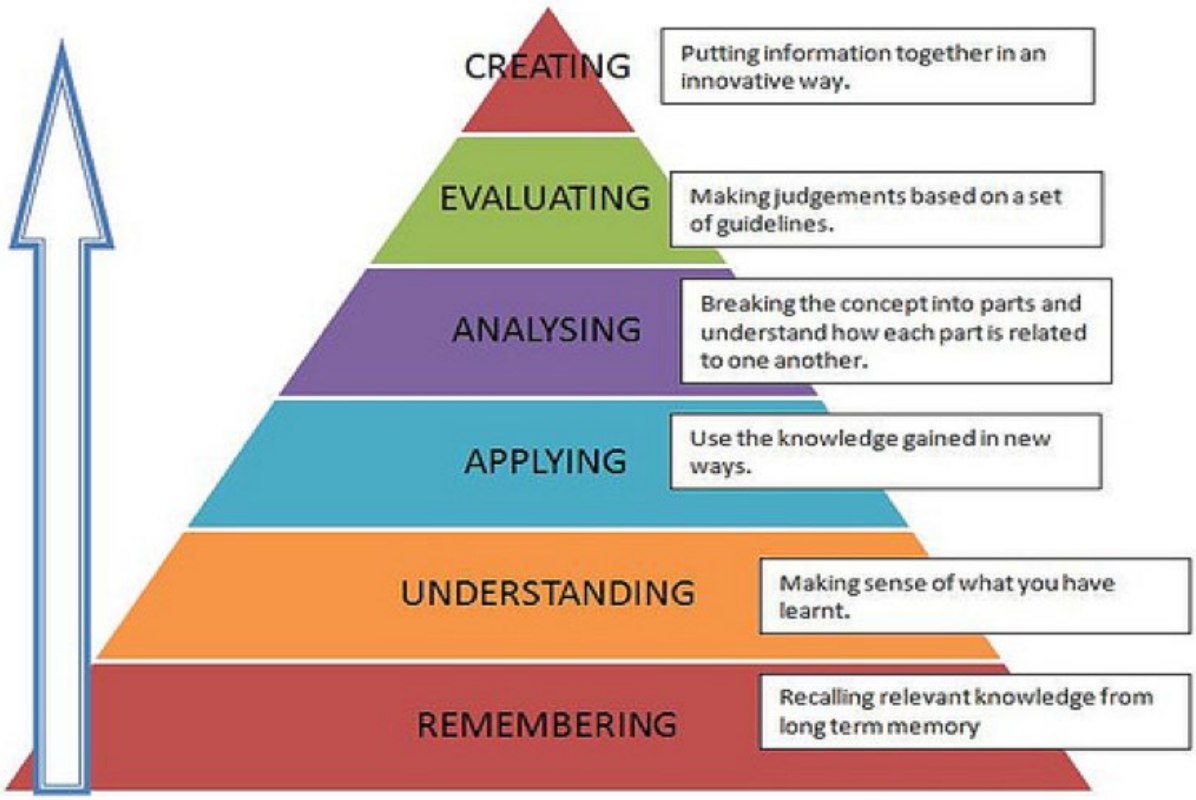
Consider the questions below regarding the concept of rigor. What type of knowledge do Questions 1 and 2 assess? What type of knowledge is being assessed with Questions 3 and 4? Do the questions require different levels of thinking? Do the questions require different levels of effort to answer them? Do they require different kinds of engagement with the concept of rigor?

1) What does rigor mean?
2) Can you explain why we should enhance rigor in the classroom?
3) How would you design a rigorous course?
4) Do you feel that it would be easy or difficult to design a rigorous course? Why?

If you said that Questions 1 and 2 require a different level of cognitive effort than Questions 3 and 4, you are correct! Instructors must remember to assess student learning at various levels of cognitive complexity, especially cognitive levels beyond remembering and understanding if they want to create a rigorous learning experience for students.

.

Explanation



https://courses.lumenlearning.com/suny-oneonta-education106/chapter/2-1-blooms-taxonomy/

Bloom's revised taxonomy (Anderson et al., 2001) can be a helpful framework to reference when you are thinking about different ways of assessing student learning. While it may sometimes be difficult to identify the fine distinctions between a question or prompt that gets at analysis vs. evaluation, for example, this should not be an instructor's main goal. The idea is to push students so that they are doing intellectual work that takes effort with the ultimate goal being to move students beyond *reproduction of knowledge* to a place where they are *reasoning through knowledge*.

For an in-depth review of Bloom's Revised Taxonomy and ideas for creating questions at the various levels, look over some of the resources listed below. The last resource is particularly helpful if you wish to use more digital-oriented assessments. Additional research, including discipline-specific research for foreign languages, math and philosophy, can be found in the reference section located at the end of this guide.

- Bloom's Taxonomy Revised for 21st-Century Learners (University of Utah)
- Bloom's Taxonomy (Vanderbilt University)
- Revised Bloom's Taxonomy – Question Starters (Illinois State University)
- Bloom's Taxonomy "Revised" Key Words, Model Questions, & Instructional Strategies (Georgetown University)
- Revised Bloom's Taxonomy (Iowa State University)
- Questions for the Revised Bloom's Taxonomy (Georgia State University)

If instructors want students to be able to reason through knowledge and develop and use higher order cognitive skills like evaluation and analysis, then instructors must model and encourage this type of processing within their courses. A primary method to accomplish this is to assess student learning at levels other than remembering and understanding by using higher-order questioning. Research has shown that "students are more likely to improve their critical thinking skills when they have answered higher-order questions in their coursework" (Renaud & Murray, 2007, p. 345).

Assessing student learning at various levels of cognitive complexity can be accomplished in any course regardless of discipline. Take for example the childhood story of "Goldilocks and the Three Bears." How would you apply Bloom's Levels of Learning to this story? What questions or activities would you ask to assess each level?

Below are some examples of different types of assessment prompts spanning Bloom's revised taxonomy applied to "Goldilocks and the Three Bears." You can see that what you're asking students to do with information and how you're asking them to approach knowledge becomes more intellectually effortful as you go down the list below or up the pyramid pictured above. While asking students to apply, analyze, evaluate, and create will improve their ability to think critically and encourage deep learning, it is important to note that lower-level questions do serve an important role and should still be used.

Remember	List the items used by Goldilocks while she was in the Bear's house.
Understand	Explain why Goldilocks likes Baby Bear's chair the best.
Apply	Demonstrate what Goldilocks would use if she came to your house.
Analyze	Compare this story to reality. What events could not really happen?
Evaluate	Judge whether Goldilocks was good or bad. Defend your opinion.
Create	Write a story about "Goldilocks and the Three Fish." How would it differ from "Goldilocks and the Three Bears?"

Taken from: Figure 4.4 Bloom's Taxonomy and Goldilocks from p.37 of *Teach Students How to Learn* (2015).

If you have any questions or wish to discuss this teaching strategy in more depth, please contact your R.I.S.E. scholar or the Learning Academy.

Let's practice!

Using the example prompts below, please take a few minutes to consider how you could assess your students' learning at various levels of cognitive complexity. Using an existing or future course topic or concept, write 2-3 prompts that assesses student learning at lower levels of cognitive complexity and 3-4 prompts that assess student learning at higher levels of cognitive complexity.

Example prompts to assess lower levels of cognitive complexity (remembering and understanding)

- What is a thesis statement?
- What's the difference between occupational therapy and physical therapy?
- What is the primary role of an Artistic Director?

Example prompts to assess higher levels of cognitive complexity (applying, analyzing, evaluating and creating)

- Can you identify the thesis statement in this essay? Is it a good one? Explain.
- How do the benefits of occupational therapy compare to those of physical therapy?
- Create a detailed job posting for an Artistic Director for the Winter Dance Concert.

We hope that the information on this teaching strategy encouraged you to include assessments that measure student learning at higher levels of cognitive complexity in your courses as a way to enhance rigor and, ultimately, improve student learning. If you have any questions or wish to receive feedback on your ideas for the practice activities, please contact your R.I.S.E. scholar or the Learning Academy.

References and More Resources on Assessing Student Learning at Higher Levels of Cognitive Complexity

Anderson, L., Krathwohl, D.R., Airasian, P., Cruikshank, K., Mayer, R., Pintrich, P., Raths, J., & Wittrock, M. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

DeJarnette, A. F., Wilke, E., & Hord, C. (2020). Categorizing mathematics teachers' questioning: The demands and contributions of teachers' questions. *International Journal of Educational Research*, *104*, N.PAG. https://doi.org/10.1016/j.ijer.2020.101690

Feng, Z. (2013). Using teacher questions to enhance EFL students' critical thinking ability. *Journal of Curriculum and Teaching, 2*(2), 147–153.

Radmehr, F., & Drake, M. (2018). An assessment-based model for exploring the solving of mathematical problems: Utilizing revised bloom's taxonomy and facets of metacognition. *Studies in Educational Evaluation, 59*, 41–51. https://doi.org/10.1016/j.stueduc.2018.02.004

Renaud, R. D., & Murray, H. G. (2007). The validity of higher-order questions as a process indicator of educational quality. *Research in Higher Education, 48***,** 319–351. https://doi.org/10.1007/s11162-006-9028-1

Rentmeester, C. (2018). Adding academic rigor to introductory ethics courses using Bloom's taxonomy. *International Journal of Ethics Education*, *3*, 67–74. https://doi.org/10.1007/s40889-017-0047-x

Samson, G. E., Sirykowski, B., Weinstein, T., & Walberg, H. J. (1987). The effects of teacher questioning levels on student achievement: A quantitative synthesis. *Journal of Educational Research, 80*(5), 290–295. https://doi.org/10.1080/00220671.1987.10885769