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The R.I.S.E. Guide to Designing Learning Centered on Inquiry

Introduction

One of the ways that we can teach with rigor is to design courses to focus on the process of inquiry. Take a second to reflect on if and how you do that now. Ask yourself the following questions:

- *What place do questions or problems, or both, have in my classes?*
- *Are questions mainly asked by students when they don't understand something? Or are questions a primary way that understanding is built from the start?*
- *Do I ask the kinds of questions that challenge students to think more deeply during class, on a discussion board, or on assessments?*
- *Do I present problems for students to solve?*
- *Do I facilitate students' exploration of ideas, investigation of phenomena, or analysis of some sort of data, text, or process?*

If you can't answer "yes" to some of the questions above, you might consider implementing some form of inquiry-based learning as a means for enhancing rigor in your courses. Now, take a second to consider how your class culture might change if inquiry were placed at the center of your approach to teaching. Ask yourself:

1. *Would students think more or more deeply about the content?*
2. *Would student learning be more active?*
3. *Would students have to prepare for and engage in the course differently?*
4. *Would they share more responsibility for their learning?*
5. *What would your role as the instructor look like?*

The answer to questions 1-4 above is "YES!" Getting students to think critically and to deeply engage with course concepts happens through the use of higher order questions, problem-solving, and a process of exploration (Renaud and Murray, 2007). When we approach teaching this way, our role as instructors changes from that of a provider of information to that of a role model and a guide.

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Explanation

Lecture-based learning is typically deductive; students are provided with information about rules, theories, concepts, or processes and then, perhaps, are asked to apply their new knowledge. Inquiry-based learning (IBL; also known as inquiry guided learning or guided inquiry) represents an inductive approach in which **"...students are presented with questions to be answered, problems to be solved, or a set of observations to be explained"** (Prince & Felder, 2006, p. 9) and identify patterns or principles from that. **"Students grappling with these challenges quickly recognize the need for facts, skills, and conceptual understanding, at which point the teacher provides instruction or helps students learn on their own"** (Prince & Felder, 2007, p. 14). Inductive methods of teaching and learning serve to motivate students (Fencl & Scheel, 2005), facilitate deeper learning of material (Ramsden 2003), and present the kinds of challenges that lead to intellectual development (Felder & Brent, 2004).

IBL is about involving students in the co-creation of knowledge by way of exploring questions or problems and reasoning through concepts, connections, and processes. In IBL, the instructor guides the inquiry process and students wrestle with ambiguity as a way of engaging deeply with material.

Inquiry-based learning ranges from a fairly structured and guided activity to one where students are more fully responsible for not only answering questions but formulating them. There are many ways to incorporate inquiry-based learning, many of which can be considered "small teaching" changes (Lang, 2016) that don't require a total overhaul of your course design or instructional approach.

Below, you will find information and resources on IBL teaching strategies, but before you dive into some specifics, you might want to check out some other resources that discuss IBL as an approach.

> This article provides a very helpful overview of various inductive teaching methods, which could all be considered forms of IBL.

> This article gives a detailed overview of IBL.

> To hear faculty from Western Washington University talk about how they use IBL and to see IBL in action, view these videos.
> - Inquiry-based Learning across Disciplines
> - Classroom Environment with IBL
> - Math as Inquiry Based Learning
> - Developing community with IBL
> - Role of the Inquiry-based Learning Teacher
> - Group Dynamics with Inquiry-based Learning
> - Getting Started Teaching Inquiry-based Learning

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While the instructors featured in the videos linked above discuss IBL in STEM courses, IBL is an approach to teaching and learning relevant for most any discipline. Read more about the use of IBL in other disciplines in these resources:

- [Inquiry at the Center of a Literary Criticism Course](#)
- [IBL in a Course on Human Trafficking](#)
- Archer-Kuhn, B., Yeonjung L., Finnessey, S., & Liu, J. (2020). Inquiry-based learning as a facilitator to student engagement in undergraduate and graduate social work programs. *Teaching & Learning Inquiry,* 8 (1), 187-207. https://doi.org/10.20343/teachlearninqu.8.1.13.
- Atkinson, M.P. & Hunt, M.P. (2008). Inquiry-guided learning in Sociology. *Teaching Sociology, 36,* 1-7.
- Feldt, J.E., & Petersen, E.B. (2021). Inquiry-based learning in the Humanities: Moving from topics to problems using the "Humanities imagination*." Arts and Humanities in Higher Education, 20*(2), 155-171. doi:10.1177/1474022220910368
- Friedman, D., Crews, T., Caicedo, J., Besley, J., Weinberg, J., & Freeman, M. (2010). An exploration into inquiry-based learning by a multidisciplinary group of higher education faculty. *Higher Education, 59*(6), 765- 783.
- Van Oostrum, D., Steadman-Jones, R., & Carson, Z. (2007). Taking the imaginative leap: Creative writing and inquiry-based learning. *Pedagogy, 7*(3), 556-566.

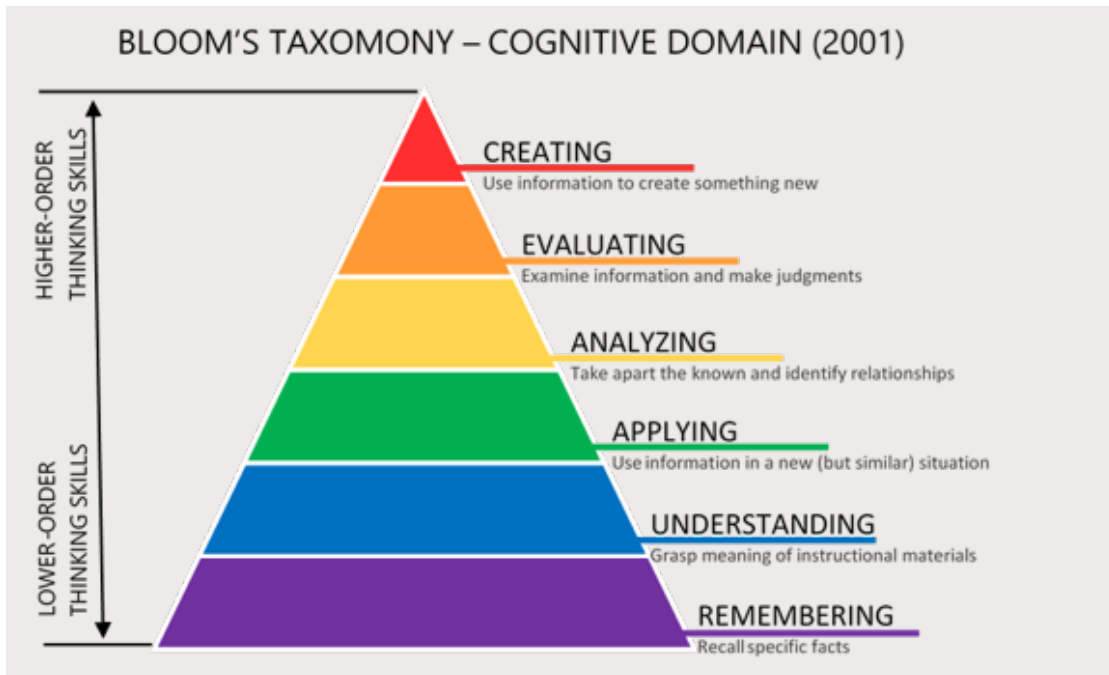Some teaching strategies to introduce or enhance IBL in your courses include:
- [Structuring your course around "big questions"](#)
- Using higher order questioning for discussions (in-depth guide provided below)
- Using problem-based learning (more information provided below)
- [Incorporating student research](#)

Using Higher Order Questions for Discussion

If you want students to be able to reason through knowledge and develop and use higher order cognitive skills like evaluation and analysis, then you must model and encourage this type of processing within your courses. A primary method to accomplish this is 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).

Higher-order questions are an important means to enhancing rigor and can be used as both a driver of discussion and to assess student knowledge (see our Guide to Assessing Student Learning at Higher Levels of Cognitive Complexity for more information on the latter).

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Bloom's (revised) Taxonomy can be helpful in formulating higher order questions for either purpose, though we'll focus on the former here.

BLOOM'S TAXOMONY – COGNITIVE DOMAIN (2001)

HIGHER-ORDER THINKING SKILLS

CREATING
Use information to create something new

EVALUATING
Examine information and make judgments

ANALYZING
Take apart the known and identify relationships

LOWER-ORDER THINKING SKILLS

APPLYING
Use information in a new (but similar) situation

UNDERSTANDING
Grasp meaning of instructional materials

REMEMBERING
Recall specific facts

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

While the fine distinctions in language that make a question one of analysis vs. evaluation are not terribly important, what is important is to ensure that the questions you pose to students push them from lower levels of cognitive processing (recall and understanding) to intellectual work that takes cognitive effort.

Below are some example questions about concepts from the discipline of Public Health that span Bloom's revised taxonomy. You can see that the way students are being asked to think about information becomes more effortful as you go down the list.

Remember	What is it called when we intervene before health effects occur?
Understand	What's the difference between primary and secondary prevention?
Apply	Can you identify how each of these were used during the pandemic?
Analyze	How do the ways these were used during COVID compare to the ways they were used during the height of the Ebola outbreak?
Evaluate	Which of these approaches was more effective and why?
Create	What ideas do you have for primary prevention services going forward that would reach those most vulnerable to COVID?

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Reflect on the kinds of questions you pose to students in class discussions and on discussion boards now; do they mostly stay at the levels of remembering and understanding? Do you often ask students higher order questions?

Asking students to apply, analyze, evaluate, and create will improve their ability to think critically and encourage deep learning; however, it is important to note that lower-level questions do have a place in inquiry-based learning and should still be used. The idea is to scaffold your questioning to take students from lower to higher level processing as they explore content.

Also, very important to encouraging inquiry and higher order thinking are probing or follow-up questions that challenge students to further examine the material and/or their own thought processes. Once you start your question-centered learning session (whether that takes place synchronously or asynchronously), you'll want to be ready with prompts like these:

- What makes you think P?
- What if Q happened?
- What if P were not true?
- What do you think causes P?
- What if I told you XYZ? Would you still think P?
- Where in the reading/data can you see evidence of P?
- What happens if we reverse the P?
- How is P like Q?
- What else could account for P?
- Is there another way to go about P?
- Are there other possible answers?
- Can you think of any exceptions?

IBL in On-ground Discussions

If you're using higher order questioning as an IBL strategy in an on-ground class for the first time, or trying to enhance your approach, here are some tips:

- Go in with a questioning strategy.
  - Certainly, flexibility in your plan is important as you follow students' lead, but formulating a strategy (and even writing down questions) before class will enhance your ability to effectively guide students through the material in a productive way.
- Interrogate the reading with students.

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- Bring and use the course text(s) during class, referring to the reading for answers or isolating parts of it to analyze with students. Model for students how they should use the text(s).
- Use questioning first, then "mini-lecturing".
    - This is one of the best ways to break into IBL if you're using it for the first time. Start class with questioning as the mode for getting into the content and then pause for short, interactive lecturing when you need to clarify, build on, or connect concepts.
- Respond to students' answers with more questions.
    - Challenge students to go deeper by asking things like, "What makes you think that?" or "How did you get there?"
- Reward students who ask good questions.
    - Explicitly encourage students to ask questions themselves. Provide positive feedback to students who ask questions in addition to answering them. Consider incentivizing good question-asking. You can require students to come to class with questions prepared, to come up with them in small groups, and to ask questions of each other, not just of you.

IBL in Online Discussions

IBL may be a bit more challenging in an online class, but you can find ways to center higher order questions when you're in an asynchronous format. Here are some tips:

- Assign discussions before content presentations.
    - Asking students to engage in a discussion about the reading before they watch, listen to, or read your content presentations can get them thinking about the content by way of questioning/discussion.
- Frame your content presentations with questions and model reasoning as you present.
    - When you create asynchronous content presentations, use questions as a framing device, reasoning through content as you discuss it.
- Embed questions within or between presentations.
    - Actually ask students questions within your recorded presentations or at the end of them. You can do this by simply asking students to hit pause on the video and do some thinking or even complete an assignment where they respond to the question you've posed and submit an answer. There are also technologies like EdPuzzle (free to integrate with Canvas!) which allows you to embed assessments in your videos (even those you've already recorded). You can choose to use these to engage students or you can grade students' responses.
- Pose divergent but specific questions on discussion boards.
    - When you formulate a discussion board prompt, make sure to use a divergent question – one that has the potential to spark multiple responses – but be specific so that students have some direction for the conversation.

- Frequently respond with follow-up questions.
  - Be present in the discussion as you would in a synchronous class to probe student responses, provide clarification, or to extend their thinking in some other way.
- Make students responsible for questioning, not just answering.
  - Have students take the lead in questioning one another. One way to do this is to assign students roles for a given discussion board. For example, students in group A have to pose a "big question" to get others thinking and talking. Group B students have to offer an answer. Group C students have to counter an answer already posted with their own answer, or support one of those already posted with further reasoning or evidence.

Let's practice!

Writing Higher Order Questions for Use in Discussion

Think about one of your courses and write one lower-order question followed by one higher-order question about a topic within that course.

Remember OR Understand (use these examples as a reference)

- What is primary disease prevention in public health?
- What's the difference between primary and secondary prevention?

Lower-order question that could be used in one of your classes:

Apply OR Analyze OR Evaluate OR Create (use these examples as a reference)

- Can you identify how each of these were used during the pandemic?
- How do the ways these were used during COVID compare to the ways they were used during the height of the Ebola outbreak?
- Which of these approaches was more effective and why?
  What ideas do you have for primary prevention services going forward that would reach those most vulnerabl**e** to COVID?

Higher-order question that could be used in one of your classes:

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After you've drafted initial questions, consider how you might follow up with additional questions once one or more students have provided answers.

If you have any questions or wish to receive feedback on this practice activity, please contact your [R.I.S.E. scholar](#) or the Learning Academy.

Using Problem-based Learning

"Problem-based learning (PBL) begins when students are confronted with an open-ended, ill-structured, authentic (real-world) problem and work in teams to identify learning needs and develop a viable solution, with instructors acting as facilitators rather than primary sources of information" (Prince & Felder, 2006, p.11). A defining characteristic of PBL is that before solving the problem, students work to understand and formulate the problem. Although the implementation of PBL can vary widely, it is typical in PBL for instructors not to provide students with information needed to solve the problem(s) (i.e., an overview of relevant theories, concepts, findings, or principles) before assigning the task. When students determine that they need information to progress, the instructor will provide it or guide students to find it. Students should consider multiple solutions and, ultimately, make an argument for the solution(s) they deem best. Reflection on the learning process is an important element of PBL. Instructors can use PBL sporadically in a course or as a consistent mode of exploration of content throughout a course.

For more information, see the University of Delaware's PBL resources:
- [What is PBL?](#)
- [PBL Resources](#) (syllabi and exams)
- [PBL Clearinghouse](#) (library with problems from various disciplines)

References and More Resources on IBL:

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