Example Assignments that Stimulate Higher Order Thinking

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Key Point

• Help foster critical thought by giving assignments that explicitly focus student thinking in directions that require reasoning through a problem or issue.
Thesis Governed Thinking

1. Present a proposition (thesis) that students defend or refute.

1. Give students a problem or question that requires a thesis answer.

1. Ask students to follow an organizational structure that requires a problem-thesis pattern.
KEY IDEA Elaborated
Students support a given thesis or construct a thesis to be defended

Give students a controversial thesis to defend or refute.
Reinforces view that useful and meaningful knowledge can be dialogically constructed.
Reinforces that our perception of truth must be questioned when divergent interpretations challenge our existing beliefs of validity.
Helps foster confidence in reason.
(1) Present a proposition (thesis) that students defend or refute.

- "This proposed bridge design does not meet the criteria set forth by the city in its requirements for proposal." (civil engineering)

- "The path to holiness lies through questioning everything." Agree or disagree. (religious studies)

- Mercury amalgam fillings are safe. (research project on scientific argument)
Students take position you specify

Mathematics Example

Write a letter to the editor against sales tax on the grounds of it being a regressive tax. Explicitly use ratio and proportion to explain to the uninformed reader the meaning of *regressive tax*.
Economics Example

Upon arriving home for Christmas, you discover your father writing a letter to his representative in Congress urging the passage of legislation limiting beef imports from Argentina. He argues that such imports put ranchers out of business, cause U.S. packing houses to close, and generally make this country poorer.
You, on the basis of your brilliant performance in Economics 105, engage your father in a spirited discussion. Write the argument that you use to convince him of the error of his position. Your father doesn’t understand economic jargon, so any jargon you use must be explained.
Thesis Governed Writing

1. Present a proposition (thesis) that students defend or refute.

1. Give students a problem or question that requires a thesis answer.

1. Ask students to follow an organizational structure that requires a problem-thesis pattern.
(2) Give students a problem or question that requires a thesis answer.

- Require that students sum up the problem in a one-sentence question.

- Require that students state their response in a one-sentence thesis.

- The abbreviated statements allows for more manageable and direct assessment.
Write an essay of no more than two double-spaced pages answering the following question: *Is a skilled trout fisherman on a variable interval or a variable ratio schedule of reinforcement?*

Imagine that you are writing to a classmate who has missed the last week of lectures and finds the textbook explanations of “variable interval” and “variable ratio” confusing.
Physics Example 1

Physics (electricity and magnetism)

- An electric dipole is placed above an infinitely conducting plane. Does the dipole feel a net force or a torque. Explain.

Gauss’s law relates the field at the surface to the charge inside the surface. But surely the field at the surface is affected by the charges outside the surface. How do you resolve this difficulty?

• Mullin, 1989, p. 207 in Bean p. 88-89
Philosophy Example 1

Choose a question that Plato answers in one way and Aristotle answers in a different way (for example, “How do things change?”). Then, in the first part of your paper, explain to your reader the differences in these two theories.
In the second part of your paper, evaluate the two positions, arguing that one position is stronger than the other. In this section, specifically answer the following question: What situation or thing does one theory explain well that the other cannot explain adequately?
Philosophy Example 2

Possible Traditional Assignment

“As a group, discuss your reaction to Plato’s Crito.”
An assignment that fosters critical thought may ask instead:

“In a group of three, propose a list of significant questions you would like to have the teacher address or the class discuss regarding Plato’s *Crito*. Your initial list (which you will hand in to the instructor) should include a dozen or so questions.... (next slide)
Then reach consensus on what you consider your three best questions. Your recorder will write these questions on the board and will explain to the class why your group considers them pertinent, interesting, and significant questions raised by *Crito*. Time: 15 minutes.”

Source: Bean, p. 152
Common Problem

- Student thinking is easily confused.

- We want to guide student thinking, or model for them the process of asking background and follow-up questions.

- Too many questions can confuse students.

- Make prompts succinct: give one question instead of many questions.
Teacher-directed (confusing)

- There are 12 Christmas trees and five are cut down. How many are left standing?

What is confusing about this prompt?

What intellectual skills are targeted?
- In other words, what are we asking students to do?
Teacher-directed (clearer)

- There are 12 Christmas trees standing. Of those, five are cut down. How many are left standing?

What intellectual moves does this assignment initiate?

What intellectual skills are targeted?
Student-centered

• Susan says that if there are 12 Christmas trees standing and of those five are cut down, seven are left standing. But Bobby says that is incorrect and there are 8.

Who is correct and why?
How did you arrive at your answer?

• Jim Braly, *The Oregonian*, Jan. 11, 2009
In the graveyard scene of Hamlet, Shakespeare alters his sources by adding the clownish gravediggers. How does the presence of the gravediggers influence your interpretation of the scene? Do you think they are funny? Absurd? Blasphemous? How does Hamlet’s attitude toward the gravediggers affect the scene? Do you think it is appropriate to sing while digging a grave? What about the jokes they tell? Is the scene really lighthearted? Etc…
In the graveyard scene of Hamlet, Shakespeare alters his sources by adding the clownish gravediggers. How does the presence of the gravediggers influence your interpretation of the scene?

(Phrased as a single question forces students to frame a single answer as a thesis: focuses their thinking)
The paper will be graded based on (a) how deeply and extensively you are able to analyze the primary source you selected, and this includes a brief, concise presentation of the main arguments in the primary source; (b) how effectively you are able to connect it with larger themes, and controversies in the Common School Movement. This includes references to information in the Rury and the Mintz text and the larger goals of the Common School movement set out by Horace Mann; (c) the care and thought you put into analyzing the limitations of the particular document together with your discussion of what additionally it would be useful to know, and (d) the clarity & organization of your writing.
Activity: Educational Foundations

Assignment

1. Identify the process words (intellectual tasks)
2. Which of these is clear? In other words, which of the process words would be easily understood by an undergraduate college student?
3. Which process words are unclear?
4. Map out the assignment. Draw a diagram that shows the relationship between the various expectations.
5. How would you rewrite this portion of the assignment to bring greater clarity and depth?
Thesis Governed Writing

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1. Give students a problem or question that requires a thesis answer.

1. Ask students to follow an organizational structure that requires a problem-thesis pattern.
(3) Ask students to follow an organizational structure that requires a problem-thesis pattern.

- Open-ended thesis-governed assignment: students choose their topic/problem/question to answer or address.
  1. Permits free choice of topics while guiding students toward a thesis-governed paper outlined in the introduction.
  2. Focus on questions encourages/models process of inquiry w/in a discipline.
  3. Easy to coach. (prospectus, shorter assessment)
Example

Write an essay of X pages on any topic related to this course. Use the introduction of your essay to engage your reader’s interest in a problem or question that you would like to address in your essay. Show your reader what makes the question both significant and problematic.

(continued next page)
The body of your essay should be your own response to this question made as persuasive as possible through appropriate analysis and argumentation, including effective use of evidence. Midway through the course, you will submit to the instructor a prospectus that describes the problem or question that you plan to address and shows why the question is (1) problematic and (2) significant.
Personal Forms of Formal Writing

1. **Thesis-Seeking Essay** (as opposed to a thesis-supporting essay)
   - Students construct a narrative that describes their thinking process as they think through a problem.
   - Easily adaptable to any discipline.
   - Often encourages student motivation.

Example next slide.
Write a first-person, chronologically organized account of your thinking process as you explore possible solutions to a question or problem related to this course. Begin by describing what the question is and how and why you became interested in it. Then, as you contemplate the problem and do research, narrate the evolving process of your thinking. Your exploratory essay should include both external details (what you read, how you found it, who you talked to) and internal mental details (what you were thinking about, how your ideas were evolving).
For this essay, it doesn’t matter whether you reach a final position or solve the problem; your reader is interested in your process, not your final product. Show us, for example, your frustration when a promising source turned out to be useless. Show us how new ideas continually led you to reformulate your problem through expansion, narrowing, shifting of focus, or whatever. Make your exploratory essay an interesting intellectual detective story – something your readers will enjoy.
Personal Forms of Formal Writing

2. Reflection Papers.
   (a.k.a. “reader-response paper” or “personal reaction paper”)
   • Purpose is to explore connections between course material and a student’s individual life or psyche.
   • Assigned to elicit students’ responses to complex, difficult, or troubling readings.
   • Invites the writer to “speak back” to the reading in a probing and questioning way.
Example: Philosophy

In a two- to three-page reflection essay, consider the following statement by Aristotle (Ethics II, 2) with respect to your own life:

We are not studying in order to know what excellence is, but to become good, for otherwise there would be no profit in it...[We must therefore] consider the question of how we ought to act.

Are you studying in order to become good? Explain what you think Aristotle is getting at and then explore your own response.
Challenge Students to Generate Research Questions

Pose an interesting problem or question, appropriate to this course, that will require a combination of library [or field or laboratory] research and your own analytical skills to answer… (cont’d next page)
The quality of your research paper will depend on the quality of your initial question. I will be working with you early in the term to help you pose a productive question.
1. What research problem or question do you intend to address?

1. How did you come to see this as a problem? What did you read?

1. Why is this an interesting question? Why is it problematic? Why is it significant?
4. How far along are you in your thinking and research? What do you expect to discover? Are you ready yet to formulate a thesis statement? If so, what is it?

5. Attach a working bibliography of the sources you have used so far. Write short annotations for the material you have already read.

Adapted from Bean, p. 207
Essential Idea:

To learn well, we must write well.
Principle of Leverage

• “A small amount of writing preceded by a great amount of thinking.” (Bean, 80).
• Design short writing assignments that target one or two key concepts.
• Design the assignment to require that students explain the concept, differentiate the concept(s) from related and opposite concepts, contextualize/exemplify the concept.
You are Dr. Science, the question-and-answer person for a popular magazine called *Practical Science*. Readers of your magazine are invited to submit letters to Dr. Science, who answers them in “Dear Abby” style in a special section of the magazine. One day you receive the following letter:
Dear Dr. Science:
You’ve got to help me settle this argument I am having with my girlfriend. We were watching a baseball game several weeks ago when this guy hit a high pop-up straight over the catcher’s head. When it finally came down, the catcher caught it standing on home plate. Well, my girlfriend told me that when the ball stopped in midair just before it started back down, its velocity was zero, but its acceleration was not zero. I said she was stupid. If something isn’t moving at all, how could it have any acceleration?
Ever since then, she has been making a big deal out of this and won’t let me kiss her. I love her, but I don’t think we can get back together until we settle this argument. We checked some physics books, but they weren’t very clear. We agreed that I would write to you and let you settle the argument. But, Dr. Science, don’t just tell us the answer. You’ve got to explain it so we both understand because my girlfriend is really dogmatic. She said she wouldn’t even trust Einstein unless he could explain himself clearly.

Sincerely,

Baseball Blues
Can this relationship be saved? Your task is to write an answer to Baseball Blues. Because space in your magazine is limited, restrict your answer to what can be put on a single five-by eight-inch card. Don’t confuse Baseball and his girlfriend by using any special physics terms unless you explain clearly what they mean.
Consider the following problem:
In the morning, when Professor Catlove opens a new can of cat food, his cats run into the kitchen purring and meowing and rubbing their backs against his legs. What examples, if any, of classical condition, operant conditioning, and social learning are at work in this brief scene? Note that both the cats and the professor might be exhibiting conditioned behavior here.
You and some fellow classmates have been discussing this problem over coffee, and you are convinced that the other members of your group are confused about the concepts. Write a one- to two-page essay that sets them straight.
Generating Thesis Statements

Key Idea

- Students write a one sentence thesis statement, followed by an elaboration. Places a lot of emphasis on writing a clear and concise sentence.
Question: “According to Robert Heilman, what is the difference between a tragedy and a disaster?”

Brief Thesis: According to Heilman, a disaster is caused by an accident or outside force, whereas a tragedy is caused by the hero’s wrong choice.

Elaborated Thesis: For Robert Heilman, both disasters and tragedies bring about suffering or death; a disaster, however, is caused by an accident or outside force so that the hero’s physical suffering is not accompanied by guilt, whereas a tragedy is caused by the hero’s wrong choice leading to an agonizing discovery of personal responsibility, consequence, and spiritual suffering.
History Examples
Ask students to think historically from a specific theoretical lens/point of view (e.g. comparative):

• Why did the American Rev. turn out so much better – with a far lower death toll – than the French Rev.?
• Why did George Washington’s legacy prove more enduring than Simon Bolivar’s?
• Why did the Civil War not end in political division, the way Germany’s Wars of Unification ended with exclusion of the south-Austria-from the Reich?

Source: Ferguson, N. “How to Get Smart Again.”
History Examples cont’d

Ask exciting questions (e.g. hypothetical / counterfactual):

• What if Washington had shared Napoleon’s appetite for imperial power?
• What if the British had supported the confederacy with cash and cannons?
• What if Franklin Roosevelt had not been president in WWII?
• Philip Roth’s answer to this question, from The Plot Against America, is that “it’s the sense of inevitability – whatever happened had to happen – that makes school history so dull…But when historic events are actually happening – as in Japan and the Arab world – ‘the unfolding of the unforeseen [is] everything.’”
  (N. Ferguson, p. 63).
Key Ideas

• Design the assignment to require that students explain the key concept(s).

• Design the assignment to require that students explain their thinking processes.
Example “What I Observed/What I Thought” Laboratory Notebooks

Problem: students often equate scientific thinking with merely following a formula in a lab manual.

Two columns
- Left-hand column contains empirical observations and calculations.
- Right-hand column records mental processes.
Example Entries

**Left-hand column**: empirical record  
• “The solution turned blue-green.”

**Right-hand column**: reflections  
• “I therefore hypothesized that the solution contained copper. I then decided to run a confirmation test for copper.”

Source: Bean, p. 109
Math Autobiography

Asks students to write their own “math autobiography” in which they reflect on their past math history and experiences.

(One professor reported getting very useful insights into mathematical anxieties and learning problems of her students as well as the causes of many of these problems)

Bean, p. 94
KEY IDEA
Link fundamental course concepts to students’ personal experiences

Think of examples out of your own personal experience to illustrate the uses of vector algebra. You might consider such experiences as swimming in a river with a steady current, walking across the deck of a moving boat, crossing the wake while water-skiing…
cutting diagonally across a vacant lot while friends walk around the lot, or watching a car trying to beat a moving train to a railroad crossing. Use one or more of your personal experiences to explain to a friend what vector algebra is all about. Use both words and diagrams.
Your thirteen-year-old sister mailed you a cartoon showing a picture of Frank and Ernest taking a number from the dispenser at an ice-cream parlor. The number they draw is $\sqrt{-1}$. Ernest has puzzled look on his face. Your sister is taking a pre-algebra class and is familiar with the idea of square roots such as $\sqrt{4} = 2$ and $\sqrt{81} = 9$. …
She also knows how to do arithmetic with positive and negative integers. However, she does not understand the cartoon and wants you to explain it to her. Prepare a written explanation for your sister that builds on her current mathematics background.

•Bean, p. 125
“Take a sheet of paper and tear it in half. Put the two pieces together and tear them in half. Put the pieces together and tear them in half, and so on. Assuming you could do it 50 times altogether, the stack would be so high it would be more than halfway to the sun.”

Defend or refute.

(Answer: True, it is about 93 million miles to the sun)
• Students would have to construct a way to test and verify answers.

• Use a ruler to give a physical/conceptual link by measuring a stack and extrapolating.

• Students would be expected to describe the problem in mathematical terms and concepts.

• Students would be challenged to generalize by creating their own problems.
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<tr>
<th>Critical Thinking Skills / Moves</th>
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<tbody>
<tr>
<td>• Conceptualize</td>
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<td>• Verify</td>
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<td>• Extrapolate</td>
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<td>• Explain</td>
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<td>• Defend</td>
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<td>• Check assumptions by</td>
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<td>confronting something that</td>
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<td>impossible</td>
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<td>• Construct system (formula)</td>
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<td>for solving problem</td>
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<td>• Assess the logic of peer</td>
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<td>answers</td>
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Targeting Modalities

- Groups of 5
- Move through (as directed) the following different dimensions of thinking about the following topic.
- The questioning mind is the critical mind.
Targeting Modalities

**Spatial**: create a chart, cartoon, graph, diagram, or other illustrative visual expression.

**Linguistic**: articulate alternative concepts, construct a poem, think of a metaphor or simile.

**Logical**: create an analogy or general rule.

**Musical**: write a jingle or song.

**Intrapersonal**: write a reflection drawing on your personal experiences, beliefs, or values.
Selected Sources


Sources Continued