

EPISTEMIC COGNITION EXAMPLES - 1 of 5

EXAMPLE PROBLEM FROM REFLECTIVE JUDGMENT INTERVIEW

Most historians claim that the pyramids were built as tombs for kings by the ancient Egyptians, using human labor, and aided by ropes, pulleys, and rollers. Others have suggested that the Egyptians could not have built such huge structures by themselves, for they had neither the mathematical knowledge, the necessary tools, nor an adequate source of power.

REFLECTIVE JUDGMENT INTERVIEW PROBES

1. What do you think about these statements?
2. How did you come to hold that point of view?
3. On what do you base that point of view?
4. Can you ever know for sure that your position on this issue is correct? How or why not?
5. When two people differ about issues such as this, is it the case that one opinion is right and one is wrong?
 If yes, what do you mean by "right"?
 if no, can you say that one opinion is in some way better than the other?
 What do you mean by "better"?
6. How is it possible that people have such different points of view about this subject?
7. How is it possible that experts in the field disagree about this subject?

(SOURCE: King, P. M., & Kitchener, K. S. (1994). *Developing reflective judgment*. San Francisco: Jossey-Bass.)

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EXAMPLE QUESTIONS FROM THE EPISTEMOLOGICAL BELIEFS QUESTIONNAIRE

	Strongly Disagree.....Strongly Agree
1. Most words have one clear meaning	1----2----3----4----5
2. I don't like movies that don't have an ending.	1----2----3----4----5
3. People who challenge authority are overconfident.	1----2----3----4----5
4. Self help books are not much help.	1----2----3----4----5
5. An expert is someone who has a special gift in one area.	1----2----3----4----5
6. When I study I look for specific facts.	1----2----3----4----5
7. Scientists can ultimately get to the truth.	1----2----3----4----5
8. How much a person gets out of school depends on the quality of the teacher.	1----2----3----4----5
9. The really smart students don't have to work hard to do well in school.	1----2----3----4----5

(SOURCE: Schommer, M. (1990). The effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, 82, 498-504.)

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VIEWS OF NATURE OF SCIENCE QUESTIONNAIRE (VNOS-Form C)

Instructions

- Please answer each of the following questions. You can use the back of a page if you need more space.
 - Please answer each question **fully**. The more you write, the better we can understand what you mean.
 - **There are no “right” or “wrong” answers to the following questions. We are only interested in your views on a number of issues about science.**
1. What, in your view, is science? What makes science (or a scientific discipline such as physics, biology, etc.) different from other ways of knowing about the world (e.g., religion, philosophy)?
 2. Science textbooks often represent the atom as a central nucleus composed of protons (positively charged particles) and neutrons (neutral particles) with electrons (negatively charged particles) orbiting that nucleus. How certain are scientists about the structure of the atom? What specific evidence **do you think** scientists used to determine what an atom looks like?
 3. It is believed that about 65 million years ago the dinosaurs became extinct. Of the hypotheses formulated by scientists to explain the extinction, two enjoy wide support. The first, formulated by one group of scientists, suggests that a huge meteorite hit the earth 65 million years ago and led to a series of events that caused the extinction. The second hypothesis, formulated by another group of scientists, suggests that massive and violent volcanic eruptions were responsible for the extinction. How are these **different conclusions** possible if scientists in both groups have access to and use the **same set of data** to derive their conclusions?

(SOURCE: Lederman, N. G., Abd-El-Khalick, F., Bell, R. L., & Schwartz, R. S. (2002). Views of Nature of Science Questionnaire: toward valid and meaningful assessment of learners' conceptions of nature of science. *Journal of Research in Science Teaching*, 39(6), 497-521.)

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EXAMPLE OF EPISTEMIC FRAMING AND ITS CONSEQUENCES

1. Lisa: I need to get out the papers.
2. Bethany: OK, so what is the rock cycle?
3. Ben: Well, it starts out as an igneous rock. Right? And then it um-and then it like-
4. Johanna: An igneous rock forms, weathering occurs.
5. Bethany: OK, wait ... Igneous rock.
6. Johanna: [sing-song voice, reciting] Igneous rock forms, weathering occurs... weathering.
7. Ryan: I have all of my sheets if we're allowed to go back in the room.
8. Bethany: OK, what happens next? Lisa? [Lisa has her papers out.]
9. Lisa: Igneous rock...it forms from magma (inaudible) lava. First we have to start with the plates running into each other, and the lava going up.
10. Tracy: It's either erosion (inaudible) or sediments are formed.
While Lisa is speaking, several other students chime in with comments about the "deposits." Tracy decides erosion comes first and tells Bethany to record that:
11. Ben: The deposit goes through erosion, and settles at the bottom of the sea.
12. Lisa: First we have to start with uh first we have to start with the plates – underground.
13. Bethany: Oh wait, so what happens?
14. Tracy: (inaudible) plates underground.
15. Bethany: So, the Teutonic plates move, and-
16. Lisa: Yeah, that's the very beginning.
17. Bethany: OK. [Starting to write] Teutonic plates ...
...
25. Ms. Phelan: Can I make a suggestion?
26. Bethany: Yeah.
27. Ms. Phelan: You're looking at a lot of papers and using a lot of words that you don't know what they mean.
28. Gustavo: ["Sure we do"?]. [Ryan laughs]
29. Ms. Phelan: And if you're doing that, for your model, it's not going to be very good. So, I want to start with what you know, not with what the paper says.
30. Johanna: Well, then we don't know anything!
31. Lisa: Well, the lava comes out, no, the lava comes out and it hardens.
32. Ben: Yeah, the lava comes out.
33. Johanna: So-so a volcano erupts.
34. Ryan: Blam!
35. Lisa: Then, the, the lava shoots up.
36. Bethany: OK. [Starts a new page] So lav-uh-so volcano erupts. [Pause, reading what she is writing] And lava comes out. Right.
37. Lisa: Do we have to talk about minerals too?
38. Students: No, nah. [Johanna, Gustavo, Ben, and Ryan]
39. Bethany: OK, so volcano erupts and lava comes out, the lava cools...and creates a ... what?
40. Gustavo: A rock?

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41. Johanna: An igneous rock?

42. Bethany: An igneous rock.

43. Bethany: Listen up! OK, the volcano erupts, and lava comes out. Lava cools and makes igneous rock. Rain and wind cause small pieces of rock to break off. Sediments form, and rain and wind carry it away, and rain and wind slow down and deposit sediments and this happens over and over again to form layers. OK, so water is added to this—

Bethany is interrupted as students tease her about her hand gestures. She sits on her hands and continues:

44. Bethany: Water is added, and sediment layers are cemented. OK. What happens next?

(SOURCE: Rosenberg, S., Hammer, D., & Phelan, J. (2006). Multiple epistemological coherences in an eighth-grade discussion of the rock cycle. *Journal of the Learning Sciences*, 15(2), 261-292.)