Views of Nature of Science Questionnaire (VNOS)

Version D+

PhysPort
Supporting physics teaching with research-based resources

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Format: Short answer
Duration: 60 minutes
Focus: Beliefs / Attitudes (nature of science, theories and laws, tentativeness, creativity, objectivity, subjectivity, social and cultural influences)
Level: Intro college, High school, Middle school

How to give the test

- If you are interested in learning how your students' nature of science ideas change as a result of your course, give it as both a pre- and post-test.
  - Give the pre-test at the beginning of the term.
  - Give the post-test at the end of the term.
- Use the whole test, with the original wording and question order. This makes comparisons with other classes meaningful.
- Make the test required, and give credit for completing the test (but not correctness). This ensures maximum participation from your students.
- Tell your students there are no right or wrong answers to any item and that the intention is to elicit their views on some issues related to nature of science. Tell them that correctness will not affect their grades (only participation). This helps alleviate student anxiety.
- For more details, read the **PhysPort Guides** on implementation:
  - **PhysPort VNOS implementation guide** (www.physport.org/implementation/VNOS)
  - **PhysPort Expert Recommendation on Best Practices for Administering Belief Surveys** (www.physport.org/expert/AdministeringBeliefSurveys/)

How to score the test

- Download the scoring rubric from PhysPort (www.physport.org/key/VNOS)
- Since the VNOS is an open-ended survey, it is important to interview a subset of your students about their answers. Once you are confident you are accurately interpreting their responses, you can compare the written answers to the scoring rubric, and categorize students' views about seven aspects of the nature of science as naïve, transitional or informed.
- The assessment developers routinely conduct training sessions with users of the VNOS in order to insure correct scoring and reliability in scoring because they find that it is difficult to correctly use the VNOS without the training. Contact the developers, Dr. Norman Lederman (ledermann@iit.edu) or Dr. Judith Lederman (ledermanj@iit.edu) for more information on these training sessions.
- For more information on interviewing students about their answers and scoring the VNOS, see the **PhysPort VNOS implementation Guide** (www.physport.org/implementation/VNOS)
- See the **PhysPort Expert Recommendation on Best Practices for Administering Belief Surveys** for instructions on calculating shift and effect size (www.physport.org/expert/AdministeringBeliefSurveys/)

VIEWS OF NATURE OF SCIENCE

(VNOS D +)

Name: _____

Date: / /

Instructions

- Please answer each of the following questions. You can use all the space provided and the backs of the pages to answer a question.
- Some questions have more than one part. Please make sure you write answers for each part.
- This is not a test and will not be graded. There are no “right” or “wrong” answers to the following questions. I am only interested in your ideas relating to the following questions.

1. What is science?

2. What makes science (or a scientific discipline such as physics, biology, etc.) different from other subject/disciplines (art, history, philosophy, etc.)?

3. Scientists produce scientific knowledge. Do you think this knowledge may change in the future? Explain your answer and give an example.

4. (a) How do scientists know that dinosaurs really existed? Explain your answer.

(b) How certain are scientists about the way dinosaurs looked? Explain your answer.

(c) Scientists agree that about 65 millions of years ago the dinosaurs became extinct (all died away). However, scientists disagree about what had caused this to happen. Why do you think they disagree even though they all have the same information?

(d) If a scientist wants to persuade other scientists of their theory of dinosaur extinction, what do they have to do to convince them? Explain your answer.

5. In order to predict the weather, weather persons collect different types of information. Often they produce computer models of different weather patterns.
(a) Do you think weather persons are certain (sure) about the computer models of the weather patterns?

(b) Why or why not?

6. The model of the inside of the Earth shows that the Earth is made up of layers called the crust, upper mantle, mantle, outer core and the inner core. Does the model of the layers of the Earth *exactly* represent how the inside of the Earth looks? Explain your answer.

7. Scientists try to find answers to their questions by doing investigations / experiments. Do you think that scientists use their imaginations and creativity when they do these investigations / experiments?

a. If **NO**, explain why.

b. If **YES**, in what part(s) of their investigations (planning, experimenting, making observations, analysis of data, interpretation, reporting results, etc.) do you think they use their imagination and creativity? Give examples if you can.

8. Is there a difference between a scientific theory and a scientific law? Illustrate your answer with an example.

9. After scientists have developed a scientific theory (e.g., atomic theory, evolution theory), does the theory ever change? Explain and give an example.

10. Is there a relationship between science, society, and cultural values? If so, how? If not, why not? Explain and provide examples.