PhysPort Implementation Guide:
Views About Science Survey (VASS)

Version P05.07

PhysPort
Supporting physics teaching with research-based resources

Implementation Guide by Adrian Madsen and Sam McKagan

Table of Contents

Implementation

Purpose of the VASS

To characterize student views about knowing and learning science and assess the relation of these views to achievement in science courses.

Course Level: What kinds of courses is it appropriate for?

Intro college and High school

Content: What does it test?

Beliefs / Attitudes (structure and validity of scientific knowledge, scientific methodology, learnability of science, reflective thinking, personal relevance of science)

Timing: How long should I give students to take it?

40 minutes

Example Questions

Sample questions from the VASS:

My understanding of topics in this course depends on:

	1	2	3	4	5	
(a) how well the teacher explains things in class;	a>>b	a>b	a=b	b>a	b>>a	(b) how much effort I put into studying.

When I experience difficulty while studying this course:

	1	2	3	4	5	
(a) I seek help or put the matter of difficulty aside until we discuss it in class;	a>>b	a>b	a=b	b>a	b>>a	(b) I try to figure things out on my own.

Access: Where do I get the test?

Download the test from physport at www.physport.org/assessments/VASS.

Versions and Variations: Which version of the test should I use?

The latest version of the VASS for physics, released in 2007, is version P05.07. Earlier versions include P12, released in 2001, and P204, released in 2004. There are also versions of the VASS for chemistry, biology, geology, general science, and mathematics available from the developer's website. Version numbers starting with P are for physics, while those starting with B or C are for biology or chemistry, respectively.

Administering: How do I give the test?

- Give it as both a pre- and post-test. This measures student learning.
  - Give the pre-test before you cover relevant course material.
  - 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 that the test is designed to evaluate the course (not them), and that knowing how they think will help you teach better. Tell them that correctness will not affect their grades (only participation). This helps alleviate student anxiety.
- Refer to the test by a generic title like "Beliefs / Attitudes Survey" to prevent students from looking up the answers.
- For more details, read the **PhysPort Guides** on implementation:
  - **PhysPort Expert Recommendation on Best Practices for Administering Belief Surveys** (www.physport.org/expert/AdministeringBeliefSurveys/)

Scoring: How do I calculate my students' scores?

- Each student's score is their percentage of expert-like responses out of 39 questions.
- See the **PhysPort Expert Recommendation on Best Practices for Administering Belief Surveys** for instructions on calculating normalized gain and effect size (www.physport.org/expert/AdministeringBeliefSurveys/)
- Use the **PhysPort Assessment Data Explorer** for analysis and visualization of your students' responses (www.physport.org/explore/VASS)

Clusters: Does this test include clusters of questions by topic?

Core-disciplinary aspects *Students need to realize the following aspects of science and to construct their own knowledge accordingly*	Items
1. Nature of science and of anticipated student knowledge:	
N1 Science is about generic: (a) coherently interrelated conceptions, and (b) patterns of thinking, including problem solving, - rather than about idiosyncratic and isolated, situation-specific terms, statements and procedures.	21, 22 24, 28
N2 Scientists rely on multiple ways to (a) represent the situation in any problem and (b) solve it; - rather than concentrating on a single representation or a single problem solving strategy.	23, 26
N3 Mathematical representations help: (a) relate scientific concepts in meaningful ways, and (b) express such relationships objectively, - rather than being good for mere number crunching and open for subjective interpretation.	25, 27
2. Connections:	
I1 Science and mathematics benefit from each other's knowledge, - rather than being each confined to its own domain.	31, 32
I2 Scientists rely on technology for deploying their knowledge in: (a) meaningful ways and (b) novel areas, - rather than for reproducing paper-and-pencil solutions of traditional textbook problems.	29, 30
I3 Science is relevant to everyone's life, - and not just to scientists.	33

Meta-cognitive aspects	Items
3. Learning conditions:	
Locus of control:	
C1 Science is learnable by (a) anyone (b) willing to make the effort, - not just by a few talented people.	2
C2 Achievement depends more on: (a) personal effort, (b) self confidence and (c) perseverance - than on the influence of teacher, peers or textbook.	4, 7, 10
C3 Studying science should be an (a) enjoyable, (b) confidence building and (c) self-satisfying experience, - rather than a frustrating and intimidating undertaking for satisfying curriculum requirement.	1, 3, 11
Meaningful understanding favors:	
C4 Students who come to class with a prepared mind, - rather than those who study only after the teacher covers materials in class;	5
C5 Those who seek information from alternative sources, - rather than those who stick to the textbook;	6
C6 Those who are (a) tolerant, and (b) open to others' ideas - rather than those who stand blindly and firmly by their own ideas; and	8
C7 Those who cooperate with others for knowledge development - rather than for mere task achievement.	9

4. Insightful, meaningful learning requires one to:	
L1 Construct new subject knowledge: (a) on one's own, and (b) delimit its scope, - instead of assimilating it from an authority and memorizing it as given.	12, 16
L2 Deploy knowledge following purposeful plans, - rather than by recalling certain routines learned by rote.	15
L3 Deploy knowledge in a variety of activities (paper-an-pencil exercises, case studies, etc.), - instead of concentrating on traditional end-of-chapter exercises.	19
L4 Continuously: (a) justify, and (b) evaluate one's own work, - rather than getting satisfied with mere task completion.	13, 14
L5 Look for the teacher as a mediator of learning - rather than an authoritative source of information.	17
L6 Contrast and regulate any discrepancy between one's own knowledge and the target scientific knowledge, - instead of blindly assimilating target knowledge.	18
L7 Use assessment for self-evaluation and regulation - rather than for ranking oneself relative to peers.	20

Typical Results: What scores are usually achieved?

Typical results from Halloun and Hestenes 1998:

Table 1
General profile characteristics

Profile Type	Code	Number of Items out of 30
Expert	EP	19 items or more with *expert views*
High Transitional	HTP	15 to 18 items with *expert views*
Low Transitional	LTP	11 to 14 items with *expert views* and an equal or smaller number of items with *folk views*
Folk	FP	11 to 14 items with *expert views* but a larger number of items with *folk views,* or 10 items or less with *expert views*

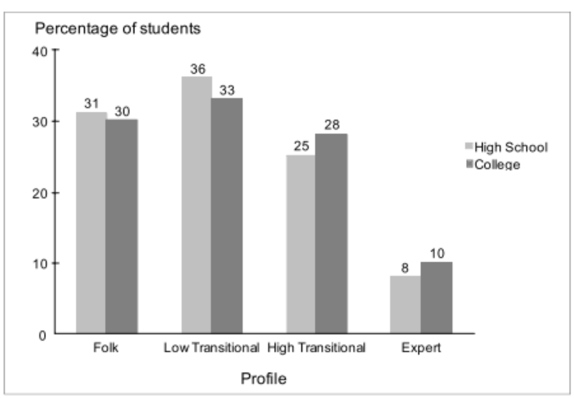

Figure 4. Profile distribution among participating physics students.

Interpretation: How do I interpret my students' score in light of typical results?

Look at the shift between pre- and post-test

Your VASS results are especially useful for comparing shifts in students' beliefs before and after you have made a change to your teaching, for example, trying teaching methods that explicitly focus on model- building and/or developing expert-like beliefs. You can compare the shifts in beliefs before and after you try new teaching techniques as one measure to gauge the effectiveness of the techniques.

Look at the effect size of the change

This tells you how substantially your pre- and post-test scores differ. Compare your effect size to the ranges given below to find out how substantial the change from pre- to post-test was. For more details, read the **PhysPort Expert Recommendation on Effect Size** (www.physport.org/expert/effectsize)

Effect Size	Cohen's d
Large	~0.8
Medium	~0.5
Small	0.2-0.3

Look at clusters of questions

You can also gain insight into what areas of your students' beliefs are being improved through your course by looking at their shifts in favorable or unfavorable beliefs by cluster.

Resources

Where can I learn more about this test?

I. Halloun and D. Hestenes, Interpreting VASS dimensions and profiles for physics students, Sci. & Educ. **7** (6), 553 (1998).

Translations: Where can I find translations of this test in other languages?

We don't have any translations of this assessment yet.

If you know of a translation that we don't have yet, or if you would like to translate this assessment, please contact us!

Background

Similar Tests

The VASS questions use a contrasting alternatives design (CAD) where students are given two viewpoints and asked to compare and contrast two things, whereas the CLASS and MPEX use a standard 5-point Likert scale. The expert-like response to the questions is not always clear, whereas the expert-like response on the CLASS and MPEX is clear. The VASS is useful for discussing the ideas around students' beliefs about learning physics, but is less useful for reliably measuring how expert-like your students' beliefs are. It includes clusters/taxonomies of questions based on questions that are similar in content according to an expert, similar to the MPEX categories.

Research: What research has been done to create and validate the test?

Research Validation: Silver

This is the second highest level of research validation, corresponding to at least 5 of the validation categories below.

- [x] Based on research into **student thinking**
- [x] Studied using **student interviews**
- [x] Studied using **expert review**
- [ ] Studied using **appropriate statistical analysis**
- [x] Research conducted **at multiple institutions**
- [ ] Research conducted **by multiple research groups**
- [x] **Peer-reviewed publication**

Research Overview

The contrasting alternatives design (CAD) questions on the VASS were developed starting with a literature review and construction of a theoretical framework. This framework was used to create an expert/folk taxonomy of student views about science, which underwent expert review. The taxonomy was used to write open-ended and CAD questions, which were given to students, who were later interviewed about their responses. The questions went through several iterations of revision. They VASS questions underwent expert review, and were found to measure what the developers intended. Experts also agreed on the “expert-like” answer to each question. The internal consistency, and test-retest reliability were tested and reasonable results found. The VASS has been given to thousands of students in many institutions and countries. The results are published in four papers.

Developer: Who developed this test?

Ibrahim Halloun

References

- D. Desbien, Modeling Discourse Management Compared to Other Classroom Management Styles in University Physics, Arizona State University, 2002.
- I. Halloun, Views About Science and physics achievement: The VASS story, presented at the AIP Conference Proceedings, College Park, Maryland (USA), 1996.
- I. Halloun and D. Hestenes, Interpreting VASS dimensions and profiles for physics students, Sci. & Educ. **7** (6), 553 (1998).
- I. Halloun, Evaluation of the Impact of the New Physics Curriculum on the Conceptual Profiles of Secondary Students, , 2007.