PhysPort Implementation Guide: Attitudes toward Problem Solving Survey (APSS)

Version 1

PhysPort
Supporting physics teaching with research-based resources

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Implementation

Purpose of the APSS

To survey students' attitudes towards and views of problem solving.

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

Intro college

Content: What does it test?

Beliefs / Attitudes (problem-solving)

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

20 minutes

Example Questions

Sample questions from the APSS:

To what extent do you agree with each of the following statements?

A) Strongly Agree B) Agree Somewhat C) Neutral or Don't Know D) Disagree Somewhat E) Strongly Disagree

If I'm not sure about the right way to start a problem, I'm stuck. There is nothing I can do with that problem except to go see the teacher or a friend for help.

It is never alright to make approximations when solving textbook problems in introductory physics.

Access: Where do I get the test?

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

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

The latest version of the APSS, released in 2003, is version 1.

Administering: How do I give the test?

- Give it as both a pre- and post-test. This measures how your class shifts student thinking.
  - 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 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.
- For more details, read the **PhysPort Guides** on implementation:
  - **PhysPort Expert Recommendation on Best Practices for Administering Concept Inventories** (www.physport.org/expert/AdministeringConceptInventories/)

Scoring: How do I calculate my students' scores?

- Download the answer key from PhysPort (www.physport.org/key/APSS)
- The "percent favorable score" is the percentage of questions where a student agrees with the expert response. (Dis)agree and strongly (dis)agree are counted as equivalent responses.
- 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/)

- Use the **PhysPort Assessment Data Explorer** for analysis and visualization of your students' responses (www.physport.org/explore/APSS)

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

There are no clusters of questions on the APSS.

Typical Results: What scores are usually achieved?

Typical scores on the AAPS from (Marx and Cummings, 2006).

Figure 2 displays the matched pre/post- instructional scores on the APSS for two sections of McDaniel students during Phase II of our study (labeled PS and N-PS). Also included are the pre/post-instructional averages from RPI, and the post-instructional averages for McDaniel College and Southern Connecticut State University (SCSU) for the Fall semester of 2002.

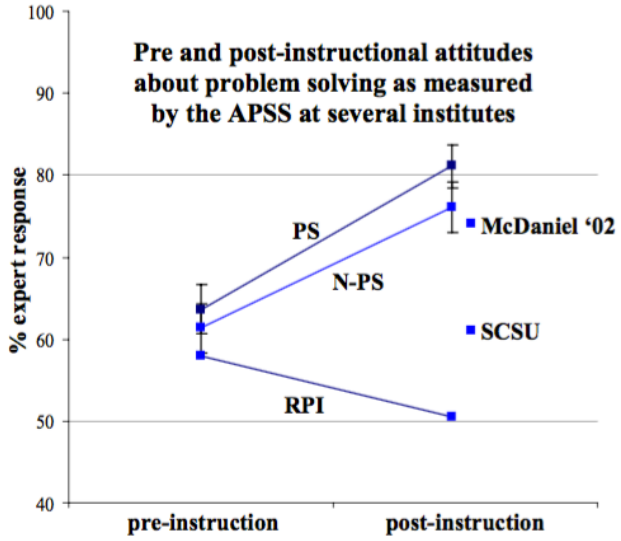

Figure 2: Pre/post-instructional data for the APSS. Error bars are the standard error. The points for which we have only post-instructional data are shifted slightly to the right for clarity purposes, only. The RPI data, and the post-instructional-only data for McDaniel and SCSU are adapted from reference 5.

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

Look at the shift between pre- and post-test

Your APSS results are especially useful for comparing shifts in students' beliefs about problem-solving before and after you have made a change to your teaching, for example, trying teaching methods that explicitly focus on improving your students beliefs about problem-solving. You can compare the shifts in percent favorable or unfavorable 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 individual questions:

You can also look at the post-test scores for individual questions to learn more about which particular concepts your students did well on and which they need help with. This can help you figure out which parts of your teaching worked well, and which parts you could improve in the future.

Resources

Where can I learn more about this test?

K. Cummings, S. Lockwood, and J. Marx, Attitudes Toward Problem Solving as Predictors of Student Success, presented at the Physics Education Research Conference 2003, Madison, WI, 2003.

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 topics covered, questions and format of the AAPS and APSS are quite similar. Fourteen of the questions are the same or very similar between the tests. The AAPS has more questions, so it covers a few more aspects of problem-solving than the APSS, including how students feel about problem-solving, how they learn from the problem-solving process, use of pictures/diagrams and what students actually do while solving a problem. The AAPS also covers similar topics to the APSS, but in more depth.

The CLASS, MPEX, EBAPS and VASS also contain questions about students' attitudes and beliefs about problem solving, similar to those on the APSS and AAPS. The AAPS and APSS can be used to specifically target problem-solving beliefs, while the CLASS, MPEX, EBAPS and VASS ask about a wider range of beliefs and attitudes.

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

Research Validation: Bronze

This is the third highest level of research validation, corresponding to at least 3 of the validation categories below.

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

Research Overview

Some of the Likert-scale agree/disagree questions on the APSS were adopted from the MPEX, while others were newly created. The questions underwent expert review and were revised. The APSS was given to over 250 introductory physics students at a private research institution, over 20 introductory physics students at a small liberal arts college and over 20 students at a medium sized state university. There were moderate correlations between APSS scores and other measures such as exam average and FMCE average. It was also found that those in the top third of the FMCE score distribution were more "expert-like" on every APSS question than those in the bottom third of the FMCE score distribution. The APSS has been given to over 300 students at three universities, and the results published in two peer-reviewed publications.

Developer: Who developed this test?

References

- K. Cummings, S. Lockwood, and J. Marx, Attitudes Toward Problem Solving as Predictors of Student Success, presented at the Physics Education Research Conference 2003, Madison, WI, 2003.
- J. Marx and K. Cummings, What Factors Really Influence Shifts in Students' Attitudes and Expectations in an Introductory Physics Course? , presented at the Physics Education Research Conference 2006, Syracuse, New York, 2006.