

Attitudes and Approaches to Problem Solving Survey (AAPS)

Version 1



PhysPort

Supporting physics teaching
with research-based resources

downloaded from [PhysPort.org](https://www.physport.org)

Developed by: Andrew Mason and Chandralekha Singh

Format: Pre/post, Multiple-choice, Agree/disagree

Duration: 15 minutes

Focus: Beliefs / Attitudes (problem-solving)

Level: Graduate, Upper-level, Intermediate, Intro college

How to give the test

- Give it as both a pre- and post-test. This measures how your class shifts student attitudes and approaches to problem-solving.
 - 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 AAPS implementation guide** (www.physport.org/implementation/AAPS)
 - **PhysPort Expert Recommendation on Best Practices for Administering Belief Surveys** (www.physport.org/expert/AdministeringBeliefSurveys/)

How to score the test

- Download the answer key from PhysPort (www.physport.org/key/AAPS)
- To calculate the average score for a question, give +1 for each favorable response (student's response matches the expert-like response), a -1 is assigned to each unfavorable response (student's response does not match expert-like response), and give 0 for neutral responses. Agree (or disagree) are scored the same as strongly agree (or disagree).
- Find the average score for each student on the pre- and post-test, and use these to find the class average for the pre- and post-test.
- 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/AAPS)

Attitudes and Approaches to Problem Solving Survey

by Andrew Mason and Chandralekha Singh

To what extent do you agree with each of the following statements when you solve physics problems?

Answer with a single letter as follows:

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

1. If I'm not sure about the right way to start a problem, I'm stuck unless I go see the teacher/TA or someone else for help.
2. When solving physics problems, I often make approximations about the physical world.
3. In solving problems in physics, being able to handle the mathematics is the most important part of the process.
4. In solving problems in physics, I always identify the physics principles involved in the problem first before looking for corresponding equations.
5. "Problem solving" in physics basically means matching problems with the correct equations and then substituting values to get a number.
6. In solving problems in physics, I can often tell when my work and/or answer is wrong, even without looking at the answer in the back of the book or talking to someone else about it.
7. To be able to use an equation to solve a problem (particularly in a problem that I haven't seen before), I think about what each term in the equation represents and how it matches the problem situation.
8. There is usually only one correct way to solve a given problem in physics.
9. I use a similar approach to solving all problems involving conservation of linear momentum even if the physical situations given in the problems are very different.
10. If I am not sure about the correct approach to solving a problem, I will reflect upon physics principles that may apply and see if they yield a reasonable solution.

11. Equations are not things that one needs to understand in an intuitive sense; I routinely use equations to calculate numerical answers even if they are non-intuitive.
12. Physics involves many equations each of which applies primarily to a specific situation.
13. If I used two different approaches to solve a physics problem and they gave different answers, I would spend considerable time thinking about which approach is more reasonable.
14. When I solve physics problems, I always explicitly think about the concepts that underlie the problem.
15. When solving physics problems, I often find it useful to first draw a picture or a diagram of the situations described in the problems.
16. When answering conceptual physics questions, I mostly use my "gut" feeling rather than using the physics principles I usually think about when solving quantitative problems.
17. I am equally likely to draw pictures and/or diagrams when answering a multiple-choice question or a corresponding free-response (essay) question.
18. I usually draw pictures and/or diagrams even if there is no partial credit for drawing them.
19. I am equally likely to do scratch work when answering a multiple-choice question or a corresponding free-response (essay) question.
20. After I solve each physics homework problem, I take the time to reflect and learn from the problem solution.
21. After I have solved several physics problems in which the same principle is applied in different contexts, I should be able to apply the same principle in other situations.
22. If I obtain an answer to a physics problem that does not seem reasonable, I spend considerable time thinking about what may be wrong with the problem solution.
23. If I cannot solve a physics problem in 10 minutes, I give up on that problem.
24. When I have difficulty solving a physics homework problem, I like to think through the problem with a peer.
25. When I do not get a question correct on a test or homework, I always make sure I learn from my mistakes and do not make the same mistakes again.

26. It is more useful for me to solve a few difficult problems using a systematic approach and learn from them rather than solving many similar easy problems one after another.
27. I enjoy solving physics problems even though it can be challenging at times.
28. I try different approaches if one approach does not work.
29. If I realize that my answer to a physics problem is not reasonable, I trace back my solution to see where I went wrong.
30. It is much more difficult to solve a physics problem with symbols than solving an identical problem with a numerical answer.
31. While solving a physics problem with a numerical answer, I prefer to solve the problem symbolically first and only plug in the numbers at the very end.
32. Suppose you are given two problems. One problem is about a block sliding down an inclined plane with no friction present. The other problem is about a person swinging on a rope. Air resistance is negligible. You are told that both problems can be solved using the concept of conservation of mechanical energy of the system. Which one of the following statements do you MOST agree with? (Choose only one answer.)
- A) The two problems can be solved using very similar methods.
 - B) The two problems can be solved using somewhat similar methods.
 - C) The two problems must be solved using somewhat different methods.
 - D) The two problems must be solved using very different methods.
 - E) There is not enough information given to know how the problems will be solved.
33. Suppose you are given two problems. One problem is about a block sliding down an inclined plane. There is friction between the block and the incline. The other problem is about a person swinging on a rope. There is air resistance between the person and air molecules. You are told that both problems can be solved using the concept of conservation of total (not just mechanical) energy. Which one of the following statements do you MOST agree with? (Choose only one answer.)
- A) The two problems can be solved using very similar methods.
 - B) The two problems can be solved using somewhat similar methods.
 - C) The two problems must be solved using somewhat different methods.
 - D) The two problems must be solved using very different methods.
 - E) There is not enough information given to know how the problems will be solved.

Expert-Like Responses to Attitudes and Approaches to Problem Solving Survey
by Andrew Mason and Chandralekha Singh

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- E) Strongly Disagree

- | | |
|---------|---------|
| 1. D/E | 18. A/B |
| 2. A/B | 19. A/B |
| 3. D/E | 20. A/B |
| 4. A/B | 21. A/B |
| 5. D/E | 22. A/B |
| 6. A/B | 23. D/E |
| 7. A/B | 24. A/B |
| 8. D/E | 25. A/B |
| 9. A/B | 26. A/B |
| 10. A/B | 27. A/B |
| 11. D/E | 28. A/B |
| 12. D/E | 29. A/B |
| 13. A/B | 30. D/E |
| 14. A/B | 31. A/B |
| 15. A/B | 32. A/B |
| 16. D/E | 33. A/B |
| 17. A/B | |