PhysPort Implementation Guide:
Sources of Self-Efficacy in Science Courses - Physics
(SOSESC-P)
Version 1

PhysPort
Supporting physics teaching with
research-based resources

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Implementation

Purpose of the SOSESC-P

To assess students' beliefs that they can succeed in their physics course.

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

Intro college

Content: What does it assess?

Beliefs / Attitudes (self-efficacy)

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

20 minutes

Example Questions

Sample statements from the SOSESC-P:

I am capable of receiving good grades on my assignments in this class.

1 Strongly disagree   2 Disagree   3 Neutral   4 Agree   5 Strongly agree

Listening to the instructor and other students in question-and-answer sessions makes me think that I cannot understand physics.

1 Strongly disagree   2 Disagree   3 Neutral   4 Agree   5 Strongly agree

I get positive feedback about my ability to recall physics ideas.

1 Strongly disagree   2 Disagree   3 Neutral   4 Agree   5 Strongly agree

Access: Where do I get the assessment?

Download the assessment from physport at www.physport.org/assessments/SOSESCP.

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

The latest version of the SOSESC-P, released in 2004, is version 1. The SOSESC has been adapted for several disciplines including physics and chemistry.

Administering: How do I give the assessment?

- 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. 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 SOSESC-P implementation guide** (www.physport.org/implementation/SOSESCP)
  - **PhysPort Expert Recommendation on Best Practices for Administering Belief Surveys** (www.physport.org/expert/AdministeringBeliefSurveys/)

Scoring: How do I calculate my students' scores?

- Download the answer key from PhysPort (www.physport.org/key/SOSESCP)
- The SOSESC-P score is the average Likert rating for a student agreeing with the expert response for each question. For instructions on scoring the SOSESC-P, see the **PhysPort SOSESC-P implementation guide** (www.physport.org/implementation/SOSESCP)
- 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/)

The SOSESC-P answer key contains "typically" scored items, and "reverse" scored items. For typically scored items, students get points (1-5) for agreeing to the statement, e.g., a student receives 5 points for strongly agreeing to a typically scored item, 4 points for agreeing etc. For reverse scored items, students get points (1-5) for disagreeing with the items, e.g., a student gets 5 points for strongly disagreeing with a reverse scored statement. A student's SOSESC-P score is the average of the points on each question, with possible SOSESC-P mean values ranging from 1 to 5.

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

Self efficacy is understood to be affected in four ways (Bandura, 1977). The questions corresponding to each of these are shown below:

- Emotional Arousal: 2, 6, 9, 13, 18, 24, 26, 29
- Vicarious Learning: 3, 7, 10, 19, 23, 27, 31
- Perfomance Accomplishment: 1, 4, 8, 11, 14, 15, 17, 22, 30, 33
- Verbal Encouragement/Social Persuasion: 5, 12, 16, 20, 25, 28, 32

Typical Results: What scores are usually achieved?

Typical scores on the SOSESC-P from Sawtelle, Brewe and Kramer, 2010.

TABLE 1. Comparison of PRE to POST Total SOSESC-P Results by Course Type.

	Modeling Instruction (n = 70)	Lecture (n = 175)
Pre	3.838	3.565
Post	3.859	3.302
t	0.229	-6.923
p	0.819	<.0005***
Cohen's d	0.027	0.5233
95% CI (LL, UL)	(-0.207, 0.262)	(-0.6807, -0.365)

***p<.0005
CI = Confidence interval around Cohen's d, LL = Lower limit, UL = Upper limit

Typical Results from Fencl and Scheel, 2004:
Multiple regression analyses, controlling for the influence of ACT score and student sex, were conducted to determine which significantly related teaching strategies uniquely predicted self-efficacy. Collaborative learning, then demonstration, question & answer, and conceptual problem assignments had the greatest impact on physics self-efficacy. Both student-student climate and, especially, instructor-student climate were also significantly correlated to all sources of self-efficacy.

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

It is hoped that students' SOSESC-P scores improve as a result of your course or at least do not decrease from pre- to post-test. Aim for positive shifts in scores from pre- to post-test. You can also compare your SOSESC-P scores to those listed in Typical Results. The test developers found that SOSESC scores varied by teaching method, with more interactive teaching methods resulting in higher SOSESC-P scores. You could expect your scores to be similar to other courses taught with the same teaching methods.

Resources

Where can I learn more about this assessment?

H. Fencl and K. Scheel, Pedagogical approaches, contextual variables, and the development of student self-efficacy in undergraduate physics courses , presented at the Physics Education Research Conference 2003, Madison, WI, 2003.

Translations: Where can I find translations of this assessment 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 Assessments

The SOSESC-P has 33 questions, whereas the PSEQ and SEP have 5 and 8 questions, respectively, so the SOSESC-P probes more dimensions of self-efficacy in more depth than the other surveys. There is a lot more variety in the questions on the SEP than the questions on the PSEQ. The SEP asks students about their belief that they can solve very specific physics problems, their comfort using a computer, and if they consider themselves good at mathematics, whereas the PSEQ questions are about physics in general. All have the same level of research validation

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

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

A portion of the Likert-scale questions on the SOSESC were taken from existing math and general academic surveys of self-efficacy. Additional new questions were written based on the developers experience with undergraduate science education. The SOSESC was given to over 600 undergraduates, and appropriate analysis of validity and reliability was conducted. A confirmatory factor analysis was performed to ensure the four categories of questions were aligned with the way students thought about the questions. The SOSESC has been given to over 1100 students at several universities and the results published in three peer-reviewed publications.

Developer: Who developed this assessment?

Heidi Fencl and Karen Scheel

References

- H. Fencl and K. Scheel, Research and Teaching: Engaging Students - An Examination of the Effects of Teaching Strategies on Self-Efficacy and Course Climate in a Nonmajors Physics Course, J. Coll. Sci. Teaching **35** (1), 20 (2005).
- V. Sawtelle, E. Brewe, and L. Kramer, Positive Impacts of Modeling Instruction on Self-Efficacy, presented at the Physics Education Research Conference 2010, Portland, Oregon, 2010.