

How an active-learning class influences physics self-efficacy in pre-service teachers

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Education majors are required to enroll in a physics course designed specifically for them:



This course is hands-on, inquiry driven, and highly collaborative.

Students gain content knowledge¹, but such gains may be futile if the course does not ensure that students feel efficacious in doing science: *feelings of self-efficacy are tied to incentives to act²*.

self-efficacy: belief in one's capabilities to perform a given task; increases are related to learning, motivation, and academic achievement^{3,4}.

Bandura hypothesized² that self-efficacy came from four primary sources:

1. personal mastery experience
2. vicarious experience (e.g., observation of others at the same level)
3. evaluative feedback
4. interpretation of one's own physiological and affective experience

What specific influences from this class do the students report as affecting their SE?

Data Sources:

Code	Semester	Instructor	# Participating
S11A	Spring 2011	A	17
S11C	Spring 2011	C	19
F11B	Fall 2011	B	14
F11C	Fall 2011	C	34
S12C	Spring 2012	C	34

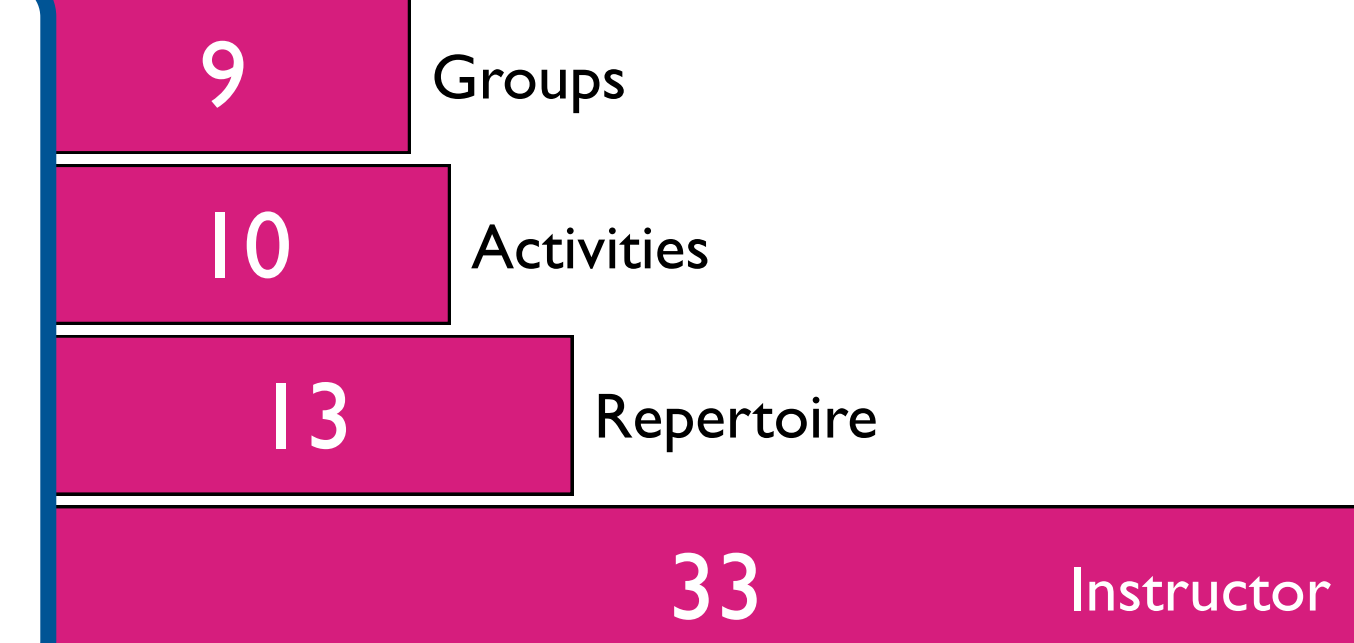
1. e.g., K. C. Trundle, R. K. Atwood, and J. E. Christopher, *Journal of Research in Science Teaching* **44**, 303–326 (2007).
2. A. Bandura, *Self-efficacy: The exercise of control*, W. H. Freeman and Company, New York, 1997.
3. e.g., J. W. Thomas, L. Iventosch, and W. D. Rohwer, *Contemporary Educational Psychology* **12**, 344–364 (1987).
4. R. M. Klassen, and E. L. Usher, in *Advances in Motivation and Achievement: Vol 16A*, edited by T. C. Urdan, and S. A. Karabenick, Emerald Publishing Group, Bingley, UK, 2010, pp. 1–33.

We Asked Students:

Q1: Are there other things that happened this semester that influenced your confidence in understanding and using science? If so, please tell us what affected you and how it affected your confidence.

Q2: Please explain ways in which the class changed your confidence level in science.

Q3: What would have further helped you improve your confidence in understanding and using science?



Before I started this class I did not like science at all and didn't feel confident in teaching it. After taking this course, I feel like I have numerous activities I could do in the classroom. (S12C)

I now understand more basic science that will be applied throughout my lifetime. (F11C)

We were able to learn specific concepts and then directly apply them. (F11B)

I'm less confident, the concepts confused me. (S12C)

[It is] very difficult to learn when you are not being taught, but instead the professor has the class "teach themselves"... how can a student learn something that they do not know by teaching themselves [sic]? Isn't that what the professor is there for, to teach the students? (S11A)

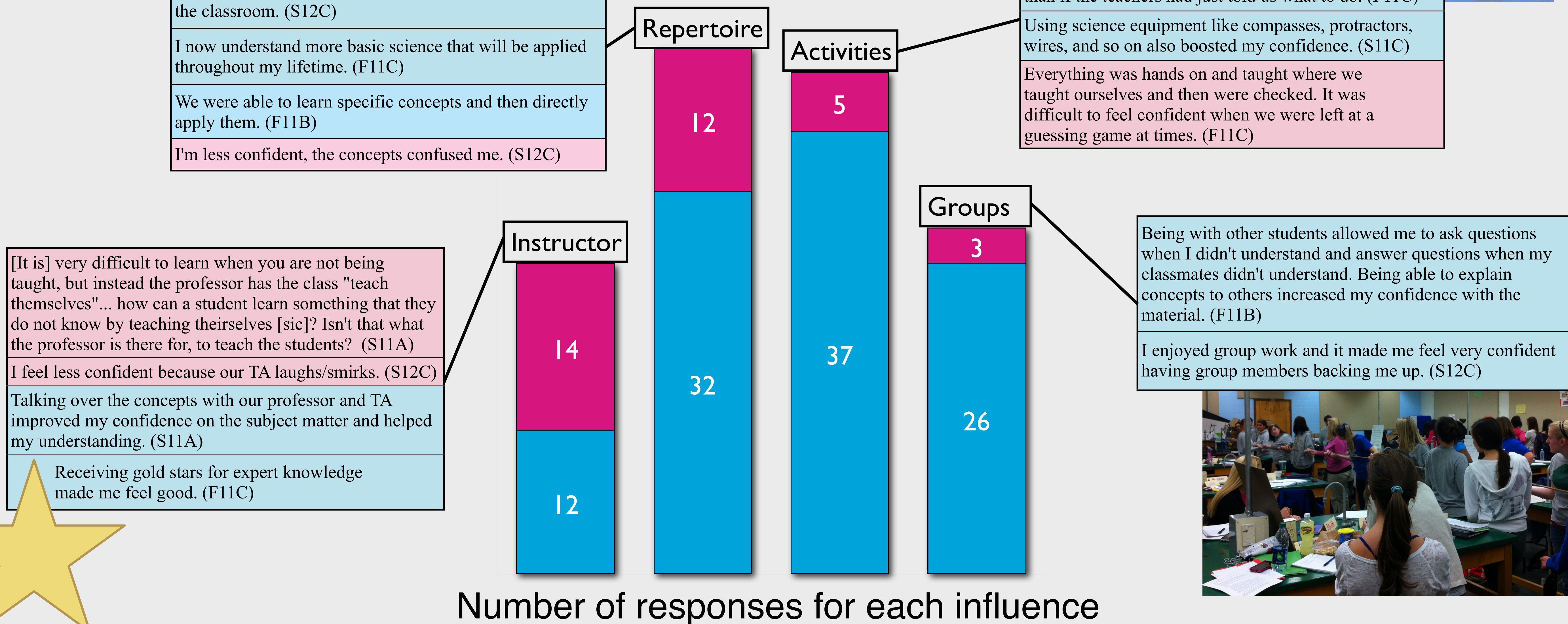
I feel less confident because our TA laughs/smirks. (S12C)

Talking over the concepts with our professor and TA improved my confidence on the subject matter and helped my understanding. (S11A)

Receiving gold stars for expert knowledge made me feel good. (F11C)

Four major influences

■ Negative
■ Positive



Working through the book everyday helped me most. (S11A)

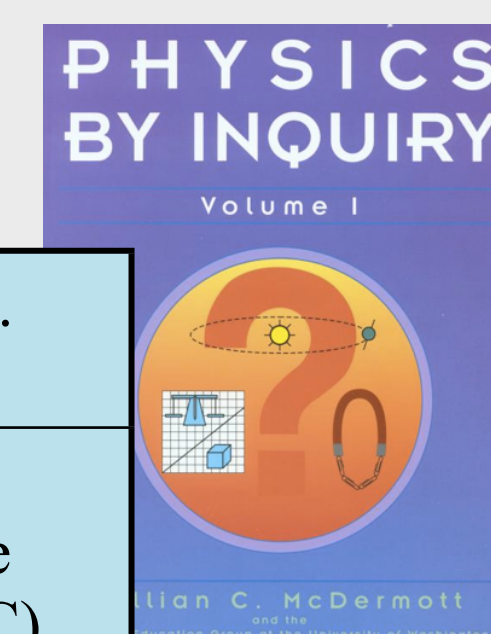
Being forced to figure things out kind of on our own helped my confidence in understanding science more than if the teachers had just told us what to do. (F11C)

Using science equipment like compasses, protractors, wires, and so on also boosted my confidence. (S11C)

Everything was hands on and taught where we taught ourselves and then were checked. It was difficult to feel confident when we were left at a guessing game at times. (F11C)

Being with other students allowed me to ask questions when I didn't understand and answer questions when my classmates didn't understand. Being able to explain concepts to others increased my confidence with the material. (F11B)

I enjoyed group work and it made me feel very confident having group members backing me up. (S12C)



Number of responses for each influence

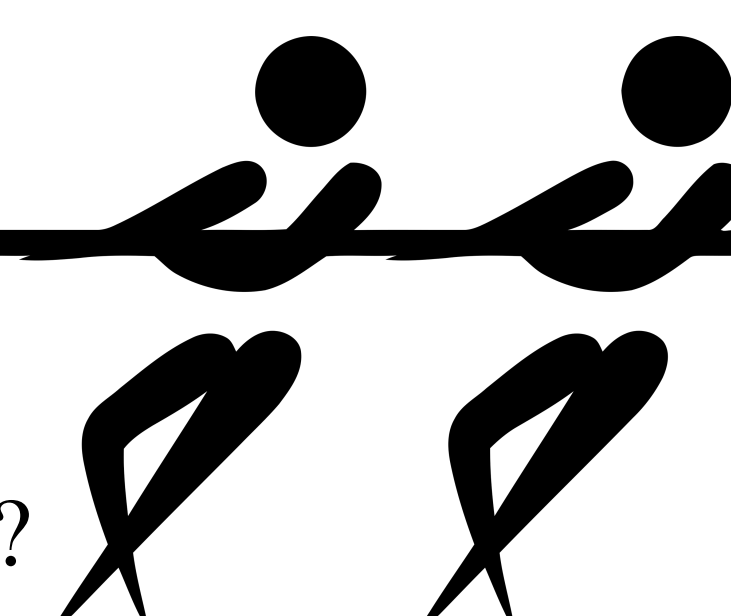
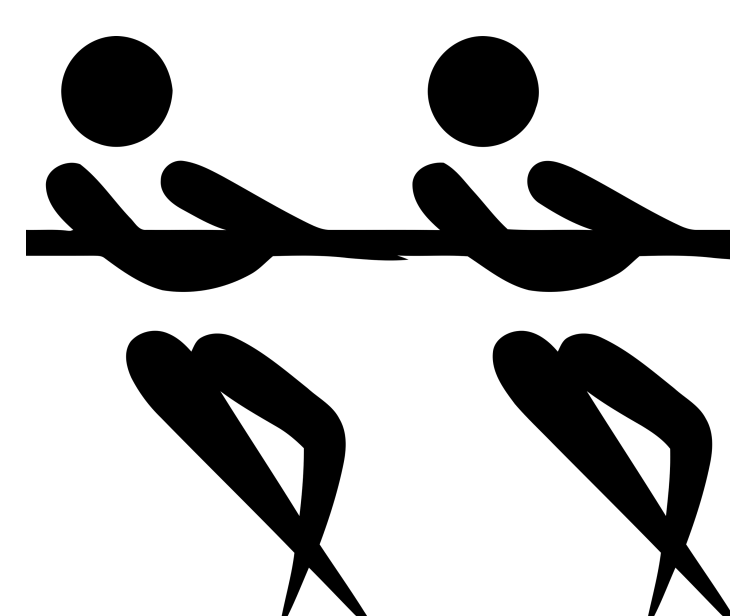
"I can do it!"

Benefits to SE: Building up a repertoire of scientific knowledge, procedures, and classroom activities, working with peers, hands-on activities, and instructor guidance and support.

TENSION

Detriments to SE: Difficulty level of content, lack of intervention by instructor (especially by not telling students that they are "right" or "wrong" or what they are expected to do).

"Tell me what to do!"



Questions for further investigation: How do these findings map onto Bandura's hypothesis? Is the tension between or within the students? Does *lecture* modify SE, or the expectancy violation in *not receiving* lecture?