Building Education Majors' Confidence for Teaching Physics

College of Education

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P20 Motivation & Learning Lab

Introduction

- Science performance in elementary and middle schools in the U.S. is poor relative to other countries, as evidenced by low student scores on state and national tests (34% and 30% of students scored at or above "proficient" in science in Grades 4 and 8, respectively, on the 2009 NAEP test as reported by NCES).
- Beliefs in one's ability to understand science and to teach science content are important predictors of how well one will actually teach science material (Schoon & Boone, 1998).
- Teaching self-efficacy is related to teacher motivation, job satisfaction, use of instructional strategies, and student achievement (see Klassen, Tze, Betts, & Gordon, 2011, for a review).

Purpose of the Study

The purpose of this study was to examine the content-related and teaching efficacy beliefs of elementary and middle school education majors enrolled in a semester-long physics course designed for preservice teachers.

Method

Participants

Participants in the study were 51 education majors (i.e., preservice teachers) from a Southeastern U.S. land-grant university who were enrolled in two sections of a 100-level physics course, *Physics and Astronomy for Teachers,* in the spring of 2011. Participants were 94% female and most were 21-23 years of age. Participants were in their second (21%), third (63%), fourth (14%), or fifth (2%) year of undergraduate studies.

Measures

Physics Self-Efficacy Scale

- Participants rated how certain they were that they could do 19 science-related tasks covered in the course (e.g., "I can explain what causes the seasons on Earth") on a scale from 0 (*Not very certain*) to 100 (*Very certain*).

Physics Teaching Self-Efficacy Scale

- Participants rated their self-efficacy that they could teach these same 19 science-related tasks (e.g., "I can teach students what causes the seasons on Earth.") on a scale from 0 (*Not very certain*) to 100 (*Very certain*).

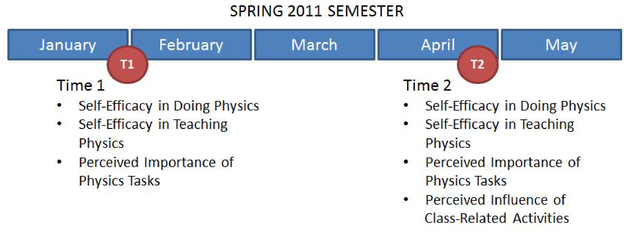
Perceived Importance of Physics Tasks

- Participants rated how important it was for their students to be able to perform these same 19 science-related tasks (e.g., "Explaining what causes the seasons on Earth") on a scale from 0 (*Not very important*) to 100 (*Very important*).

Perceived Influence of Class-Related Activities

- Participants rated how influential various class-related activities (e.g., keeping a notebook, homework) were on their confidence to do and teach physics from -50 (*This activity made me feel much less confident*) to +50 (*This activity made me feel much more confident*).

Design



Analyses

- Descriptive statistics and zero-order correlations were calculated for all variables.
- Paired-samples *t* tests were conducted to examine mean differences in preservice teachers' content and teaching self-efficacy in physics across the semester.
- One-way ANOVA and post-hoc *t* tests were used to examine whether mean differences in self-efficacy were related to the reported amount of teaching experience.
- Independent-samples *t* tests were used to determine whether students' physics self-efficacy and physics teaching self-efficacy in one course section changed more than in the other section.
- Mean ratings reflect students' judgments of how class-related activities influenced their confidence for doing and teaching physics.

Results

Table 1. Means, Standard Deviations, Zero-Order Correlations for All Variables

	M	*SD*	1	2	3	4
1. Age	21.67	4.55	-			
2. Completed Science Courses	3.18	1.94	.01	-		
3. Physics Self-Efficacy	82.69	10.88	-.01	.09	-	
4. Physics Teaching Self-Efficacy	82.17	11.94	.21	-.01	.84*	-
5. Perceived Importance	79.56	16.03	.06	.04	.47*	.54*

Note. Time 2 was used for the variables in the matrix.
*p < .01.

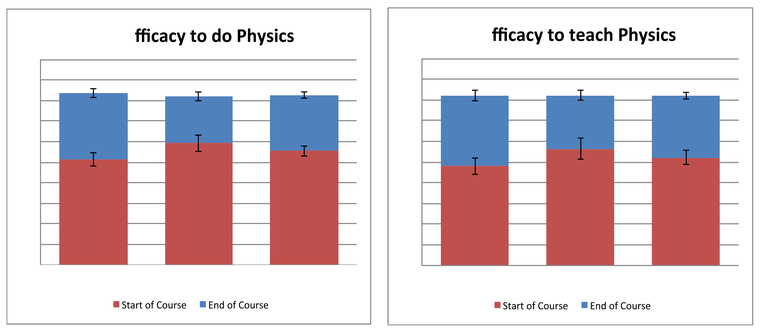


Figure 1. Changes in self-efficacy across the semester, by course section

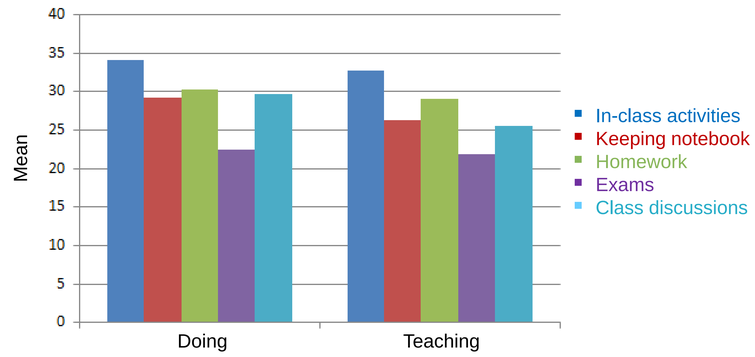


Figure 2. Mean levels of perceived influence of class-related activities

Key Findings

- Education majors' self-efficacy in doing and in teaching physics increased from beginning to end of the semester.
- Both efficacy judgments were positively related to perceived importance of the physics tasks and unrelated to completed science courses, years in school, and prior teaching experience.
- Changes in self-efficacy did not differ by section.
- In-class activities had the most influence on students' confidence for doing and teaching physics, whereas exams were reported to have the least influence on their confidence.

Conclusion

- Physics and Astronomy for Teachers helped build confidence for doing and in teaching physics.
- Course experiences such as in-class activities help enhance both physics self-efficacy and physics teaching self-efficacy.
- Being able to perform a physics task successfully might strengthen preservice teachers' beliefs that they can teach what they know and that the concepts they are teaching are important. This causal relationship should be tested.
- Future research should examine other classroom variables (e.g., teacher behaviors, time-on-task), qualitative data from interviews, and a comparison of physics-for-teachers courses and lecture-based general physics courses with respect to their influence on preservice teachers' self-efficacy.

References

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