Attitudes Towards Science and Science Teaching –

Understanding How Coursework and Practicum Affect Preservice Elementary Teachers

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Introduction

As a professor of a science methods course at UW Eau Claire, Dr. Rosin noticed that many preservice teachers commented on the negative experiences they had, and negative attitudes they held, towards science. This is concerning because as future elementary and middle school teachers, research has indicated these attitudes could affect how much science is taught in their future classrooms (Palmer, 2002). The purpose of this research project is to gather information on the attitudes and experiences of preservice teachers in: science and science teaching, the science methods course and the practicum experience. A review of the data revealed any trends as to how the preservice teachers' attitudes have changed positively, negatively, or not at all and how the experiences influenced their attitudes. The findings will inform the science methods course as to what occurs during the practicum and how to better align course outcomes to the practicum experience.

Methods

Participants

Participants were sought from students enrolled in the science methods course (ES308) during Spring 2016 and Fall 2016. Preservice teachers in this course are at the Junior or Senior level of study and are predominately white females. Additional participants will be sought in May from the Spring 2017 term. For Spring and Fall 2016 terms there were a total of 56 participants for the survey and 2 who completed semi-structured interviews.

Framework

To develop both a general and detailed research picture, a mixed methods framework is used. Mixed methods is a study design in which the researchers collect and analyze data by integrating and drawing inferences from quantitative as well as qualitative methods (Teddlie & Tashakkori, 2006). A quantitative online survey and qualitative semi-structured interviews are used in this study.

Survey

The majority of the data collected comes from an anonymous online survey. The survey link was sent to all preservice teachers enrolled in the science methods course (ES308) at the end of the course and practicum component. The intent of the survey questions is to get a broad overview of the preservice teachers' attitudes towards science and science teaching, and how the information taught in the science methods course aligns, or not, with the practicum experience. The survey consists of 10 questions that focus on the topics:

- Attitudes towards science before and and after ES308.
- Attitudes towards science teaching before and after ES308.
- Ability to observe and teach science during practicum.
- Whether the science pedagogy taught in ES308 is the pedagogy observed/used during practicum.

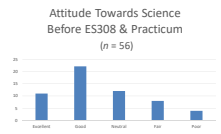
The survey questions use a 5-point Likert scale of: *Excellent, Good, Neutral, Fair,* and *Poor.* An open text box is included to allow the preservice teachers to elaborate on their rating. Preservice teachers were not required to answer all questions. Descriptive summary statistics were run on the data.

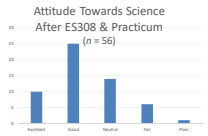
Semi-Structured Interviews

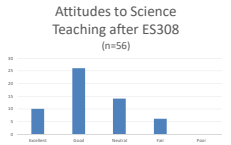
The semi-structured interviews are used to develop depth in the data gathered from the survey. An invitation to participate in the interviews is included in the second email note that preservice teachers receive one week after the first email note invited them to participate in the survey. Like the survey, the questions being asked are intended to gather information on the preservice teachers' attitudes towards science, science teaching, and whether the information taught in the science methods course aligns with the pedagogy developed during practicum. While the questions are similar, the interview allows for the preservice teachers to elaborate on their answers and provide more specific responses. Interview data was reviewed for patterns that supported or refuted findings in the survey data.

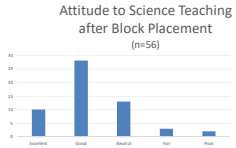
Results

Survey results indicated that preservice teachers' science attitudes increased toward the *good* and *excellent* categories after ES308 and the practicum, and decreased in *fair* and *poor*. Five preservice teachers wrote how they felt more confident in their ability to teach science lessons, particularly after the practicum. Additionally, two preservice teachers who held less positive attitudes towards science teaching after the practicum wrote that they did not have the option to teach a science lesson during their practicum.

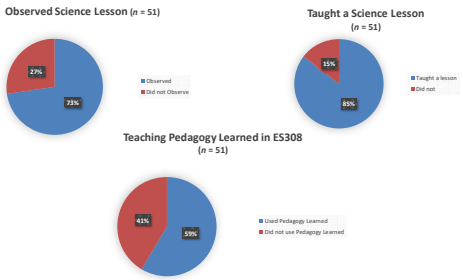








While there was an increase in positive attitudes towards science and science teaching after the science methods course, preservice teachers commented wanting to see more adjustments to the course in the following areas: cross-curricular activities (2x), science content (2x), resource s(5x), addressing misconceptions (2x), hands on experiences (2x), and more opportunities to observe and/or teach more science lessons(7x). Whether these adjustments are possible to the course due to current course outcomes and time constraints, is not discernible at this time.



The inability for some preservice teachers to observe and/or teach a science lesson was a frequent survey comment (7x) when asked what they would change about the practicum. Ten preservice teachers emphasized how helpful it was to actually teach a science lesson. Another problem encountered was the lack of time devoted to teaching science lessons (10x). Several preservice teachers said that this was due to limitations of the lesson due to either the cooperating teacher or using science kits (14x). Lack of time was particularly problematic as this issue prevented some from teaching a full lesson, and instead they taught "mini lessons" where going in depth with science content is not possible. During interviews, a preservice teacher noted how she was not given the chance to teach a science lesson and had to seek out the opportunity to observe science in another classroom. Teaching and observing science is important as another interviewee, who was placed in a classroom that taught all the science for a grade commented, how it felt as if the practicum was the first time they "were actually able to apply [their] science knowledge to the classroom".

Survey data also revealed that over a third of preservice teachers were not able to practice the science teaching pedagogies taught in ES308 (Inquiry and Constructivism). As one interview preservice teacher noted, they used a science kit while teaching their lessons, so they were only able to incorporate the pedagogies learned when asking their students questions.

Discussion

A large majority of the preservice teachers enrolled in the University of Wisconsin- Eau Claire's science methods course were able to teach and observe a science lesson. This finding is in contrast to several studies that reported preservice teachers not being able to see and teach science lessons while in their placement (Anderson, Bartholomew, & Moeed, 2009; O'Sullivan, 2008; Varma, Volkmann & Hanuscin, 2009). However, despite a majority of preservice teachers being able to teach a science lesson, many commented that they felt as if they needed to observe and teach more science lessons in their practicums. Common trends of what preservice teachers reported wanting to see more of in ES308 include:

- More activities that cover multiple subject areas.
- Having all school placements to allow for science lesson teaching and observing.
- More science content.
- More science resources.
- More on how to address science misconceptions.
- More hands-on experiences

Why some preservice teachers are not feeling confident/ prepared to teach science varied. Common trends reported include:

- Didn't have the opportunity to teach science lessons in practicum.
- Having limited time to teach science lessons in practicum.
- Science not being a practicum school priority.
- Unsure whether the elementary students were engaged during science teaching.
- Preservice teachers needed more time to prepare.

In some cases, when the preservice teacher would be unable to observe and/or teach science, the cooperating teacher worked with the preservice teachers to give them an opportunity to observe and/or teach a science lesson by either changing the classroom schedule or by having the preservice teachers go into a different classroom. However, this was not the case for all preservice teachers. One interviewed preservice teacher noted how if they had not actively sought out a science lesson from a different teacher in the school, they would have never seen science during the practicum. As one preservice teacher that was interviewed mentioned, the only science lesson they observed was a lab report writing workshop, so the lesson was more focused on writing than science content. Three preservice teachers wrote on the survey that the science lessons they observed or taught were focused more on other content than science, most commonly writing and reading. One interviewee stated that the science writing lesson was better than no exposure to science teaching within their placement, but would have been more beneficial to observe and/or teach a traditional science lesson.

Conclusion

Due to the fact that there is limited control over what science lessons are taught in practicum or the amount of time devoted to teaching science, this poses the problem of what the science methods course is able to do before the practicum to assist those who will have limited time or opportunities to teach science during the practicum. Preservice teachers who reported *neutral* through *poor* categories in science confidence and preparation attributed the feelings to the limited time and opportunities for science lesson teaching and observing within their practicum. Considering how influential the practicum is in regards to preparing preservice teachers, the dissatisfaction noted with the allocated time for teaching and observing science directly relates to preservice teachers confidence in science teaching. It is important that changes be made to increase the confidence levels of preservice teachers as research studies indicate, as teachers' science confidence increases, so does the amount of science teaching time in the classroom and it also increases the use of appropriate pedagogical practices (Anderson, et al., 2009; Appleton & Kindt, 1999; Harlen & Holoroyd, 1997). In addition, as inquiry and constructivism are considered appropriate pedagogical practices, the lower number of preservice teachers using these pedagogies is concerning. The results of this study prompt further research questions such as how do you improve science teaching time when there is limited control over what is done at practicum schools? Will preservice teachers be able to use the best practice pedagogies before they graduate? Would implementing the suggested changes to the course, such as having extra science content or more 'hands-on' experience, improve confidence in science teaching? Would said changes replace the deficit of not teaching science during practicum?

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