

The Relationships between Professional Development for Elementary Teachers and Student

Achievement in Science

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America is facing a crisis in filling future Science, Technology, Engineering, and Math (STEM) related jobs. Elementary science education is of particular concern because early foundational science understanding is important for later interest and success in STEM disciplines. Ongoing teacher professional development has been shown to improve student science achievement. A research gap exists in the understanding of how elementary teacher professional development affects students' later success in science.

This study examined how 5<sup>th</sup> grade science teachers' professional development influenced their students' 8<sup>th</sup> grade science achievement. Science professional development improves elementary teacher skills and efficacy. Cognitive development researchers note early student learning is particularly rich when teachers use methods.

Student science and reading test scores were collected for 5<sup>th</sup> and 8<sup>th</sup> grade students from a high performing K-8 school in the Orange County Public School (OCPS) system. The study included only students who attended both 5<sup>th</sup> and 8<sup>th</sup> grade at the research site. The researchers gathered 2009-2011 5<sup>th</sup> grade teacher names, the 5<sup>th</sup> grade science and reading scores for their students, and the 2012-2014 8<sup>th</sup> grade science and reading scores for the same students. The data were organized by student cohorts, which consisted of a 5<sup>th</sup> grade teacher and her/his 2009-2011 5<sup>th</sup> grade students. Professional development (PD) data for seven teachers were collected using an online demographic survey. The level of PD was determined to be high, medium, or low based on the data collected from the survey.

The categories high, medium, and low teacher PD were based on a combination of education, certification, teaching experience, and in-service professional development. A high level of science PD included a science degree, a supplementary credential in science or a STEM discipline, more than four years teaching science, and annual in-service science professional development. A medium level included a degree with a science minor or a supplementary credential in science or a science discipline, two years teaching science, and bi-annual PD. Low level science PD included education, experience, and professional development that did not meet the minimum for the medium level. Researchers rated two teachers at a high level of PD, two at a medium level and three were rated at a low level. The seven teachers had a total of 135 students in the 5<sup>th</sup> grade who also continued through the 8<sup>th</sup> grade at the school.

The researchers used multivariate ANCOVA techniques to analyze the relationship between elementary teachers' PD and students' science achievement. Reading scores controlled for the effect of reading skill on science achievement tests. No significant difference in 8<sup>th</sup> grade science achievement was noted between students who had teachers with a high level of PD and those who had a teacher with a medium or low level of PD. While no link was found between teacher PD and science achievement the analysis indicated a significant link between 5<sup>th</sup> grade reading skill and science achievement. The relationship between reading skill and science achievement is not surprising and supports findings from related studies of reading ability and achievement in other disciplines.

In considering why a significant relationship was not found between teacher PD and science achievement, the researchers concluded the levels of science PD developed from the survey data did not provide a relevant measure. A new measure is recommended that takes into account hours of science PD in topics shown by studies to increase science achievement. Additionally, the research site incorporated a robust integrated science PD program that may have leveled the playing field such that all science teachers at the research site developed a high level of science teaching skills. The researchers are grateful for OCPS' generous support of the project, which informed the district's intense focus on student achievement.