

Making the Graduate Degree a Useful Tool in Professional Development

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Recent editorials in *Innovations* have focused on the ever-growing problem of recruiting teachers into the profession (Boesdorfer, 2022; Darner & Boesdorfer, 2022; Hermann & Miranda, 2019). Equally important is retaining those teachers once they are there (e.g., Bozeman et al., 2013). Similar to many licensed professions, teachers who stay in the profession are then required to stay up to date through continued professional development. Specific requirements vary from state to state but often allow teachers to use graduate credits to count toward their professional development credits. Additionally, the accrual of enough graduate credits often leads to an increase in salary with an additional bump upon completion of a graduate degree. For example, in Iowa, all public-school teachers receive a salary increase for 10, 20, 25, and 30 credits of graduate-level work beyond the bachelor's degree with an additional bump after earning an MA degree (Johnson County Community School District, 2021; West Des Moines Community School district, 2021). The incentive for teachers to invest in graduate-level work is certainly present, and a quick Google search yields an overwhelming number of graduate programs in education. But are all of these degrees providing effective professional development for teachers, specifically for science teachers? If we measure effectiveness by student performance, some evidence suggests that obtaining a graduate degree does not lead to additional student gains (e.g., Nye et al., 2004), but the research is less clear regarding gains for teachers.

If we examine the literature on effective professional development, several best practices become apparent: (1) focus on content, (2) active learning opportunities, (3) coherence with school/district curriculum and needs and teacher knowledge and beliefs, (4) long-term sustained duration of programming, and (5) collective and collaborative participation by teachers in similar grades or content areas (Desimone & Garet, 2015, p. 253). All these characteristics can be integrated into a graduate program, but in my experience and interactions with teachers who report back on the graduate programs they participate in, few programs do. I also think this fact creates a path of least resistance for teachers simply seeking the degree instead of an educational experience that improves science teaching. This alone is problematic when one considers the implications for classroom teaching, but it may also cause programs that do adhere to these principles to be passed over by prospective students, resulting in enrollment issues for these programs.

The MA in Science Education program at the University of Northern Iowa (UNI), which I coordinate, can be used as an example. This 30-credit MA is specifically designed for K–12 inservice science teachers, although most of our student population teaches in Grades 6–12.

All students are required to take a series of five courses (14 credits) over five terms (summer, fall, spring, summer, and fall) covering the history and philosophy of science, learning theory and the corresponding models for teaching science, current trends and issues in science education, the development of science curriculum, and research methods in science education. Additional course requirements include 6–8 credits of elective science content coursework and 4–5 credits of additional electives that could include additional science content or courses in education based on individual teacher needs and goals. Finally, all students must complete a culminating project, much of which is conceptualized and started in the research methods course. Although students receive one-on-one mentoring from a faculty member on these projects, the projects are chosen by the students based on their own professional needs and interests. Previous student projects have included the development of an original standards-aligned science curriculum or series of assessments, portions of the National Board for Professional Teaching Standards (NBPTS) or Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) portfolio, action research projects specific to the teacher's classroom, and authentic educational research in science education that extends beyond classroom practice specifically. Programmatically, we check all the boxes above with regard to effective professional development: (1) our courses require expansion of science content knowledge through science course requirements and integrate this content knowledge through the core courses; (2) in addition to group work opportunities in class, assignments often involve teachers implementing something within their own classrooms and analyzing the results; (3) these assignments consequently must be aligned with classroom and teacher goals; (4) because of course sequencing, teachers are involved in the program for a minimum of 2 years; and (5) although teachers may not all be teaching the same science discipline, they are all teaching science.

Of course, UNI is not the only program that aligns with these principles. For example, Illinois State University's MS and MCE in Chemistry Education (Illinois State University, 2022) and Montana State University's MS in Science Education (Montana State University, 2022) both appear to be based on a similar theoretical and philosophical foundation. So why do science teachers opt for more generic MA or MAE programs? I suspect these choices sometimes reflect shifts in professional interests for our teachers. However, the other layer to this type of professional development is accessibility. Are courses offered online or in person? If they are online, are they offered synchronously or asynchronously? If they are synchronous, are meeting days/times conducive to teaching schedules? What about coaching or extracurricular activities that teachers may be involved in? And finally, is there flexibility in course sequencing? Can students enter the program at the beginning of any term, or must they wait for the start of a specific sequence? Once they start, what happens if they miss a course in that sequence? Regardless of the philosophical and best practices foundation of a program, if it's not accessible to teachers, they will not invest their time, effort, or money in pursuing that program. As graduate programs in science education seek to attract additional students, we must consider both the characteristics of effective professional development

and the characteristics of programming that make professional development and degree attainment possible. If teachers perceive that the simple mechanics of obtaining a degree from one program are not conducive to their current lives, they will simply find another program that is, regardless of whether that program matches their individual professional needs. I challenge all science teacher educators to provide teachers with the opportunity to both enhance their skills and knowledge *and* achieve a graduate degree.

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