NSF Outcomes Report: MORE for Teachers **January 2019**

Studies have shown the benefits of "active learning" (also called student-centered) science content courses on undergraduate students' science content knowledge (e.g., Freeman et al., 2014), but there is a paucity of research about the impacts of such courses on preservice teachers' beliefs and instructional practices. Additionally, there is limited research on the impacts of active learning science methods courses on preservice teachers (PSTs). Our research team from Western Washington University examined an elementary science teacher preparation at a mid-size, public higher education institution in the Pacific Northwest. We found that PSTs who took a student-centered science content course compared to a "traditional lecture/lab" science content course began their science methods and practicum course sequence with significantly more sophisticated understandings of effective science instruction and taught significantly higher quality science lessons in their initial teaching experiences during their practicum course.

The participating university had multiple campuses that were geographically dispersed, and some PSTs took their elementary science methods/practicum sequence on a campus, where the hallmark of a good elementary science lesson was the "hands-on" aspect of the lesson, even if the lesson lacked clear learning targets or wasn't part of a coherent sequence of lessons within an instructional unit. Other PSTs took their elementary science methods/practicum sequence on a campus, where the hallmark of a good science lesson was the "minds-on" aspect of the lesson, where elementary students actively engaged in constructing their understanding of important concepts that built sequentially to big scientific ideas. Compared to PSTs who took the elementary science methods/practicum sequence with a hands-on activity focus, PSTs who took the sequence grounded in cognitive learning theory significantly increased their ability to understand and recognize the quality of science lessons.

Through our research, we also learned that classroom teachers, who had practicum students teach science in their elementary classrooms for a quarter, had little or no training on how to mentor PSTs. We identified the key knowledge and skills classroom teachers needed to effectively mentor novice teachers, including: 1) knowledge of research-based components of effective science instruction, 2) skills with mentoring stances and strategies, and 3) the ability to use observational and student data as evidence of student learning in mentoring conversations. Then, we designed the *MORE for Teachers* Mentoring Professional Development (PD) Program around these principles.

Between September 2012 and April 2016, forty-six teachers from six elementary schools participated in the PD Program. Teachers participated in three "mentoring cycles" over an 18-month period. During each mentoring cycle, mentor teachers hosted a team of 2-3 elementary science practicum students who taught a FOSS science kit to their elementary students. We structured the PD to lead the mentor teachers through a cycle of new learning, practice, and analysis of practice. Each mentoring cycle included an eight-hour Saturday PD day for new learning, opportunities to practice facilitating mentoring conversations with one practicum student volunteer who was teaching in the mentor teacher's classroom, and a two-hour school-based meeting for mentor teachers within a school to discuss the mentoring strategies they tried, what went well, and what they would do differently next time.

Prior to participating in the *MORE for Teachers* Mentoring PD Program, teachers' mentoring conversations with practicum students focused on classroom management and the classroom teaching did most of the talking/sharing (i.e. a consulting mentoring stance). After participating in the mentoring PD, their mentoring conversations focused on student learning from a coaching stance, where the classroom teacher and novice teacher were authentic thinking partners who shared their observational and student data to understand: 1) Elementary students' understanding of the targeted science ideas for the lesson, 2) The factors that contributed or inhibited students' learning, and 3) The next steps to support students' learning. The PD also increased mentor teachers' understanding of effective science instruction and ability to collect observational data. Furthermore, the elementary science practicum students who were mentored (n=73) showed statistically greater gains in their understanding of effective science instruction than their non-mentored peers (n=177).

In light of the significant impacts of the *MORE for Teachers* Mentoring PD, we developed a series of free, online mentoring modules to help K-16 teachers and administrators effectively mentor preservice teachers, novice teachers, or any teacher who wants to improve student learning in their classroom. A pilot-test of the online modules found positive impacts on teachers' mentoring practices that aligned with the findings from our in-person mentoring PD. The three online modules can be completed in one hour and feature engaging animations and authentic cases that highlight best practices in mentoring.

You can access the *MORE for Teachers* Mentoring Modules through the following websites:
Canvas: https://wwu.instructure.com/courses/1261000
YouTube: https://www.youtube.com/playlist?list=PL3wWD0mP5Nawfm7jsfZ5PoGJxnV5cRF1N
Screencast-O-Matic: https://screencast-o-matic.com/channels/cFje30gQ4
Vimeo: https://vimeo.com/channels/1394904

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