

The Impact of the Triad Project on Science Teaching Practices in Grades K-8

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Dates of Previous Sabbatical Leave: Fall, 2009

Proposed Leave Period: Spring 2020

Statement of Purpose

For the proposed sabbatical, I will complete data analysis and submit two manuscripts focused on the impact of the Triad Project, a grant-funded, science-focused professional development model for novice and veteran teachers, grades K-8. The Triad Project, which is supported by a \$900,000 grant from the Bechtel Foundation, grew out of a need for teacher professional development focused on the new K-12 science standards (Next Generation Science Standards, or NGSS), which call for conceptual shifts in how science is taught. The Triad Project engages three-person triad teams (i.e., a university-based science education faculty, a teacher candidate and a mentor teacher from Chico Unified School District) in the creation of an instructional unit that is aligned to the Next Generation Science Standards. Triad Project teams work collaboratively over one semester to design a week-long instructional unit that is co-taught by a teacher candidate and the experienced mentor teacher in the public school setting. Funding for this three-year project concludes in December of 2019, and the sabbatical will provide time to conduct data analysis and write two manuscripts for publication.

Goal 1: Data analysis.

During the first two years of the three-year grant (2016-2019) the Triad Project’s co-principal investigator (Al Schademan) and I have collected data from multiple sources to measure the impact on teachers and their students. These data sources are varied and include, for example, formal observations of classroom instruction, participant responses to surveys (locally constructed and CSU Systemwide), an analysis of the curriculum created by Triads (See Appendix A). Preliminary analyses conducted in grant years one and two indicate that the Triad model 1) increases participant confidence in planning and implementing NGSS instruction, and 2) results in the adoption of a number of NGSS-aligned teaching practices by both preservice and in-service teachers (Schademan, Miller & Slemrod, 2018). Post-grant analyses will continue in this line of inquiry, using a “mixed methods” approach in which both quantitative and qualitative analysis are used to capture the complexity of the

educational intervention (Cresswell & Clark, 2017). Monthly phone calls with educational researchers from WestEd and SRI have supported our efforts to plan and study the impact of Triad. As a result, data at the end of the project will be robust and lead to meaningful analyses.

Goal 2: Manuscript—Target Audience Educational Administrators.

The Triad Project is an innovative professional development model that could be replicated by other universities working in partnership with a local school district. Initial findings suggest that one particular reason for Triad's success is that it creates "non-hierarchical collaboration" between credential candidates, mentor teachers, and university science professors (Shademan & Miller, 2018). A manuscript written for Educational Administrators will present the key features of the Triad model and connect these to the research base on effective professional development for teachers. My aim is to submit this article to the Journal *Educational Leadership*, which reaches a wide audience of school leaders.

Goal 3: Manuscript—Target Audience Practicing Teachers.

The Triad Project has produced 53 instructional units, all published online and authored by Triad teams that combine the expertise of classroom teachers and university professors. A preliminary analysis of these units shows specific, high leverage teaching practices that teachers use to engage students in science content. For example, measures of Triad units as planned and taught indicate a consistent use of methods such as using scientific phenomena to build student thinking (Schademan & Miller, 2018). The second manuscript will identify best instructional practices for elementary educators to successfully transition to a method of teaching science that is vastly different than how it has been traditionally taught in the past. A target journal for this manuscript is *Science and Children*, a publication of the National Science Teachers Association (NSTA).

Merit of the Proposed Study

In the past, shifts in standards have been communicated to credential candidates in their university courses and to experienced mentor teachers in workshops. However, research in teacher development suggests that effective professional development takes place over extended time periods, involves active learning, and engages learners in deep reflection (Clarke & Hollingsworth, 2002). Furthermore, "activity theory" suggests that engaging learners in a collaborative, goal directed activity leads to sustained understanding (Engestrom & Miettinen, 1999). Triad's professional development system supports a goal-directed activity (i.e. creating and implementing curriculum) enabling beginning teachers, experienced teachers, and science professors to be equal partners in learning. This approach is vastly different from the "one-shot workshop" that is offered to teachers when there is a significant change in teaching expectations. By sharing this model, other districts and universities will see the value in partnering to simultaneously educate pre-service teachers and in-service teachers. In fact, teacher educators from other universities have requested guidance in using the Triad model in their local contexts.

Results of the Triad Impact Study will also support elementary educators as they shift to the Next Generation Science Standards. To use these standards with fidelity, teachers must adopt ambitious science pedagogical practices that may be unfamiliar and uncomfortable. Rather than introducing a science concept and showing a demonstration, teachers are asked allow students to experience a phenomenon. The teacher then, with intention, guides students' discovery, gradually layering on scientific content in a meaningful way. The goal is for scientific learning to be guided by purpose, as students think like scientists and engineers to design solutions to problems. Although the national set of standards was adopted by California in 2013, the first curriculum adoption aligned to the standards will not take place until November 2018. Therefore, elementary teachers need both the curriculum and the pedagogical methods to make that curriculum come to life.

Relevance to University-related Professional Development

Since fall of 2016, I have served as co-principal investigator of the Triad Project. I joined my colleague Al Schademan in this endeavor because of my 17 years of experience in elementary teacher education. Our collaboration has led to implementation of the Triad Project as described and also to sustainable changes that will be captured through the impact study. Through the Triad Project, we have strengthened our partnership with Chico Unified School District, whose veteran teachers provide exceptional apprenticeships to Chico State students. We have aligned coursework with current standards and best teaching practices. Research on the Triad Project will continue to inform my role as a teacher-scholar as I work with credential candidates.

The proposed sabbatical also aligns with my scholarly work in assessment, which focuses on using data to inform meaningful change (Miller & Summers, 2018). As a grant requirement I lead "continuous improvement learning sprints," short improvement cycles in which we identify areas for improvement, use data to make an informed change, and study the impact of that change. The Triad Impact Study will include examples of continuous improvement to illustrate that Triad is a system that is dynamic and adaptable to different contexts.

To date, professional achievements based on the Triad Project include several peer-reviewed conference presentations and one article in a professional development newsletter. Our focus has been on supporting 15 Triad teams each semester, and the sabbatical would provide the time for a thorough analysis of findings, building a solid foundation for continued scholarly inquiry.

Contribution to the Department/University/CSU

The Triad Project is part of the CSU system's New Generation of Educators Initiative, an effort to transform teacher education by creating partnerships between universities and local school districts. The grant was one of the 11 awarded to CSU campuses for innovative projects in teacher education in the STEM fields (science, technology, engineering and mathematics). As such, this work is overseen both by the grantor (SD Bechtel, Jr. Foundation) and by the CSU chancellor's office. Throughout the grant, the learnings of different campuses have been shared in webinars that reach

teacher education programs across the state. The results of the Triad Impact Study at CSU Chico will become part of the knowledge base that informs teacher education in California.

Locally, we have leveraged the grant to make sustainable changes to programs in the School of Education (SOE). One significant change has been to adopt a new observation rubric for use when supervisors observe lessons taught by beginning teachers. This new rubric began with Triad and now is used across programs in the SOE; it focuses on creating a learning environment that promotes students' evidence-based thinking and collaboration. This and other learnings from the Triad Impact Study will help us continue the of innovation and excellence that are hallmarks of teacher preparation at Chico State.

Timeline

Date	Activity
(Pre-sabbatical) October 2018-December 2019	Continue Triad Project implementation and data collection
January - February, 2020	Analyze data
March 1 to April 15, 2020	Write first manuscript—Educational Administrators
April 15, 2020	Submit first manuscript
April 16 – June 1, 2020	Write second manuscript—Practicing Teachers
June 1, 2020	Submit second manuscript

References

Creswell, J. W., & Clark, V.L. (2017). *Designing and conducting mixed methods research*. Los Angeles: Sage.

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education*, 18 (8), pp. 947-967.

Engestrom, Y., & Miettinen, R. (1999). Introduction. In Y. Engestrom, R. Miettinen & R.-L. Punamaki (Eds.), *Perspectives on activity theory* (pp. 1-16). Cambridge, MA: Cambridge University Press.

Miller, M., & Summers, D. (2018). Reframing data to build a strengths-based culture of assessment. Manuscript submitted for publication.

Schademan, A. R., Miller, M., & Slemrod, T. (2018, April). The Triad Project: A professional development activity system for teaching to the NGSS. Presented at the Conference of the American Educational Research Association, New York, NY.

Appendix A: Triad Data Sources

Data Source	Focus	Details
1. Unit Plan Rubric	To what extent do unit plans written by Triads include best practices for teaching that is aligned to the Next Generation Science Standards?	14 categories 4 point scale Adapted from NGSS EQUIP Rubric Units scored by faculty
2. Chico Observational Rubric for Educators (CORE)	To what extent does instruction by the credential candidate meet an acceptable level of performance on a set of teaching expectations defined by the School of Education, and aligned with state standards?	4 categories 5 point scale Adapted from TNTP rubric Lessons observed by trained supervisors Feedback provided to candidates
3. Triad Reflective Survey	What was the Triad project's impact of on candidates, cooperating teachers, and content specialists?	Likert scale and free response items
4. Semi-structured Interviews	What was the Triad project's impact of on candidates, cooperating teachers, and content specialists?	16 Interviews with candidates, cooperating teachers, and content specialists
5. CSU Exit Survey	How well did the program prepare are candidates to teach?	Likert scale and written responses
6. CSU Year-Out Survey	After the first year of teaching, how well prepared are candidates to teach science.	Likert scale
7. Classroom Data: Chico Unified School District	What is the impact of the Triad Project on student learning?	A data agreement with Chico Unified allows us to examine classroom-level testing data for patterns between science instruction and student performance