**PROJECT SUMMARY**

*Unifying Science for Students: Investigating transfer within a coherent, interdisciplinary set of science courses*

**Intellectual Merit:** Faculty at Western Washington University (WWU) in partnership with Whatcom Community College (WCC) will use a unique integrated science curriculum for preservice elementary teachers to study the *far transfer* of foundational science concepts from a physics context to geology, biology, and chemistry contexts. We focus on ideas about energy, which unite the science disciplines and are emphasized in national standards for precollege science education. The integrated curriculum, designed and implemented at both institutions over the past 10 years, consists of four 10-week courses (*The Flow of Matter and Energy in Physical Systems, Earth Systems, Life Systems, and Chemical Systems*) with coherent, research-based instructional design and consistent framing and presentation of energy concepts. This instructional environment is particularly suited to support far transfer, a goal of education both fundamental and known to be elusive. This exploratory project will add general and discipline-specific knowledge to the research base on transfer through the following three goals:

1. Evaluate the extent to which students successfully transfer understanding of energy in a coherent, constructivist-based sequence of science courses.
2. Document the reasoning approaches and modes of thinking - both productive and problematic - that arise when students transfer ideas about energy to new situations.
3. Investigate the impact of explicit instruction in metacognition on the understanding, retention, and transfer of energy concepts across disciplines.

Quantitative and qualitative methods will be employed to address these goals. A longitudinal study will generate quantitative measures of the transfer of energy concepts from the original learning context, physics, to a target domain, chemistry. Interviews, classroom observations, and analysis of written class work will be used to describe “what transfer looks like” by developing a taxonomy of discipline-specific transfer attempts. Finally, a quasi-experimental study will investigate the impact of metacognitive reflection on transfer.

**Broader Impacts of the Proposed Work:** This project responds to the call put forth by the National Research Council’s Discipline-Based Education Research (DBER) report to generate more discipline-specific knowledge on transfer in higher education. Documenting what works in supporting transfer is imperative because transfer is both known to be elusive and is an assumed outcome on which many education systems are built. Findings from this project will inform the development of discipline-specific instructional interventions to promote transfer of energy ideas, and may help to establish the integrated science courses at WWU as a national model for the content preparation of preservice elementary teachers.