

# Supporting K-12 Teachers' Instruction about Water using Scientific Modeling: A View Across Programs



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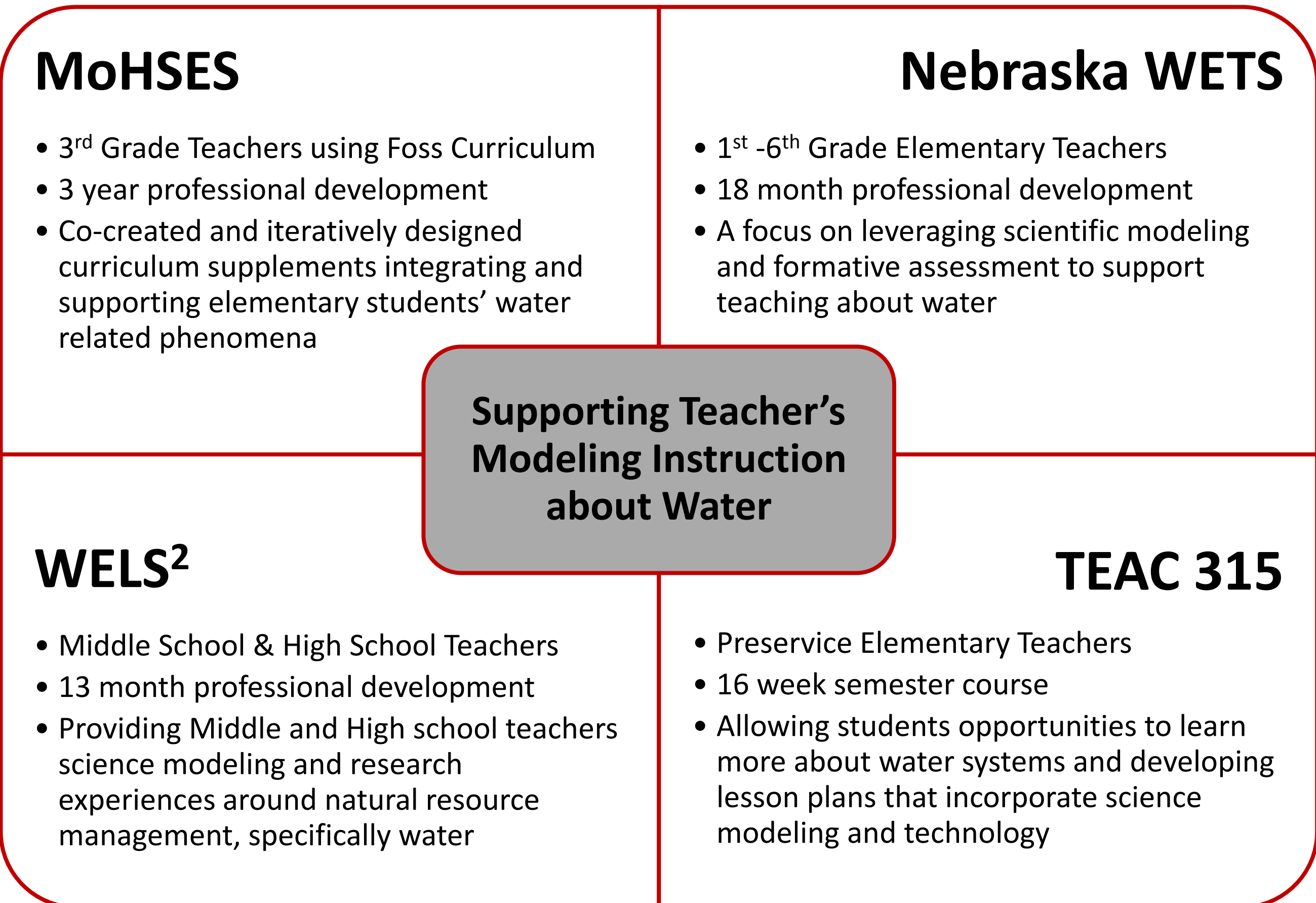
**WATER EDUCATION LEADERS for SECONDARY SCIENCE**



The collaborative WELS2 project gives Nebraska middle and high school teachers tools and resources to help students learn about water.



## Overview of Projects



While all of the previously mentioned projects focus on leveraging scientific modeling to teach about hydrological phenomena; different populations must meet different needs and requirements to provide adequate support to students at such varying levels. Many various methods of support were and are being employed to help teachers to use scientific modeling within their classroom contexts. These projects represent a small sampling differentiations that can be made to support teachers' scientific modeling of water systems. Most are focused on specific water topics but can be modified to meet the needs of other audiences and the issues that are important in their classrooms.

## Types of Educational Supports

### MoHSES

- Content supplements for teachers specific to their curriculum focused existing models
- Teacher reflection and assessment of their personal classroom needs
- Modeling experiences specifically tailored to teachers' curriculum and needs, developed iteratively through teacher researcher dialogs

### Nebraska WETS

- General content supplements for teachers ranging multiple hydrologic concepts
- Integrated activities, readings, and discussion around formative assessment and modeling
- Focused guidance on developing student consensus models and discussions



### WELS<sup>2</sup>

- Research experiences focused on natural resource systems
- Opportunity to present/write up the research they conduct to science audiences



- Mentorship opportunities with water scientists
- Training with groundwater modeling software; translated to age-appropriate modules for the classroom
- Contact with local resources focused on providing scientific and classroom appropriate texts for students around water management systems

### TEAC 315

- Multi-week project focused on developing lesson plans about water phenomena
- Readings, activities, and discussion focused on scientific modeling, technology, and water
- Multiple rounds of peer and instructor feedback focused content and modeling
- Written reflections focused on students' conceptions about modeling different aspects of water

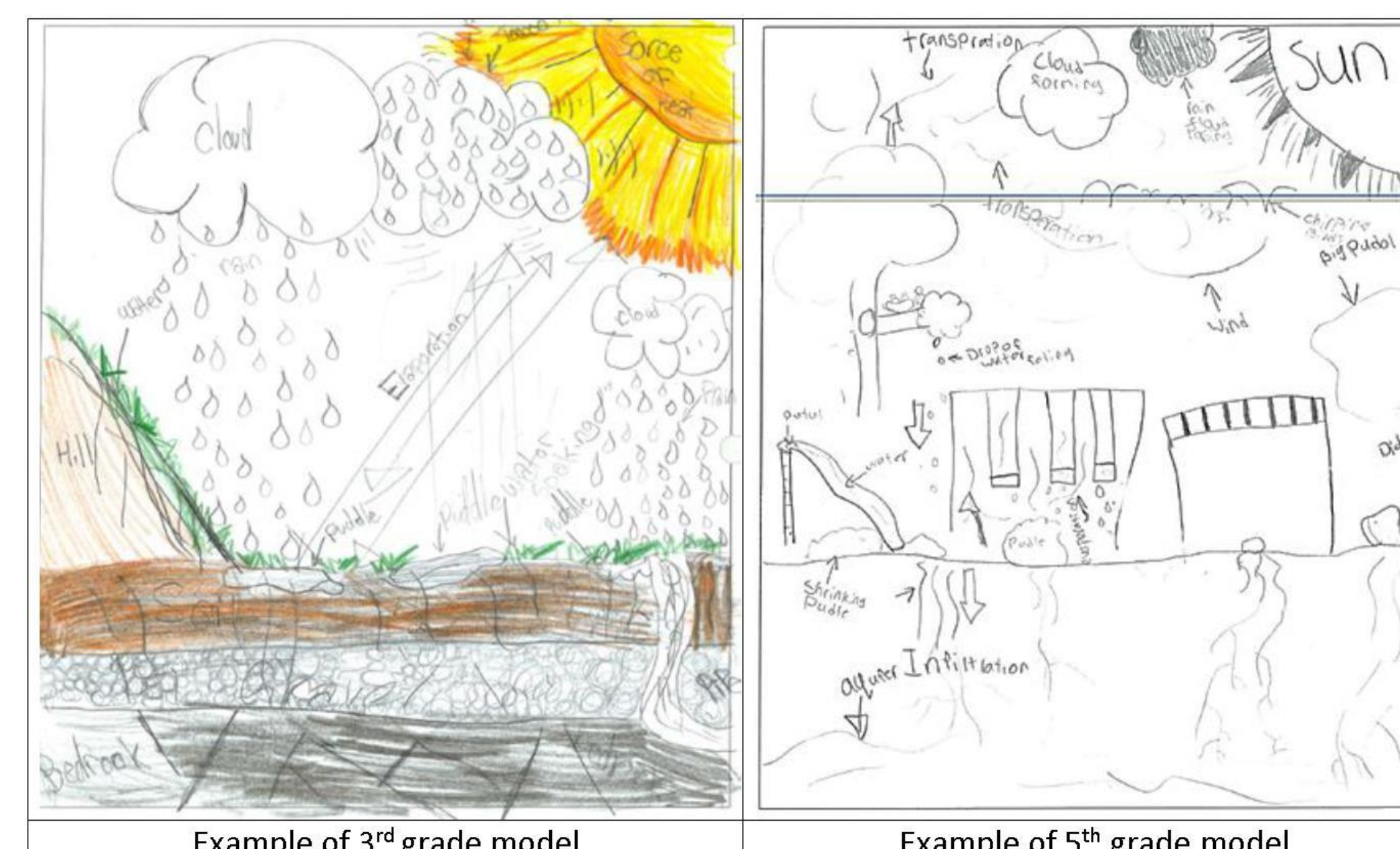
## Implications

These projects contribute to students' engagement in scientific modeling by supporting preservice and inservice teachers' conceptualization and enactment. While model based curriculum can help bolster and support teachers to provide modeling opportunities other avenues also exist to support teachers and preservice teachers to engage in modeling opportunities for their students'. These projects begin exploring different ways to support the plethora of needs teachers across K-12 have which would be of interest to curriculum designers, teacher trainers, and professional development providers who want to align with NGSS's ideas on scientific modeling within elementary contexts. It is important that elementary teachers understand and incorporate scientific modeling into their classrooms, leveraging this information to provide opportunities for students to engage in complex scientific ideas. To that end, we must acknowledge the supports needed for teachers can be exhibited very differently.



## Avenues of Research

Currently, research is being conducted in each of these projects attempting to answer a myriad of questions focused on both teaching and learning. This research is guided by multiple sources including learning progressions focused on elementary students' learning about water systems (Gunckel et al., 2012) and scientific modeling (Schwarz et. al, 2009) which identified levels of knowledge elementary students would likely progress through as they develop conceptual knowledge around modeling hydrological phenomena. Some research questions focus on ascertaining teachers' conceptualizations and practices around using models in their classroom and this work is guided by previous teacher work (Vo, Forbes, Zangori, Schwarz, 2015). Other questions being explored outline students' use of models and modeling. This area of our research has focused on student learning gains, model-based explanations, and comparing ideas across groups of students who do and do not use modeling supplements. Another area of research looks into assessing the fidelity of teachers' modeling implementations in their classroom. Finally, we look into the intersection of content, technology, and scientific modeling and is guided by literature investigating preservice teachers' ability to model (Braaten & Windschitl, 2011).



## References

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