

2 faculty awarded grant to better prepare hydrogeology workforce

BY CODY BOTELER ON JUNE 11, 2021

National Science Foundation funds TU faculty to investigate how geoscience students learn



The new Science Complex, home to the Department of Physics, Astronomy & Geosciences. (Photo by Alex Wright)

As the world grapples with a changing climate and growing demands on natural resources, it will increasingly depend on hydrogeologists to find and protect clean and sustainable sources of water. Two Towson University faculty have been awarded a grant from the National Science Foundation (NSF) to help ensure there is a reliable stream of capable and diverse hydrogeologists in the workforce.

Peggy McNeal, an assistant professor in the Department of Physics, Astronomy & Geosciences is the principal investigator and is joined by Joel Moore, an associate professor in the same department, in the \$150,000 grant.

Hydrogeologists use data from multiple inputs, including wells, maps and field work, to create three-dimensional models of groundwater and contaminant flow. However, the specific three-

dimensional spatial reasoning skills that professionals use in their work have never been categorized or defined.

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Peggy McNeal, assistant professor

This type of spatial thinking can be a stumbling block for some students in the geosciences because it is not an intuitive skill for all learners, McNeal says. This research will help educators provide the tools students need for success.

Their project will define the three-dimensional spatial reasoning skills used by professional hydrogeologists and characterize how they use them. Then, it will examine if and how students use the same skills when learning hydrogeology.

The NSF calls the research a critical first step in creating materials to prepare a capable hydrogeologist workforce because once these thinking skills are defined and categorized, they can be better developed and taught.

“Ultimately, it’s about increasing student success and improving diversity and retention in these courses,” says McNeal.

Part of the research will include interviewing undergraduate and graduate students in Moore’s hydrogeology course, he says. Additionally, the funding will allow the pair to hire undergraduate student researchers to be involved in the study, including assisting with data collection and interpretation.

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Joel Moore, associate professor

McNeal and Moore will collaborate with researchers at Western Michigan University, who were also awarded a parallel NSF grant for this project.

Ultimately, the research aims to deliver a classification of specific spatial thinking skills that are essential to hydrogeology, a development of a hydrogeology concept inventory to assess student knowledge, and an evidence-based model of how students use their knowledge of hydrogeology and spatial thinking to solve water and contaminant flow problems.

More broadly, the demand for geoscience graduates has outpaced the number of students graduating with those degrees. Improving hydrogeology education will help close that gap, Moore says.

“It’s a national need as well as a regional need,” Moore says. “These are societally important fields and students who succeed will graduate to begin careers that help us access and protect essential freshwater resources.”