Bridging Students' Knowledge Gaps through Research: A Case Using Synthetic Hydrogeologic Models

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ABSTRACT

Many educational institutions recognize that teaching through research can be a powerful tool to address gaps in students' knowledge. Such a gap has been observed in the field of geology, where students have difficulty associating 2D sedimentary strata with the 3D geomorphic forms and the processes that made them. An undergraduate research project entitled 'Synthetic Hydrogeologic Models of Fluvial Aquifers' was conducted with a team of students learning how to use the 3D model construction tools in Aquaveo Groundwater Modeling System® (GMS). Working with the U.S. Army Corps of Engineers and Texas A&M University–Kingsville faculty, students created a workflow that incorporated sedimentology and 3D numerical modeling within the formation of detailed groundwater flow models using GMS. These students were required to study literature that provided qualitative and quantitative descriptions of the processes and forms associated with several representative fluvial environments. To help further with visualization, students used visual aids, such as geologic block diagrams, to visualize the construction of such environments. By evaluating visual, textual, and sedimentological information, the students were able to obtain the knowledge needed to produce conceptual groundwater models. Several technical obstacles were encountered during the workflow to actually create twelve classic fluvial models. With guidance from faculty and research, the students were able to create a suite of software tools that overcame the obstacles. The result was a workflow to create groundwater flow models that represent different hydrogeologic environments. Compared to other approaches, this workflow provided a powerful alternative that honored the sedimentology and stratigraphy of these environments. Students were also charged with the display of this work through various interscholastic and professional activities, such as poster presentations and illustrated paper discussions. These 3D synthetic hydrogeologic models are used in sedimentology and hydrogeology classes to understand spatial concepts.