



## A Field-Based Simulation for Groundwater Education on Guam



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**Principal Investigators:**  
Paul R. Wallace and John W. Jenson

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Studies reveal that middle school and high school students hold inappropriate conceptions of the importance of groundwater in their daily lives as well as inaccurate mental models of the scale and structure of groundwater. Moreover, it has been shown that middle school and high school science teachers receive inadequate formal education concerning groundwater, and possess inaccurate mental models of groundwater. Given the poor scores of local students on national standardized tests for science concepts, it is likely that very few students or teachers on Guam hold appropriate concepts regarding the structure and importance of groundwater, one of the most vital natural resources of the island.

This project will result in increased awareness of the importance of groundwater and a more accurate spatial understanding of fundamental groundwater concepts for teachers and students on Guam. A group of twelve middle school and high school science teachers from the Guam Public School System (GPSS) will receive training in the development of field-based simulations for engaging students in fundamental issues related to the structure, scale, and the role of groundwater in the hydrologic cycle on the island. Field-based educational simulations supported by handheld technologies, also known as augmented reality simulations, are an emerging type of learning tool that integrate game-design principles and scenarios; and incorporate rich media content, such as images, audio, and video. Users employ location-aware mobile devices to receive information and explore the environment in a field-based setting.

As a result of the teacher training, a field-based simulation on groundwater concepts

will be developed and implemented with students from GPSS and participants from youth organizations, with approximately 40 youth expected to take part in the simulation during the first year. Data collected will be used to assess the effectiveness of both the teacher training and the simulation. Results and analysis will be fully documented in a final report, an article submitted for publication in a refereed journal, and a conference paper.

Project objectives are to:

1. Train GPSS middle school and high school science teachers in the development of a field-based simulation related to the importance, structure, and scale of groundwater systems on the island of Guam;
2. Assess the effectiveness of the teacher training among GPSS middle school and high school science teachers on their perceived importance of knowing about groundwater, and conceptions regarding groundwater scale and structure;
3. Develop a field-based simulation, based on fundamental groundwater concepts, that can be used for GPSS field trips, youth group excursions, and outreach programs on Guam;
4. Implement the water resource field-based simulation with youth participants on Guam;
5. Assess the effectiveness of the field-based simulation on perceived importance of knowing about groundwater, among Guam's youth;  
Provide an online resource for schools and organizations to access teaching materials, field-based simulation examples, and results of this study.