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Hydrologic Science for a Changing World: A Learning Framework Based on Hydrologic Synthesis and Team Science

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Hydrology, like all earth and environmental sciences, generates a (large) degree of place-based research, leading to detailed understanding of the behavior of a particular research site, over a particular time scale, which is usually constrained by the length of an instrumented observational record. Consequently, knowledge generation tends to be localized in both space and time, and by the particular questions that motivated individual studies, resulting in fragmented understanding. The lack of integration of data and theoretical development across sites, times and disciplinary orientation has the potential to inhibit the development of a deeper understanding of hydrology. Furthermore, it prevents extrapolation of understanding and predictability to other places (e.g., the ungauged basin problem) or to other times (e.g., future predictions under change). Predictions in a changing world, where nothing can be assumed to be stationary, requires more holistic thinking, including a synthesis of knowledge across multiple disciplines, and the use of a combination inter-disciplinary concepts, methods, tools and datasets. Given these demands, we propose that higher-level synthesis should be a part of hydrology education, to assist in generating new forms of knowledge on the basis of inter-site, multi-scale, long-term and interdisciplinary studies. Invariably, and quite often, this will involve team science, with its attendant challenges and great promise. Educational approaches in the future must embrace team science and use it effectively to increase the capacity of future hydrologists to tackle the emerging and complex problems associated with water management. In this presentation we describe our experiences running two summer institutes as part of the UIUC Hydrologic Synthesis project. The presentation will cover the science process, outcomes achieved, and aspects of the human process (team science) that helped achieve these outcomes from the perspectives of mentors and students.