Collaborative Research: Data-driven Inquiry in Geoscience
Environmental Restoration Studies (DIGERS)

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NEEDS

• How to get more American Indian students engaged in geoscience studies and pursue careers in geoscience
• How to connect students’ sense of place to authentic geoscience research
• How to tie student field experiences to the development of student data literacy skills by making explicit the connections between the places they know and spatio-temporal data representations of those places
• How to instill in students an understanding of the systemic nature of the challenges confronting our natural resources (e.g., the social, environmental, and economic characteristics of Puget Sound watershed habitats)
• How to make greater utilization of current scientific research in the classroom and how to maintain the types of productive educator-scientist relationships that make this possible

DIGERS GOALS

• Build interest in environmental science among American Indian and other students
• Connect environmental science to personal and community empowerment
• Create models of data-based inquiry for different student levels (high school, undergraduate)

DELIVERABLES

• Undergraduate course at UW
• High school-level units
• Performance assessments
• Design patterns guiding instructional and assessment task development
• Piloting
• Online access to all materials and assessment scoring guides

CENTER FOR TECHNOLOGY IN LEARNING

CTL research and development activities contribute to the knowledge base on effective learning and teaching, and embody research insights in the innovative design, use, and assessment of interactive learning environments. Much of CTL’s work is conducted in educational settings such as classrooms, after-school programs, and teacher education programs. Among other things, CTL prototypes new interactive learning environments and tools, explores best practices, and seeks to understand the mechanisms that lead to better teaching and learning.

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LOGIC MODEL

NEEDS

• To provide effective learning opportunities that interest American Indian students in pursuing courses of study and careers in geoscience
• To provide greater opportunities for American Indian students to practice data literacy and inquiry skills
• To present geoscience data sets and professional research papers to American Indian students in the context of issues relevant to sustaining the environments and economies of their communities
• To provide teachers with curriculum and assessment resources that help them facilitate American Indian student scientific inquiry with real data related to sustenance of the students’ indigenous communities

INTERVENTION

Scientist-educator-tribal collaboration
Application of foundational framework for constructing problem-based curriculum modules (DGS design principles and PADI design patterns) to UW to Puget Sound environmental history data sets and models (River History Project and Puget Sound Regional Synthesis)
Prototype educational modules about the environmental history of the Puget Sound with a focus on how humans have manipulated the watersheds and how those manipulations have affected the fate of the salmon populations and other resources
High school and undergraduate piloting

OUTCOMES

Replicable model of productive collaboration
Pilot Teacher outcomes
Satisfaction with learning materials
Perceived usefulness of assessment instruments for gauging student learning outcomes
American Indian student outcomes
Proximal: greater interest in the focal geoscience (geomorphology and environmental systems)
Distal: increased enrollments in geoscience education courses, majors, PhDs

UNIVERSITY OF WASHINGTON PUGET SOUND RIVER HISTORY PROJECT

Human activities have homogenized and simplified lowland, temperate rivers. To understand the landscape’s geomorphology and ecology prior to these changes, the University of Washington’s Puget Sound River History Project studies the river and estuarine landscapes in the Puget Lowland of Washington State before the rise of European settlement around 1850. To “see through” historical anthropogenic change, the project uses a combination of field studies, archival sources, and natural and topographic proxy methods. The pre-Euro settlement landscape had considerable diversity in landforms and geomorphic processes that is not apparent today. This diversity is caused in part by such geologic influences as Ice Age glaciation, lahars, and fault movements. These diverse physical landscapes in turn generated diverse assemblages of ecosystems. The River History Project is also studying the human-caused changes since European settlement began and how these changes affect resources such as salmon. It also investigates how to use knowledge of landscape mechanics, ecology, and history to:

1. Plan river and habitat restoration
2. Develop alternative future scenarios that consider different land uses that make competing claims on how river valleys and estuaries can be used for agriculture, urban development, restoration, and conservation

Data and analyses from the River History Project and allied programs at the University of Washington (e.g., the Puget Sound Regional Synthesis Program) provide the foundation for the DIGERS curriculum and assessment materials.

http://riverhistory.ess.washington.edu/

EDUCATIONAL FOCI

• Place-based (S. Semken, 2005; G. Smith, 2002)
• Environmental history
• Alternative futures (Lombard, 2008)
• Hands-on, field trips
• Earth systems approach
• Relating data visualizations to personal experience at sites
• Triangulating data sources to build historical understanding (combining geomorphology and history)

TOPICS

• What structures the physical and ecological character of the pre-settlement landscape?
• How have human activities changed the physical and ecological character of rivers?
• How do geoscientists investigate historical change to rivers, their ecosystems, and natural resources such as salmon and shellfish?
• How can knowledge of historical landscape change inform habitat restoration planning?
• How can traditional knowledge be used in synergy with scientific data to address these questions?
• What is the role of values in shaping rivers and their resources?
• How can an understanding of landscape history be used in developing and assessing alternative future scenarios?

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