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Expanding Environmental Health Literacy—A Focus on Water Quality and Tribal Lands.

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Abstract

Environmental health literacy (EHL), an evolving concept, has potential for significant public health impact. However, complex skills are needed to access and use information, to study and document hazards, to link findings to health outcomes, and to understand the complexities of regulations and laws needed to take efficacious action. Because water issues are creating headlines world-wide, we draw from several water-related cases on American Indian Tribal lands to examine some of the complexities associated with building needed skills, obtaining accessible information, and navigating the layers of laws and regulations that enable or inhibit efficacious action. Each case highlights the importance of partnerships, skill building, and collaborative action to redress environmental assaults. For our analysis, we draw from and expand upon Nutbeam's typology of health literacy which includes functional, interactive, and critical stages to derive lessons from each of the EHL cases. Community partnerships engaging in EHL efforts still face many challenges, including enhancing skills for community members as well as professionals, clarifying scientific processes and findings, articulating and respecting cultural practices and needs, and translating policies and laws for community accessibility and collaborative action.

Keywords

American Indian; Health Literacy; Health Disparities

Introduction

U.S. populations in rural, low-income, and minority communities may face triple jeopardy in terms of environmental health. First, members of these population groups often experience a higher risk of exposure to environmental hazards, including water contamination (Christian-Smith, Cooley, Allen, Vanderwarker, & Berry, 2012). Second, these population groups are

more likely to be living in communities with access to fewer resources to mitigate these hazards. Finally, adult literacy studies in the U.S. and other industrialized nations indicate that minority, immigrant, rural, and low-socioeconomic population groups are more likely to have lower literacy than are those who are more affluent and who are members of the majority population (Organisation for Economic Co-operation and Development, 2012). Thus, knowledge of risks associated with environmental degradation may be compromised because of limited literacy skills, inaccessible information, and inappropriate communication practices.

Recently, the field of environmental health literacy (EHL), an important area of practice and study, has expanded the scope of health literacy from individual medical interactions into community contexts and has potential for significant public health impact. EHL is especially important for under-resourced and vulnerable population groups throughout the world.

EHL programs should focus on ensuring that people and communities have access to information and resources not only to recognize environmental exposures, but also to exert influence to mitigate untoward health outcomes (Finn & O’Fallon, 2015). The use of Nutbeam’s three-level framework is complementary to community-based participatory research (CBPR), which many academic/community partnerships have used to alleviate community-level environmental exposures (Cohen, Lopez, Malloy, & Morello-Frosch, 2016; Haynes et al., 2016; Israel et al., 2005; O’Fallon & Dearth, 2002). Both EHL and CBPR focus on ensuring that community members have access to clear, health-related information, often designed in partnership with community members (functional EHL). Second, in both, there is a focus on people acting on the information gained (interactive EHL) and ultimately working together to make community-level changes (critical EHL). Our paper uses several case studies related to water quality on Native American tribally controlled lands to examine how EHL provides a foundation for work ahead.

Background: Water Quality Issues and Native Land

Water quality issues have been in the news and water is, most certainly, a critical environmental health focus. Although many people assume that safe, affordable drinking water is readily available to everyone in the U.S., current and documented historic events indicate that this is not the case.

The lead contamination of the water supply in Flint, Michigan, is one example of a widely publicized water quality failure in a present-day setting (Environmental Protection Agency, 2016; Greenberg, 2016). The contamination occurring in Flint serves to highlight the false assumptions about safe drinking water. Subsequent commentary has spurred discussions about how such a hazardous exposure can occur and continue unnoticed for so long (Miller & Wesley, 2016). The attention given to the problem in Flint, Michigan, highlights the inherent belief communities reasonably have that their drinking water is safe. More recently, the potential environmental health and cultural threats from the proposed oil pipeline owned by the Dakota Access Pipeline (known as DAPL) in North Dakota has raised significant concern among the Standing Rock Sioux Tribe, over 300 other tribal nations, and environmental activists worldwide. A key concern is the potential pollution of the Missouri River, the tribe’s sole water source upstream from the community, in the event of a pipeline

break or leak. Both of these highly publicized events demonstrate the complexity of environmental health risks and their entrenchment in broader systemic issues.

American Indian/Alaska Native (AI/AN) communities are particularly vulnerable to agricultural and mining industries' impacts occurring on their lands, and community members are at risk for related pollution. The U.S. Environmental Protection Agency reported that "61% of drinking water systems on AI/AN reservations had health violations or other significant reporting violations in 2006, compared with 27% of all public health systems in the US" (Christian-Smith et al., 2012). Despite the existence of protective laws, some communities are at a distinct disadvantage regarding the actual protection of such rights and the enforcement of laws. Federal and state laws have been criticized for their loopholes, for their general inadequacy to protect AI/AN communities from environmental contamination, and for the ease of access to tribal lands for extractive industries. (Hoover et al., 2012). Structural inequities have left tribal jurisdictions in a vulnerable state, susceptible to corporations seeking to benefit from less stringent environmental regulation as compared to those enforced by state governments (Hoover et al., 2012). Furthermore, some studies have found that organizations polluting low-income communities (including tribal land) generally receive lower monetary penalties than those who pollute white communities (Christian-Smith et al., 2012). Consequently, some of the challenges associated with implementing EHL programs in tribal communities include understanding and grappling with environmental injustices, jurisdictional hurdles, and inconsistent regulatory enforcement.

Although others have incorporated Bloom's taxonomy as a way to conceptualize EHL (Finn & O'Fallon, 2015), we have found Nutbeam's three-level schema, which was developed from a health literacy perspective, most useful for the design, implementation and analysis of EHL efforts (Nutbeam, 2000, 2008; Simonds et al., 2018). This schema integrates "interaction, participation and critical analysis" based on the pedagogy of Paulo Freire (Freire, 2000; Nutbeam, 2008). The first level of literacy within this schema is functional literacy with its focus on reading, writing, speaking, listening, and math skills and people's ability to apply these skills to tasks in everyday life. The second literacy level in Nutbeam's schema is interactive literacy which focuses on people's capacity to act on information accessed and knowledge gained. The third level focuses on critical literacy with an emphasis on collaborative action for change. We note that for each of these three levels, Nutbeam focused on individuals (lay public), and not on those preparing and presenting information (professionals). An expansion of functional, interactive, and critical literacy can also include attention to professionals' communication skills such as their ability to design and present accessible information in everyday language, through well-organized presentation of data, and with graphic displays that are neither cumbersome nor complex. Furthermore, interaction as well as engagement for interactive and critical literacy depends, in part, on the receptivity of professionals.

The cases referenced and briefly described in this paper focused on threats to safe, affordable, and accessible water in AI/AN communities. The discussion following provides an analysis of the cases based on an expanded typology of health literacy, highlights how insights from health education and health literacy studies have led to ameliorative action,

and notes how such efforts rely on attention to broader knowledge, critical skills, and partnerships.

Methods

To illustrate the multi-layered complexities frequently associated with EHL in action, we selected three case studies to demonstrate how the implementation of EHL-based initiatives has addressed exposures to contaminated water in tribal communities. More specifically, we were interested in successful cases that provided examples of how the three levels of literacy can be employed in a tribal community setting.

Selection of Case Studies

We conducted an extensive review of primary and secondary source materials related to tribal water quality in order to select case studies that demonstrated successful environmental health literacy efforts. A literature review of leading research databases including Pubmed, Web of Science, National Indian Law Library (Tribal Law Gateway) and NCAI's Tribal Public Health Law Database, was undertaken using combinations of the following search terms: *environmental health literacy*, *scientific literacy*, *legal literacy*, *Native American*, *American Indian*, *Alaskan Native*, *water quality*, *water contamination*, *pollution*. The Anishinaabe example was selected as a result of this review process. The Crow example was selected after review of the research databases and because of the authors' familiarity with the setting.

We also included primary source material (e.g., laws, policies and scientific reports) in our review as we realized the significant role these materials played throughout the processes described in the secondary material. In the Hoopa Valley case study, our key source of material was the ordinance itself and additional commentary related to the circumstances surrounding the development of this ordinance. A key collection of primary material we reviewed included the National Congress of American Indian's Tribal Public Health law database which contains laws, regulations and ordinances related to a variety of public health topics including environmental health.

Analytic Plan

Nutbeam's three-level typology offered a structure for analyzing the cases. Using the information available, we identified examples of each of the three-levels within each case. Examples of functional literacy includes reading, writing, speaking, listening, math skills, and people's ability to apply these tasks (with attention to professionals' communication skills to design and present accessible information). Interactive literacy includes people's capacity to act on information accessed and knowledge gained. Critical literacy includes collaborative action for change. Using this framework, the authors came to consensus regarding their categorization of examples in each case.

Case Analysis

The following three cases illustrate the complex nature of EHL as a tool to address environmental health hazards related to impaired water quality on tribal lands. Each case

involves potential exposure to contaminated water through consumption and contact necessary for both dietary and cultural purposes within those communities. Interdisciplinary knowledge, scientific, legal and environmental literacy and the community empowerment to effect change were essential in each scenario.

Apsáalooke Case: Building Community Functional EHL

The first case focuses on Apsáalooke (Crow Indian) tribal efforts to link health outcomes to water pollution and determine needed action to build and sustain within the community an understanding of the potential risks associated with poor water quality. Tribal members, concerned that the occurrence of stomach and lung cancers were more prevalent in communities on or near the reservation when compared to those not on or near reservations, began to suspect that the illnesses were due to environmental factors, primarily water quality (Cummins et al., 2010). As a result, community members, including a county commissioner, a construction manager, a tribal health educator and a faculty member at the local tribal college began a working group, the Crow Environmental Health Steering Committee. The partnership expanded to include researchers at Montana State University to gather crucial data to investigate their suspicions and enable them to raise awareness of water quality within the community (Cummins et al., 2010).

Community members worked with researchers to test well water to determine mineral and microbial risks. On the Crow reservation, private well water is not governed by Environmental Protection Agency legislation, which places the onus of testing and maintaining water quality on the homeowner (Environmental Protection Agency, 2017). The Crow Environmental Health Steering Committee (CEHSC) partnered with researchers at Little Big Horn College and Montana State University to obtain grant funding to conduct well water testing and educate well owners about the health risks associated with well water contamination. The CEHSC presented the information at public meetings and worked to obtain funding to further educate community members about safe well water practices (McOliver et al., 2015). Educational materials include a video with Apsáalooke community members demonstrating shock chlorination for wells that have been contaminated with bacteria. For these efforts to continue, education outreach for well-owners is critical so that the broader community of well owners can test and interpret their well water results.

In addition, the CEHSC decided that a strong science education program was needed for their children. Community members identified the lack of water-related environmental knowledge among school-aged Apsáalooke children as an area of concern. Tribal members speculated that children, if better informed, could serve as potential agents of change in the Apsáalooke community. Consequently, partnering with researchers from Montana State University tribal efforts now include hands-on educational and skill-building activities to increase EHL of school-aged Apsáalooke children and their families (LaVeaux, Simonds, Pickett, Cummins, & Calkins, 2018; Simonds et al., 2018). Through afterschool and summer camp programming, children learn about water quality and its impact on human health. Children have tested local water sources for bacterial contamination and presented results back to their community. After the completing the program, children tend to think more critically about their drinking water quality.

Anishinaabe Case: Interactive EHL—The second case focused on taking action in light of known pollution. This project arose through a collaboration involving the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), Midwest Center for Environmental Science and Policy, Michigan State University, and the University of Wisconsin-Milwaukee. In the case study we highlight, the Anishinaabe tribal community has been able to maintain safe consumption of the smaller, lower contamination risk Ogaa (walleye) as well as a connection to cultural activities related to fishing.

Government efforts to raise awareness of fish consumption have led some other tribal communities, for example, the Mohawk community of Akwesasne, to avoid ingesting local fish. While precautionary actions to minimize exposure to dietary contaminants through such fish advisories are necessary, the resulting cessation of all fish consumption and fishing activities in communities with close cultural connection to fishing is neither ideal nor necessary. Instead of a complete ban on eating fish, the Anishinaabe case example included the revision of fish advisories and maps specifically tailored to particular segments of the community (DeWeese, Kmiecik, Chiriboga, & Foran, 2009). With the primary goal to reduce risks associated with subsistence-based consumption of methylmercury contaminated fish, the GLIFWC GIS-based walleye consumption advisory maps were revised so that they followed EPA guidelines for safe consumption, while still being sensitive to Anishinaabe cultural practices (Kmiecik & Foran, 2007). The diversity of skills from project partners, including data collection (for example, fish consumption level, fish methylmercury levels and tribal members' level of concern regarding the risk of methylmercury exposure), data analysis, reconfiguration of maps and dissemination of information, showcase how complex EHL efforts may be.

Educational efforts were multidirectional. The scientific partners sought to raise awareness about pollution, and, in turn, the community educated the public health professionals about the need to craft messages that explain safe fish consumption in a culturally applicable manner. Tailor-made, lake-specific, risk-based, and culturally sensitive consumption advice for Anishinaabe tribal members in the Great Lakes region has led to an increase in awareness of safe fish consumption within that community (DeWeese et al., 2009). The EHL efforts focused on dissemination of findings with attention to action plans specifically targeted to members of an identified community.

Hoopa Valley Case: Critical EHL—The third case focuses on the Hoopa Valley Tribe's awareness of the danger posed to culturally relevant fishing as well as to a broad array of tribal activities. The tribal leaders noted the Trinity River and Klamath River riparian areas are used for drinking water, ceremonial bathing, basket weaving (weavers traditionally use their teeth to strip bark from plants pulled from waters that may contain toxins) and for gathering roots, materials and tribal medicinal plants (National Congress of American Indians, 2014).

The Hoopa Valley Tribe Title 35 Riparian Ordinance (1992) recognized that surface mining and other activities were affecting the Trinity River fishery's ceremonial and economic value. Such activities led to toxic and hazardous materials contaminating tribal waters, and the tribal council noted that if not properly contained, they would lead to significant risks to

both water quality and to public health. Importantly, the tribal council also noted in its findings that the purported regulation of such surface mining and other activities by the state and federal governments had been ineffective in addressing such impacts (Hoopa Valley Tribe, 1992).

The Hoopa Valley Tribe's Tribal Environmental Protection Agency (TEPA) has administered the reservation's water quality program following approval from the EPA in 1990 (Norton, 2006). In 2002, TEPA completed a Water Quality Control Plan based on a variety of data sources gathered to inform water quality criteria (Norton et al., 2002). TEPA responsibilities include managing water quality and ensuring compliance with water quality standards (Norton, 2006). The scientific expertise available within the TEPA, which has been in place since 1981, demonstrates the tribe's interest in and capacity to address environmental health injustices.

Over time the tribal council concluded that it was necessary to exercise comprehensive tribal regulatory authority over surface mining within the exterior boundaries of the Hoopa Valley Reservation and over surface mining and other activities in the area. The challenges involved an understanding of regulatory policies and of potential litigation before any comprehensive action could be considered. The Hoopa Valley Tribe had the legal and political knowledge to implement tribally specific environmental protection laws to protect the health of their people. The tribal council's understanding of scientific data and its ability to recognize when expertise, in the form of scientifically trained consultants was needed, along with their comprehension of relevant laws, was a necessary foundation for their efforts to address environmental risks and overcome injustices.

Findings and Analysis

The expanded schema applied to this analysis draws from current health literacy research (Nutbeam, McGill, & Premkumar, 2017; Pleasant et al., 2016) and science literacy research (National Academies of Sciences, 2016). Each case study provides an example of the three layers of Nutbeam's literacy schema within the context of environmental health. All three cases highlight the recognition and awareness within the community of a potential environmental threat via contaminated water. This recognition represents functional literacy among community leaders who make the initial connection between an environmental contamination and its potential human health threat. The next step was gathering data (whether that be sought by tribal community members or through partnerships with outside experts) to investigate further whether this potential threat was indeed harmful. This step exemplifies interactive literacy. With this evidence in hand, stakeholders took action to effect change at the legislative, policy, and education level, an example of critical literacy. In the Crow example, action taken by community partners included educational videos with local tribal members and efforts to enhance EHL in tribal youth as a method for reaching the larger community. In the Anishinaabe example, action taken involved knowledge that the fish advisories and maps should be tailored more specifically to those groups most vulnerable to exposure to fish containing methylmercury. While the source of the contamination could not necessarily be addressed, limiting the exposure to the consumption of such fish could be, and it was targeted through changes in fish consumption educational

materials. In the Hoopa Valley example, there was recognition that the surface mining may have been linked to water contamination and the tribe effected change at the legislative level by implementing the ordinance restricting water quality impairments. All three cases exemplify the web of relationships and varying literacy demands placed on community members and external stakeholders.

The application of Nutbeam's schema enables us to identify the locus of action within each case: building critical skills among members of the community, building trust between community and professionals for active engagement, and focusing on the critical engagement of community to bring about change. An expanded version of Nutbeam's schema, where attention is paid to the role of professionals and the need for professionals to build skills and provide services, enables us to see where critical action can be taken to assist community members in their endeavors.

Activities from the three cases are highlighted in Table 1 and arranged according to the Nutbeam typology. The focus is on activities undertaken in partnership – illustrating responsibility assumed by outside partners as well as by tribal members.

Discussion

These case studies provide lessons for communities and research partnerships seeking ways to enhance EHL and address environmental health problems. They also provide insight for needed expansion of an EHL perspective.

As is true for the cases here, EHL often includes issues related to health literacy, science literacy, as well as legal/regulatory literacy. The level of health literacy within a community may determine the capacity of that community to recognize and address environmental hazards, thereby minimizing negative health outcomes as well as redressing environmental injustices. The level of science literacy within a community may determine people's ability to comprehend both scientific processes and findings and their ability to make meaning out of epidemiological associations. Legal literacy may indicate the need to grapple with the legal language found in laws and regulations as well as with the nuances of interpretation. At the same time, people's ability to access these layers of complex information is dependent on professionals' communication skills—essentially their translations skills in eliminating jargon and making complex ideas clear.

We note the high value placed in each of the cases on collaboration and partnerships, both of which are emphasized in health education and health literacy efforts. All three cases bring up issues related to different realms of knowledge for each side of a partnership. Public health professionals and scientists shared knowledge and skills with community members to help build a more sophisticated understanding of the nature of scientific evidence among members of a community. Insights from health literacy can be used to ensure that scientific concepts are clearly and simply articulated. In turn, community members helped public health professionals and scientists build a nuanced understanding of the needs and culture of specific communities. Scientific efforts to illustrate the links between exposure and health outcomes are important as is the dissemination of this information. In addition, on-going

monitoring efforts and new discoveries are needed, and such endeavors can only be supported by well-trained community members, including youth. Thus, hands-on education, training, and participatory research programs can draw lessons from successfully evaluated and well-designed health education programs in a variety of areas to enable on-going efforts and continued action.

A working knowledge of legal regulations and policies proves to be key for water-related action and is likely needed for a variety of environmental health activities. Here too, effort is required to translate legal jargon to make critical information accessible to community members and tribal leadership. EHL cannot solely focus on building familiarity with scientific and environmental concepts, terms, and issues. If critical literacy is to be achieved, action is required, and action must be based on an understanding of the current legal and regulatory framework.

Implications for Further Work

As analyses in health literacy have already demonstrated, information (including information about policies, laws, and health implications) must be available and accessible so that individuals and communities can recognize health dangers as well as exposure risks, understand the available legal means to influence hazardous exposures, and take needed action to safeguard well-being. For example, community members may need to become familiar with scientific processes and develop skills related to measurement and monitoring. Consequently, the quality and clarity of information provided to community residents and leaders must be sufficiently accessible, so information can be understood and applied. We contend that it is the responsibility of professional partners in science, health, and law to provide clear and actionable information. The important work in EHL can draw from health literacy policies as they both rely on effective and appropriate communication *with* community members (Rudd, 2010).

These cases illustrate how initiatives can benefit from cross-collaborations and trans-disciplinary teams. While there are numerous examples of effective partnerships and collaborative efforts occurring to improve tribal water quality, these three case examples highlight the practical advantage efficient partnerships can have. Addressing environmental health problems requires potential partners drawn from multiple disciplines such as toxicology, microbiology, law, education, and public health. While identifying those disciplines is an important start, the actual integration of these disciplines within a community setting is of critical concern. Health education and health communication studies have long indicated that efforts are more likely to be effective and appropriate if the community works in partnership with researchers, program designers, health experts, and policy makers (Emmons, Viswanath, & Colditz, 2008; Stokals, 2006)

Research in legal literacy informs us that it is crucial to understand what issue is important to the community, what information community members require, and which groups within the community are the best recipients of the information for effective dissemination (Hackl, 2012). Researchers and practitioners in health education and health promotion have long articulated these same lessons pertaining to the value of community engagement (Israel, Schulz, Parker, & Becker, 1998; Wallerstein & Duran, 2010).

Health literacy literature indicates that key health information is quite often available but not accessible because of jargon, unfamiliar vocabulary, scientific and mathematical concepts, and poorly developed and designed materials (Berkman, Davis, & McCormack, 2010). Active engagement fosters the inclusion of community perspective, community voice, and community language. Community members can identify jargon and unfamiliar terms, scientific concepts, as well as difficult math concepts and tasks. Thus, attention to rigorous formative research, pilot testing, and adherence to health literacy principles must guide the development of all health messages (Doak, 1996).

Broad-based public messages may not be appropriate for everyone. As was noted above, fish advisories often target both tribal and non-tribal individuals who may not consume the same amount of fish. Tribal members may be more likely to rely on fish because of subsistence diets. Therefore, messages conveying risk must consider the higher levels of consumption among tribal members. Without rigorous formative research, messages about fish consumption may be inappropriate for cultural reasons, as well as literacy-level reasons (Marsili, Comba, & De Castro, 2015).

Legal language provides yet another barrier, offering a mismatch between the demands of the legal texts and the documented literacy and numeracy skills of U.S. adults (Tamariz, Palacio, Robert, & Marcus, 2013). Thus, access to critical information is hampered. Understanding the already complex legal issues can prove even more challenging in AI/AN communities, in part, because of the layers of laws governing tribal lands. Environmental health laws impacting tribal lands may consist of federal, state, tribal and local level regulations in place. Which laws apply will depend upon the particular legal framework applicable to a tribal land. Factors that influence the framework include whether the tribe is recognized as a state under federal environment laws, whether the tribe has developed its own set of particular laws, and how compliance and enforcement measures have been carried out. Additionally, governance structures including the roles and responsibilities related to water quality within a community may also be complex and difficult to sort out.

EHL education efforts should recognize the role that trusted sources of information play. Many lessons can be drawn from the now classic Diffusion of Innovation texts and the multiple studies in this area (Rogers, 2003), which advise that sources of information be attended to (Marsili et al., 2015). For example, tribal council statements and actions may be perceived as more trustworthy by community members and may be disseminated more easily than those associated with outsiders.

The three case studies we examine in this article are certainly not an exhaustive list, nor do they reflect the vast amount of activity occurring on tribal lands and elsewhere involving elements of EHL to address a range of public and environmental health concerns. Further steps may build upon this limited review of written materials to explore in more depth the experience of stakeholders involved in these processes. Such information may provide more detailed guidance to inform the implementation of EHL efforts.

Conclusion

We appreciate the challenges that tribes face and are inspired by the many tribes who are identifying the links between environmental degradation and public health, particularly in relation to water quality. Of the twelve categories used to organize the tribal codes and policies included in the NCAI's Tribal Public Health Law Database, environmental health is the largest category, representing at least 20 percent of the codes in the database (National Congress of American Indians, 2016). This dominance of environmental health within the codes demonstrates an appetite for education in governance and environmental health law mechanisms to ensure tribal communities can take steps necessary to influence and protect health.

The emerging literature from EHL references and recognizes social justice issues. Efficacious action can be promoted and supported through examinations of how communities learn to use science and law to address environmental health risks. Knowledge of scientific findings and of legal rights and the ability to enforce those rights may in fact provide needed vehicles to address environmental health hazards and ultimately protect the health of communities.

EHL efforts can draw strength from its foundation in health education, health promotion, and health literacy. This rich academic base calls for effective and appropriate communication *with* community members supported by access to understandable information. Such information must include environmental health risks, environmental health laws, as well as information related to rights and responsibilities (McOliver et al., 2015). Subsequently, EHL efforts will truly support individuals and communities to develop the means to recognize and document environmental exposures and exert influence to control such hazards and protect health.

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Table 1.

Schema for Environmental Health Literacy Focus on Water Quality

Needed Environmental Health Literacy (EHL) Knowledge and Skills Using a Three-Level Framework [*]		
Functional EHL	Interactive EHL	Critical EHL
Reading, writing, speaking, listening, and math skills and people's ability to apply these skills to tasks in everyday life. With attention to professionals' communication skills such as their ability to design and present 'accessible' information.	Focus on people's capacity to act on information accessed and knowledge gained.	An emphasis on collaborative action for change.
-Observe and document water use	-Describe & present how water and water ways are used by Tribal members	-Document and log water needs and use
-Read about water composition	-Describe water and its component parts	-Add water quality studies to school curriculum
-Read and use maps related to source of water	-Determine and discuss land use at water sources	-Monitor land use at water source
-Become familiar with the science of testing	-Explain and demonstrate how to collect water for scientific analysis -Describe and demonstrate testing process	-Teach testing processes to all well owners -Establish systematic water testing and reporting on Tribal land
-Read graphs and charts related to mineral and microbial risks	-Generate findings -Collect and monitor results	-Generate Tribal action as needed
-Comprehend the link between contaminants and health [and relevant terms such as associations, likelihood]	-Interpret results -Disseminate results through regular tribal reports	-Partner, as needed, with public health experts
-Find and learn about laws governing water use	-Establish helpful partnerships [research, public health, medicine, law, policy] -Work with Professional partners to 'translate' existing laws and regulations into plain language -Disseminate Information	-Generate legal action as needed

^{*} This framework is inspired by Nutbeam's three-level framework for health literacy (Nutbeam, 2008).