Water Literacy

Subjects: Environmental Sciences

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Water literacy may be considered generally as the culmination of water-related knowledge, attitudes and behaviors. It holds growing importance for sustainable water resource use and management. While use and definitions of the concept of water literacy vary broadly in the literature, the synthesis of these identifies common elements and themes in a holistic framework.

water literacy water education hydrosocial water sustainability conservation

1. Introduction

A strong, interdisciplinary and widespread foundation of water knowledge among all water users is a pivotal goal towards achieving water sustainability and social water equity. Drawing from educational psychology, water knowledge for an informed and engaged citizenry must also include cognitive, affective/emotional, and behavioral domains[1]. This mirrors the learning goals set forth by the United Nation's Education for the Sustainable Development Goals (ESDGs)[2]. Water literacy is therefore the culmination of water-related knowledge, attitudes and behaviors, setting apart its importance and uniqueness from other more commonly used labels such as ecological or environmental literacy. The use of water literacy is increasingly popular, but the concept's definition, application and assessment differs substantially across each use. Thus, this entry details a systematic review and synthesis of available literature to develop a holistic framework of water literacy elements, which can serve as a foundation for future study and application of water literacy efforts.

2. Development of a Water Literacy Framework

Definitions of water and watershed literacy were collected through a keyword search of scientific databases (Google Scholar, ProQuest, and Jstor) and websites. Twenty-six unique definitions and descriptions were analyzed using a qualitative thematic text analysis[3] to identify common themes. Reviewing the themes in the context of other learning and knowledge frameworks[2][4][5] led to a new framework of eight unique but complementary knowledge sets.

The synthesized knowledge sets with their descriptive themes are shown in Figure 1. The outer ring recognizes definitions that are non-specific. For example, one of the broadest and most thorough water literacy surveys to date was conducted by Fielding et al.[6] in Australia, and yet they define water literacy as "water-related knowledge" (p. 6). Ambiguity in defining water literacy is appealing because it can encompass a vast range of water-related topics, but it also limits understanding and applications of the concept.

The interior of the figure depicts more specific knowledge sets organized by the learning domains reflected in each set. From the cognitive domain, four separate knowledge sets were identified: science and systems knowledge, hydrosocial knowledge, local knowledge, and functional knowledge. From the behavioral domain, two knowledge sets were identified: individual action and collective action. From the affective domain, one knowledge set was identified: attitudes and values. The unequal division between these three learning domains reflects a common issue among sustainability education literature, which emphasize cognitive learning over behavioral and affective learning[7].

Figure 1. Water literacy framework depicting key knowledge sets that emerged from a text analysis of water literacy definitions from 26 sources[8].

Cognitive knowledge was the most detailed in water literacy definitions and provided the most distinction among knowledge sets.

Science and systems knowledge is based on water's unique scientific properties and its significance for living systems, including the water cycle and water's ability to transport dissolved and solid materials. This category encompasses ecosystem needs and flows[4][5][9][10][11], hydrological processes, cycles and functions[5][9][12][13][14][15], and water's chemical and physical properties[5][16][17]. An understanding of "watershed concepts"[18] (p. i) and ability to define watersheds[11][13][19] are also included in this knowledge set.

Local knowledge encompasses an understanding of local water sources[17][20], water infrastructure[12][13][15][21][22], and current water demands and uses[15][17][21][22][23][24][25][26]. There is a particular focus on knowing where one's water comes from[4][10][15][22][25], including a familiarity with the watershed one lives in[11][13].

Hydrosocial knowledge refers to the bi-directional and continuous interactions between society and water resources. A number of definitions emphasized how human actions impact water quality and health of water resources, and at the same time, how the health and quality of water resources directly impact human health and welfare[11][12][13][14][15][21][25][27]. This knowledge set reflects the increasing recognition of the hydrologic cycle as intricately intertwined within and around social and cultural processes[28][29][30].

Functional knowledge represents a bridging knowledge set that connects water-related knowledge to real world applications by underscoring the difference between how water is currently used and how water should be used. This includes awareness of how to use water sustainably[20][23][25], how to conserve[10][15][31], and how to protect and/or restore watersheds[11][18].

The affective application of water-related knowledge is represented by the **attitudes and values** knowledge set. Beyond a general mention[21][32][33][34], definitions specify that water literacy should include "attitudes toward watershed health"[18], a "scientific water attitude"[31], or regionally-specific elements such as valuing the role and function of the Great Lakes in the U.S.[14].

Finally, the two behavioral domains of water literacy include **individual action** and **collective action**. Individual action refers to the actions of single persons or households[9][12][13][17][21][25][31][32][33], who make "informed and responsible"[14] decisions about water resources that have the capacity to "reduce individual… impact"[11] on water quality and water quantity. In contrast, collective action refers to the water-conscious actions of a large group of people. It is the act of making informed decisions at a "societal level"[9] (p. 37), in order to reduce the "collective impact" of humans [11] (p. 29).

Together, these knowledge sets highlight that the concept of water literacy is multi-faceted and complex. While a standardized definition of water literacy may be infeasible, the identification of common elements and knowledge sets provides a holistic framework for water literacy on which to build.

Note: This entry is based on McCarroll, M. & Hamann, H. What We Know about Water: A Water Literacy Review. Water 2020, 12, 2803. For further development, see McCarroll, M. and Hamann, H. (2020) and its cited references.

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