

Water Literacy:

Educator Perspectives, Student Knowledge, and Possible Misconceptions

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Abstract:

This chapter begins to address what knowledge about water (water literacy) 5th grade students should have. Included is a summary of the results of a water literacy survey administered to Washington State formal (classroom) and informal (out-of-school) educators. The purpose of the survey was to determine from a small but diverse sample of educators what they think 5th grade students should know about water. In addition to gathering data from the educators, the author also interviewed a handful of 5th grade students to see what they know about their local water sources. It appears from the results of this small sample of educators and students that there is a great deal of consensus from adults as to what students should know about water, and conversely that students are lacking in knowledge about their local water sources and impacts. There is also minor evidence suggesting that learning about the water cycle (which students typically learn in 3rd or 4th grade) perpetuates some misconceptions about where their water comes from. The author suggests that this potential misconception might be worthy of further research.

In September of 2012, an International Water Literacy Symposium was held at the International Christian University in Tokyo Japan. I was invited to attend and present at the Symposium because of my work developing the 2009 Washington State K-12 Integrated Environmental and Sustainability Learning Standards (OSPI). This chapter provides an overview of the research and information I presented at the symposium.

What Should Students Know About Water? – Teacher Survey

The initial focus of my presentation was to share the Washington

State perspective on what upper elementary school students should know about water. In my position as Program Supervisor for Environmental and Sustainability Education for the Washington State Office of Superintendent of Public Instruction, I have some level of knowledge of what is being taught in public schools around water. However, I did not feel qualified to represent what Washington educators believed students should know about water. To address this deficit in my own knowledge, prior to attending the symposium I did some simple questioning to determine what some Washington State educators think students should know about water. I devel-

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oped a five question online survey adapted from the questions posed by the symposium organizers and sent it to teachers and other educators in Washington State.

Because of the short timeframe between issuing the survey and needing the results for the symposium, only about 15 educators completed the survey. However it was a wide representation of educators across the state in terms of grade level, content area, student demographics, and classroom (formal) and out of classroom (informal) contexts. A summary analysis of the survey results is provided here.

The first question, *What do you think students should know about water by the end of 5th grade?*, generated the most responses (and was at the core of the symposium purpose). There was a good amount of overlapping and consistent answers which I categorized into the following big ideas:

- The water cycle
- Where it [fresh water] comes from
- Human/Earth's dependency on water
- Watersheds
- Water quality, health, pollution, and treatment
- Water quantity, use, and conservation
- Water as a finite resource
- Properties of water
- Water and geology/geography
- Water as a system

The second question asked *How can we balance understanding global water issues with an effort to incorporate local water issues?* The educator responses generally fell within three broad areas: 1. start local; 2. move from local to global action; and 3. use water as a unifying element across different cultural and geographic spaces.

Question three asked, *To what degree does this water knowledge go beyond traditional curricula in science and social studies?* The educator responses to this question fell into two competing perspectives, one perspective being that water literacy naturally fits into and should be taught in the context of science and social studies (i.e. traditional curricula) and the other perspective that water provides a great concept for integrating across many content areas. It is possible the question itself was poorly worded which may have led to some confusion, but in any case they favored both keeping water in the traditional curricula of science and social studies, and for integrating the topic across subject areas.

Question four asked *How can their [5th grade students'] water knowledge serve as a foundation for further inquiry at the secondary level?* For this question there was agreement that early water literacy is important in developing more complex knowledge and skills in the upper grades. Educators provided several examples of the kinds of water literacy skills that are taught at the

secondary level and how they can scaffold and build upon a foundation laid in elementary grades.

The last question of the survey asked teachers *What sorts of water-related curriculum (experiences and instruction) do you deem as optimal preparation for acquiring this sort of knowledge (in the early elementary years)?* Their responses grouped into four general categories: Curriculum Resources, Direct Experiences, Embedded into Standards, and Teacher Knowledge/Professional Development.

What Do (and Don't) Students Know About Water? – Student Interviews

In addition to surveying educators about what students should know about water, I conducted a few video interviews with Seattle area 6th grade students asking them some of the questions generated from the educator survey. The questions I asked in the video interviews were as follows:

1. Do you know where your fresh (drinking) water comes from?
2. Do you know where it goes when you flush the toilet or turn off the faucet?
3. What is there about water that you like or think is important?
4. Do you know what a watershed is?
5. Do you know what watershed you live in?

The students' had several misconceptions about where their water

came from. Some of them said from the ocean. While this is not entirely untrue it is also not entirely correct. It seemed likely that the reason they said the ocean is because they had learned about the water cycle in 4th or 5th grade, and that water cycle lesson usually starts with evaporation from the ocean into the clouds. The question was trying to determine if students know the watershed from which their fresh water comes. The water cycle lesson may have created misconceptions about where *fresh* water comes from.

None of the students interviewed directly said that their water comes from the Cedar River Watershed. When prompted about the watershed a few of them did seem to have some idea that their water came from a watershed. One very surprising thing about this lack of knowledge of the watershed is that they had all visited the learning center at the Cedar River Watershed in during their 5th grade year.

The students had a somewhat better understanding of where their water went. They talked about it going into pipes and getting treated. Most did not know what happened to it after it was treated. Some of them guessed that it went into a lake or the ocean. Rather than a misconception, this clearly indicates a general lack of knowledge about where their water went.

All the students were able to name something they liked about water and seemed to understand its

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importance to life and health. Most referred to dehydration and needing water to hydrate. Some talked about how fish and other animals need water. One student said, "We can't live without it!"

None of the students knew what watershed they lived in or that they lived in one at all. When they talked about the field trip to a watershed they seemed to think that it was a place to go and not an area that encompasses where one lives. In other words they did not seem to understand the basic concept of a watershed.

Conclusion

Both the educator survey and the student interviews generated a wealth of useful information to inform the International Water Literacy Symposium and its follow up work. The educator survey clearly demonstrated teachers' strong agreement that teaching about water is important, that water literacy should be taught in a local to global context, and that early water literacy is a foundation for more complex water knowledge at the secondary level.

Based on the very sample of student interviews, it appears that there are some misconceptions about water and general lack of knowledge on the part of students. These misconceptions and lack of knowledge included the concept of a watershed, the water cycle, and where fresh water comes from. Students seemed to have a greater understanding of and

interest in the importance of water to life, especially as it relates to human and other species' health. Any further work on developing a water literacy curriculum, instruction, and assessments would be wise to carefully consider (among other important issues) how to address these misconceptions and build on students inherent interests.

Reference:

Office of Superintendent of Public Instruction (OSPI), K-12 Integrated Environmental and Sustainability Learning Standards, 2009.