Citizen science's broader impacts: Does participation in water quality monitoring provide more than data?

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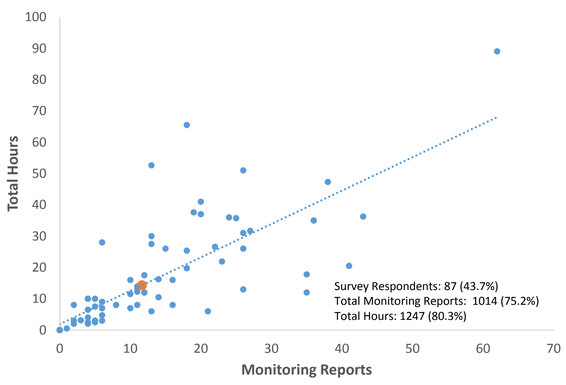
Citizen science programs are often promoted as avenues to not only increase data collection and participation in science, but to also increase people's knowledge and awareness about environmental issues. In order to make these broader educational claims about citizen science's outcomes we need to evaluate participants' knowledge and opinions to measure if there are changes due to participating in citizen science programs.

Utah Water Watch is a volunteer water quality monitoring program that seeks to improve the public's knowledge about water quality and actively engage them with monitoring lakes and streams. All volunteers attend a five hour training to learn about water quality science, the purpose of protecting water quality, and how to monitor. Volunteers independently monitor a water body and report the data back online. Utah Water Watch is free and provides all equipment and ongoing support.

In 2015 we conducted an online survey of current and past volunteers along with people interested in participating. We compared these data to pre-participation surveys and the level of volunteer participation to answer two questions.

1) What are the broader impacts on volunteer attitudes and are these related to participation? 2) Do volunteers have increased knowledge about water quality?

Participation



Monitoring reports and volunteer hours of survey respondents

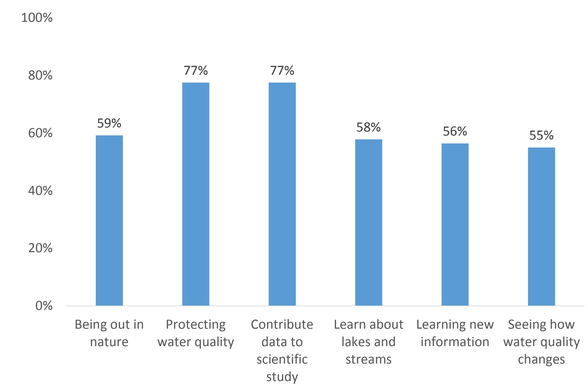
Our online survey was sent out to 199 adults that had participated in the Utah Water Watch program between 2012-2014.

87 people completed the survey for a 43.7% response rate. This included 61 active volunteers, 10 former volunteers, and 14 potential volunteers who have not monitored yet.

The most popular reasons for participating with Utah Water Watch are:

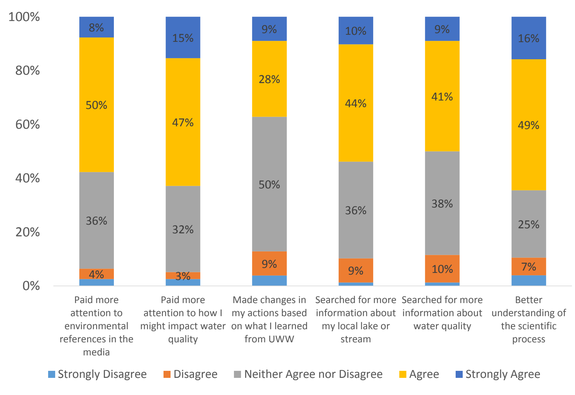
- Wanting to help protect water quality (88%)
- Like being outdoors (77%)
- To learn more about my local lake or stream (67%)

Reasons for joining Utah Water Watch are similar to what volunteers enjoy most, but with higher interest for contributing to a scientific study (77%).



What do you enjoy most about participating in Utah Water Watch?

Broader Impacts



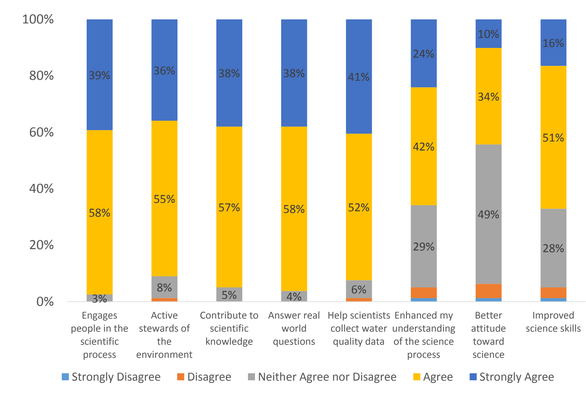
How strongly do you agree with the following: "Since I began participating with UWW…"

Volunteers reported strongly that they believed Utah Water Watch engaged them with nature and the scientific process. 62% responded that they paid more attention to how they might impact water quality and 37% made changes in their actions based on what they learned from Utah Water Watch.

We used a Pearson correlation test to see if any of these broader impacts were correlated to volunteer participation. We found only two responses were positively correlated with total hours or monitoring reports submitted:

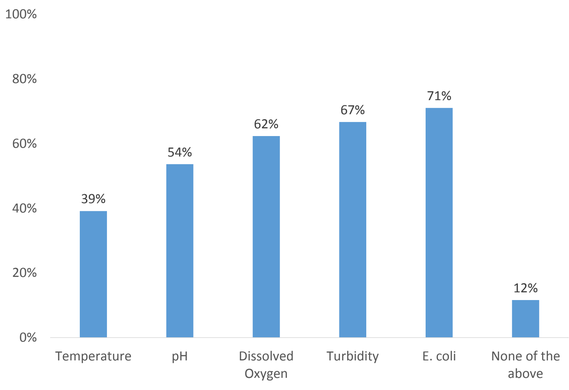
- I have searched for more information about my local lake or stream (Total Hours p = 0.021)
- I have a better understanding of the scientific process (Total Hours p = 0.036; Monitoring Reports p =0.023)

A T test of pre-post results revealed a significant decrease in the frequency that volunteers talked with neighbors (p = 0.002), family (p = 0.008), and local decision makers (p = 0.02).



How strongly do you agree or disagree with the following statements about UWW…

Knowledge



What water quality parameters do you now understand better because of your participation with Utah Water Watch?

Survey results indicate that volunteers increased their self reported knowledge on:

- Water quality parameters
- Methods to measure water quality
- Purpose of monitoring water quality

Analyzing the pre-post survey results with a T test indicate that volunteers rated the water quality higher in areas they monitored (p = 0.018) and were less concerned about the water quality (p < 0.00). Volunteers gained new knowledge and skills that enabled them to scientifically evaluate the quality of the water. Their monitoring-based knowledge then decreased their water quality concerns.

The survey included a brief quiz on water quality concepts. A majority (85%) of volunteers correctly identified the healthy pH range of Utah water and 94% correctly selected agricultural runoff as a non-point pollution source.

How knowledgeable do you feel about…	Pre Test Mean	Post Test Mean	DF	P
Sources of water pollution	3.41	3.5	57	0.563
Methods to measure water quality	2.56	3.75	56	<0.0
Purpose of monitoring water quality	3.33	4.03	57	<0.0
Organizations that monitor water quality	2.61	3.04	56	0.004

Pre – Post responses and T test results. Significant results in bold.

Conclusions

Volunteers self report increased knowledge about water quality.

Volunteers self report a greater understanding of science due to participating in Utah Water Watch.

Most dimensions of volunteer learning were not correlated with metrics of volunteer effort. This indicates that volunteers can benefit even with minimal participation.

Increased scientific experience can lead to modified behaviors including fewer interactions about water quality.