

## **FINDINGS FROM AN INDEPENDENT EVALUATION OF THE AMNH's ONLINE SEMINARS ON SCIENCE COURSE: WATER**

Inverness Research studied the AMNH Seminars on Science program for eight years, from its inception in 1998 to 2006. Since then Inverness has continued to evaluate newly developed courses. In 2010, Inverness Research evaluated the AMNH's online course, **Water**. Below we present teacher survey ratings for *Water*, along with profiles of two teachers who took the course.

### **SURVEY RATINGS FOR WATER**

Course takers report on our follow-up survey that **Water** has benefited them personally and professionally, and that their students also profit. We present below a small sample of our findings based on the responses of 22 learners from 9 states who completed our follow-up survey about the quality and value of the course. The majority of survey takers (86%) are K-12 teachers, but preservice teachers have also provided feedback about how the course has benefited them personally and as educators.

#### **What do teachers gain for their own learning from Water?<sup>1</sup>**

- *"motivation to continue learning about the course topics on my own"* (86%)
- *"additional background knowledge of science"* (77%)
- *"a bank of resources for my own learning"* (71%)
- *"a deeper insight into the work of scientists"* (59%)

#### **How do teachers apply the course directly to their classrooms?<sup>2</sup>**

- *"I used what I learned to create a unit for my students"* (85%)
- *"I have been able to teach new topics this year"* (65%)
- *"I made some course resources available to my students"* (45%)

#### **How does the course help strengthen teaching?**

- *"It introduced me to new kinds of materials and media such as simulations and websites that I can use in science"* (55%)
- *"It helped me to learn a new content area that I may teach in the future"* (58%)

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<sup>1</sup> Unless noted otherwise, percentages represent teachers who marked 4 or 5 on a 5-point scale where 1 = Not at all, 3 = Somewhat, and 5 = A very great deal.

<sup>2</sup> For questions regarding student impacts, percentages represent teachers who checked "yes."

- *"I am better able to assist students in meeting our state or district standards"* (52%)

**How do teachers say that this course helps their students?**

- *"Students better connect science in school with the real world"* (90%)
- *"Students now better appreciate the natural world"* (65%)
- *"The work of scientists is more understandable to students"* (60%)
- *"Students are motivated to continue investigating the topic(s) on their own"* (45%)

**How does the course compare with other professional learning opportunities?**

- *"The course was more valuable than other professional development available to me locally"* (90%)
- *"The course is more valuable than other distance learning courses I have taken"* (61%)

**Do teachers recommend the course?<sup>3</sup>**

- *"I have recommended the course to colleagues"* (60%)

**TEACHER PROFILES FOR WATER**

**A high school teacher learns about her local water system and is inspired to raise awareness about local water issues among her students**

**Water engages a science and art teacher in a rich exploration of ideas and issues that she draws on to portray for her middle school students the interconnections between water and all aspects of life**

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<sup>3</sup> Percentages represent teachers who checked "yes."

## **A high school teacher learns about her local water system and is inspired to raise awareness about local water issues among her students**

In San Diego, California, where conserving water is essential, Gail Massey is working to educate her students about the importance of water, and she credits some of her inspiration and most of her knowledge of water systems and issues to the SOS course, *Water*.

Gail teaches in a large, urban high school in downtown San Diego. In general, the students at her school perform well on standardized tests: on the annual performance index for California, the school is ranked as a 10 out of 10. Gail has always loved science. Initially, she was a laboratory technologist, and even when she took time off to raise her children she kept up with developments in science. She has been teaching for 12 years and teaches general and AP biology and earth science to 9<sup>th</sup>-12<sup>th</sup> graders. Gail enrolled in *Water* after seeing the documentary, *Flow* (<http://flowthefilm.com>), about the dangers of bottled water and the commercialization of water, because she wanted to learn more about the issue and apply what she learned to the earth science course she had just started teaching.

### **Enriching content knowledge: learning about wetlands, biodiversity and the profound impact of dams**

Before the *Water* course Gail had very little formal knowledge of wetlands even though she grew up in a marsh area in Arkansas and then moved to a region of estuaries in California. During the course she learned about the fragility of wetlands, the different types of wetlands, and their importance to ecosystems. She was particularly struck by the negative impact of dams on river ecosystems.

*I never thought of the damage caused by a dam. I realized that it flooded areas behind it, but I never thought about the biodiversity impacts of the dams. You always heard about them being clean, hydroelectric power [but now I know] that hydroelectric power comes at a great cost. Unless you are familiar with the area before, you can't see the impact after it has happened, and I guess most of the dams that I had ever seen had been there for a number of years and so I never was aware of what had been there previously. It was a very eye-opening experience for me.*

### **Enriching lessons: incorporating new knowledge and raising student awareness about local water issues**

Gail ended the course inspired to raise awareness amongst her urban students about the impact of water use on natural systems, something she finds they don't often think about. Gail mentioned that she appreciated the broad scope of *Water*—from China, to Africa and, serendipitously, to California. The course covered a topic that is close to home for Gail and her students—the Colorado River System—where San Diego, a city frequently visited by drought, gets most of its water. Gail decided to build a unit around this system for her earth science course.

*I had never taught about dams before. I did know that we got water from the*

*Colorado River, but I never realized the degree to which the water in the Colorado had been portioned out by the state and the river never even reached the Sea of Cortez anymore. I knew it comes from the Colorado, but I never realized the damage that the Colorado had endured because of the public drawing it and damming it and what the river had once been and what it is now.*

She started the unit by talking about Lake Powell, a reservoir on the Colorado and a common vacation destination for many of her students. She asked her students what was the source of Lake Powell and what was downstream of the lake. She then had them research the Colorado River system because she wanted them to think about where their water was coming from. One of the teachers in the building had recently visited the Sea of Cortez and he brought his photographs to the class of the once sea that is now a mudflat. Gail also showed a video that describes how in certain places along the Colorado River system people are not allowed to keep the water that flows off of their roofs during rains. These activities were a springboard to conversations about who owns water, water conservation, and water commodities, such as bottled water. This unit opened the eyes of many of her students to an issue that is literally close to home.

*The water thing really made a big impact on the students that I had in earth science...I really think it is an important topic and there were some students that were very impressed with it, and would come in and tell me things that they had found out from other sources, even later in the year. They were amazed.*

### ***Educating even more students about water systems and issues***

Gail brought some of the same information to her AP Biology class and to the environmental science club that she leads. She also took the club to a local estuary to help clear out invasive weeds and study the native grasses.

### ***Water engages a science and art teacher in a rich exploration of ideas and issues that she draws on to portray for her middle school students the interconnections between water and all aspects of life***

Charlene teaches in Toledo, Ohio, where the school district is struggling with federal mandates and is reeling from the loss of manufacturing jobs and the resulting increase in student poverty. Her school has the highest achievement test results in the district. She has been teaching for 23 years, artfully weaving together Fine Arts and Chemistry—she says, “*There is no science without fancy and no art without fact*”—and is now teaching 7<sup>th</sup> grade Life Science. She enrolled in *Water* in Summer 2009 as part of her recertification process.

### ***Experiencing “best” professional development as in-depth, knowledgeable conversations about the subject: water***

Charlene described *Water* as the best professional development she had ever participated in. The course was truly about water, as opposed to teaching about water.

She spent 25-30 hours a week “voraciously” working on the course, soaking up all of the information and online dialogue.

*I was blown away by the quality. I was absolutely, wow.*

Not only were the instructors knowledgeable and interactive, but each of the other participants also offered a wealth of information. She particularly enjoyed that the participants came from diverse professions, ranging from an English teacher to participants whose work involves water management and water issues.

*It really was a very rich experience. I would highly recommend it to anyone that is looking for professional development, no matter why you want to take it, even if you just want to hang out with some really neat people.*

### **Exploring new knowledge and issues: from the New York City water system to the education of women in third world countries**

The course led Charlene on a rich exploration of the issues related to water, opening doors to many areas she had never explored and teaching her new skills. Conversations about water availability in third world countries, for example, led to discussions of economics and education.

*We often had issues where we would talk about water, but then it led into the economics of the area and the role of women in securing water, especially in underdeveloped countries. [We learned why] the women basically were uneducated—because they were in charge of walking six miles to get the water for the day and therefore the boys went to school, but the girls didn't because they were carrying the water.*

As for skills, Charlene learned how to interpret a water quality report, and as a result was better able to understand a recent report at her summer cottage on Lake Michigan. She also learned about the ins and outs of the New York City water system, and she can explain with great enthusiasm the current repair of part of the city's immense water system. As part of a course project to research a local wetland, she learned how to use Google Maps, and as a result was inspired to take a class at a local public television station about Google applications. She is now using Google tools to help her bring concepts to life in her classroom.

### **Becoming a more knowledgeable and proactive citizen around water issues**

Charlene believes that the course has made her even more aware than she was before about the scarcity of water as a vital natural resource.

*I feel like a much more knowledgeable citizen...I truly believe in serendipity, sometimes those things that cross your path when you least expect it and enrich your life... I was at my local craft store, and I had occasion to use the restroom and the faucet was dripping and I went to the manager and I said, 'Do you know how much water you are wasting? You really need to get a new gasket.' You*

*know, I always thought that I was frugal about natural resources, but boy, I have become more so now.*

**Using the topic of water to engage her students in many different aspects of our world—health, economics, the environment, and politics**

*It [studying water] weaves such a spider web of ways to engage the students in thoughtful conversation.*

Charlene brought her enthusiasm and new awareness into her classroom by using water as the theme for the year in her honors life science classes. She set the stage with the water cycle and from there led the students in an exploration similar to her own in the SOS class—ranging from global water issues to local water issues related to the Great Lakes and Toledo waterways.

Because her students are middle school students and “kind of quirky,” she often focused on finding unique or unusual examples to teach them about the issues. For example, when teaching them about how people in different places get fresh water, she found examples that they could relate to or might find especially interesting.

*There is a pump developed for outlying areas, especially in underdeveloped countries, where water is pumped to the surface by using a merry-go-round on a playground. In turning the merry-go-round, children generate the energy necessary for the water to be pumped to the surface. My students love that kind of stuff! They just eat it up because it is somebody their age that is doing those kinds of things.*

Charlene had her class look at local issues as well, with attention to their nearby body of water, the Great Lakes. The students read articles in the local paper about the invasion of Asian carp into the Great Lakes and the controversy around the proposed channel to link the Mississippi River to the Great Lakes. She says she “continuously stressed” the fact that the Great Lakes is one of the largest areas of fresh water and told the students they should never vote away their rights to the Great Lakes.