

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

Inverness Research studied the AMNH Seminars on Science program for eight years, from its inception in 1998 to 2006. Below we present teacher survey ratings for *The Diversity of Fishes*, along with profiles of two teachers who took the course.

SURVEY RATINGS FOR *THE DIVERSITY OF FISHES*

Course takers report on our annual follow-up surveys that *The Diversity of Fishes* has benefited them personally and professionally, and that their students also profit. Compared to other AMNH online courses, its bank of resources was rated especially high, and course takers often recommend this course to colleagues.

We present below key findings based on the responses of the 52 learners from 14 states who have completed follow-up surveys about the quality and value of the course. The majority of survey takers (75%) are K-12 teachers, but informal science educators and preservice teachers have also provided feedback about how the courses have benefited them personally and as educators.

What do teachers gain for their own learning from *Diversity of Fishes*?¹

- *"a bank of resources for my own learning" (92%)*
- *"additional background knowledge of science" (87%)*
- *"a deeper insight into the work of scientists" (78%)*
- *"rekindling of passion for science and the work of scientists" (72%)*
- *"motivation to continue learning about the course topics on my own" (63%)*

How do teachers apply the course directly to their classrooms? ²

- *"I used what I learned to create a unit for my students" (83%)*
- *"I made some course resources available to my students" (62%)*

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" (74%)*

¹ 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.

² For questions regarding student impacts, percentages represent teachers who checked "yes."

The Diversity of Fishes

- *"It provided me with hands-on inquiry learning experiences that can serve as a good model for the kind of work I can have students do."* (70%)
- *"It enhanced my content knowledge in a subject area I teach regularly"* (67%)
- *"It helped me to learn a new content area that I may teach in the future"* (64%)
- *"I am better able to assist students in meeting our state or district standards"* (33%)

How do teachers say that this course helps their students?

- *"Students better connect science in school with the real world"* (66%)
- *"Students gain a better understanding of scientific inquiry"* (63%)
- *"Students have better access to and knowledge of latest research"* (58%)
- *"Students now better appreciate the natural world"* (58%)

How does the course compare with other professional learning opportunities?

- *"The course is more valuable than other distance learning courses I have taken"* (72%)
- *"The course was more valuable than other professional development available to me locally"* (69%)

Do teachers recommend the course?³

- *"I have recommended the course to colleagues"* (74%)

TEACHER PROFILE FOR THE DIVERSITY OF FISHES

On the pages below, we have profiles for the following two teachers:

A primary school teacher finds the SoS course supports her growth as a scientific thinker and teacher

An outdoor educator finds the SoS online Fishes course enriches his content knowledge and provides him with access to experts in the field

³ Percentages represent teachers who checked "yes."

A primary school teacher finds the SoS course supports her growth as a scientific thinker and teacher

Genevieve is an assistant kindergarten teacher at a small charter school in inner city Brooklyn, NY. She has been teaching for four years and this is her first year at this school. The school focuses on finding a balance between project-based teaching that emphasizes the arts and meeting state guidelines. Almost all of Genevieve's students are African American. Individual attention is an important characteristic at this school and for this reason the kindergarten and first grade classrooms each have two teachers. Genevieve enrolled in the SoS online course, *The Diversity of Fishes*, in Summer 2005 as part of her coursework for a Masters in Education.

A supportive environment for learning: A safe place to ask questions. As a child, Genevieve had been interested in nature but she hadn't had many science courses as an adult. She felt the SoS online course was a "Nice way to ease back into thinking about science and to have it feel really relevant. It was also a way to experience science for myself and then also think about how to teach that to children." Genevieve described the environment of the SoS course as nurturing and supportive.

It feels like this little mini journey that you are on and everyone is very engaged and the teachers are very present and offering lots of support and feedback. I think because for teaching there are so many women involved, the instructors are very sensitive to women coming with the fear of science or a feeling of inadequacy. I felt like from the start, it was a very safe place to feel like I wasn't so knowledgeable about science and then be able to grow as a scientist.

Growing as a scientist: Learning about classification systems, learning how to investigate. Genevieve described learning about sophisticated methods of categorizing characteristics of species and classification systems. She found that even though science hadn't been one of her strongest subjects, the learning felt relevant and exciting for her. She described how through the course, she learned a method for comparing the features of different fish and through doing this became excited about the process of investigation.

Online we would have to compare different fish and then make a chart to compare their different features. For example, numbers of fins, or what type of fin, the size of the eyes, the number of rays that they have. After you do that a couple of times, it becomes much more familiar to you. The information builds on itself and you keep going a little bit further with what you learned the week before, and gathered from the reading. It was nice to see how, even for a subject that I never felt was one of my strongest, that I could really get into it and get excited about it. I think it was likely because of the format of the course that I was able to do that. It felt like a real investigation for myself. So, I would show my friends my charts. It was fun, it was like a big nerd moment.

Growing as a teacher: Designing a curriculum, learning about learning. Genevieve stated that the course helped her to gain clarity about how she goes about learning and to become comfortable with that process. She feels that this experience is important for her as a teacher. Genevieve also described how her experience of designing a

curricular unit for her final project of the SoS online course gave her a system for designing science lessons.

I think to have designed an entire curriculum was a really great thing. I had to also take a course in teaching science this past semester and I had to design a whole new curriculum and I found that I was able to really draw on what I had done with this totally unrelated subject of fish to what I designed for this other science project. It is like a system for me, and it informed how I went about designing my other science lessons.

An outdoor educator finds the SoS online Fishes course enriches his content knowledge and provides him with access to experts in the field

Mr. A. is an aquatic education consultant in natural resource management for a state agency. For the last four years he has been teaching a wide range of students, kindergarten through graduate school, about fish, aquatic invertebrates, watershed health and fisheries. Most of his teaching takes place in rural Alaska in small village schools in either Eskimo or Athapascan Indian villages. He enrolled in the SoS online course, The Diversity of Fishes, in Summer 2005 because he wanted to strengthen his knowledge of systematics and cladistics.

Enriching content knowledge: Learning about cutting edge methods for classification. The SoS online course provided Mr. A. with a rare opportunity to learn more about cladistics—an approach to classification using DNA sequence.

The best thing for me was cladistics. Generally it is taught as a course in and of itself and it isn't tied directly to fish. So this was really neat to be able to study fish which is the bulk of what I talk about in my job. We looked at different ways of classifying them and that is something that generally is not offered at the university level.

Enriching lessons: Incorporating feedback from experts, new strategies and content. The lessons Mr. A. submitted for his SoS final project have been included in the Alaska Department of Fish and Game K-12 curriculum. These lessons incorporate new fishes and classification activities that hadn't been in the curriculum before. One of the great advantages of the SoS online course for Mr. A. was the ability to submit these lesson plans to experts in the field and to get feedback. In addition, Mr. A. learned how to look at the anatomy of a fish in a systematic way and this is a process he has shared with his students.

There is the Upward Bound program, which is a national program for bringing high school students into a university setting. We went out and were digging up juvenile lampreys. A lamprey is a really interesting type of fish. When they are young, they don't look like fish and they live down in the sediment for years and years. We were down digging them up and studying their adaptations for living in that environment and that lesson, as far as looking at the anatomy of a fish in a systematic way, came directly from the course.

Mr. A. has also adapted systematics and different methods of classification for incorporation into his lessons for elementary students.

I am sharing it with elementary students. Some of this information is being shared with students who would either never hear it, or would only hear it if they chose to get a masters or a doctorate in some sort of biology. That is kind of neat that I am sharing things that are pretty cutting edge, that wouldn't be shared otherwise.

SoS online courses: Accessible professional development for remote locations.

Mr. A. described having only one other option, besides online courses, for upper level courses—the local university. He found the SoS online course to be comparable to taking a course at a university and felt it was a great option for people like himself who don't have access to a number of different institutions.

The SoS online course was on par with actually taking a course at a university and physically being in the room. We definitely had to look at specimens and do some anatomical metrics counting things on them, but that was the only part where you really felt like this would be a little bit better if you were in a classroom with the professor. But on the other hand, all of the discussions, the papers, the video, the chats, the emails, it was on par with a one on one, physically being at a university course.