

FINDINGS FROM AN INDEPENDENT EVALUATION OF THE AMNH'S ONLINE SEMINARS ON SCIENCE COURSE: *THE OCEAN SYSTEM*

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 Ocean System*, along with profiles of three teachers who took the course

SURVEY RATINGS FOR *THE OCEAN SYSTEM*

Course takers report on our annual follow-up surveys that *The Ocean System* has benefited them personally and professionally, and that their students also profit. Compared to other AMNH online courses, its bank of resources were rated especially high; many course takers judged it to be more valuable than other online courses they had taken.

We present below a small sample of our findings based on the responses of the 29 learners from 6 states who have completed follow-up surveys about the quality and value of the course. The majority of survey takers (79%) 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 *The Ocean System*?¹

- *"a bank of resources for my own learning" (96%)*
- *"additional background knowledge of science" (93%)*
- *"a rekindling of my passion for science and the work of scientists" (76%)*
- *"motivation to continue learning about the course topics on my own" (83%)*

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

- *"I used what I learned to create a unit for my students" (84%)*
- *"I used the lesson plan I developed as my final project" (72%)*
- *"I made some course resources available to my students" (60%)*

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."

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” (92%)*
- *“It helped me to learn a new content area that I may teach in the future” (83%)*
- *“It provided me with hands-on, inquiry learning experiences that can serve as a good model for work I can have students do (68%)*
- *“I am better able to assist students in meeting our state or district standards” (36%)*

How do teachers say that this course helps their students?

- *“Students better connect science in school with the real world” (74%)*
- *“It made the work of scientists more understandable to students” (61%)*
- *“Students gain a better understanding of scientific inquiry” (52%)*

How does the course compare with other professional learning opportunities?

- *“The course was more valuable than other professional development available to me locally” (87%)*
- *“The course is more valuable than other distance learning courses I have taken” (78%)*

Do teachers recommend the course?³

- *“I have recommended the course to colleagues” (72%)*

³ Percentages represent teachers who checked “yes.”

TEACHER PROFILES FOR THE OCEAN SYSTEM

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

A high school AP biology teacher finds the SoS Oceans course provides her with content-rich resources and strategies that enrich her science teaching

A Title I high school teacher finds the SoS Oceans course pushes his thinking, strengthens his teaching, and informs his graduate studies

The Oceans course provides a middle school teacher with up-to-date research and interactive materials for her classroom, as well as enrichment for her interest in SCUBA

A high school AP biology teacher finds the SoS Oceans course provides her with content-rich resources and strategies that enrich her science teaching

We spoke with a teacher from Richmond, Virginia who teaches 9th through 12th grade Biology, AP Biology and Anatomy and Physiology at a regional school for gifted and talented students. She has been teaching for 18 years and is the chair of the science department. The teacher is also the science instructional coordinator for her school and as such oversees everything from textbook adoption to keeping the staff up-to-date on new teaching strategies. She enrolled in the Oceans Systems course in summer 2005 for two reasons: she needed a class for her re-certification and she wanted to find out more about the topic as her department is considering offering marine biology or oceanography as an elective.

Reviving a “lost” skill: writing in science. This teacher liked that the SoS course required a lot of writing because she finds most students do not associate writing with science; rather, they think writing is only done in English class.

I think writing is a more concrete way of communicating. It is also a very concrete way of supporting or defending a particular conclusion and being able to utilize knowledge, data, whatever that you have been collecting up to that point. I think with our continued reliance on technology, it is a skill we are losing.

She plans to use one of the writing assignments from the online course, tracing the travels of a drop of water from the Atlantic Ocean through the ocean currents, with her biology classes.

Using concrete examples to illustrate invisible cellular processes. As part of the SoS course, the teacher studied how mangrove trees have adapted to live in salt water. She now draws on the resources from the course to provide her freshman biology students with a concrete example of how living things use the processes of osmosis and diffusion.

The mangroves absorb salt water and they actively transport or get rid of the salt. There is one little video clip—it is on one of the web site resources that we had to

go to for the course—and it shows one of the scientists literally licking the leaves and commenting on how salty they are. The students say “Oooh, but you can lick them!” Whenever I can give them an actual concrete application of a process that you can’t really observe, it makes it more real to them. It also helps them retain, because if they have a greater understanding and appreciation, there is a greater retention as well.

New knowledge that enriches both life experiences and teaching. The teacher described the SoS course as providing her with a greater understanding of the role the ocean currents and temperatures play in the hurricane season in Virginia. The course also changed her experience of going to the beach.

When I go to the beach, I look at things a little differently now. My family went to the beach this summer, and I now have an understanding of tides and currents, the ocean life that is present and how it exists in the ocean and relies on those currents to bring in new nutrients and get rid of waste products.

She described how deepening her understanding of her local environment through the SoS course has allowed her to provide a richer learning experience for her students.

I am not going to be relying on a textbook so much, and I think students appreciate and have a respect for teachers that are continuous learners as well.

A Title I high school teacher finds the SoS Oceans course pushes his thinking, strengthens his teaching, and informs his graduate studies

Dave Buse teaches 10th, 11th and 12th graders Biology and Human Anatomy and Physiology at a Title I high school three miles north of Tijuana, Mexico. The student body at his school is diverse, with many English language learners. The teachers are working hard to improve their teaching strategies to reach more of their students and to move the school out of improvement status. Dave enrolled in the Ocean Systems course in the summer of 2005 because he needed graduate credits in science for his Master’s degree. He has also taken another SoS online course and likes the flexibility these courses offer.

The online course offers hands-on experiences and conversations with scientists. Even though the course was online, Dave was able to do experiments that deepened his content knowledge and would transfer directly to his classroom.

They did a lot of things where you could do little kitchen experiments, where you could mess around with the properties of water, salinity, for example. That was cool and that was something that I could transfer directly over to the classroom. It just gave me a little more content knowledge about that kind of thing, which I thought was really important, given the fact that living close to the ocean, it is definitely something that is applicable to my students.

Dave found the course to be well run and the instructors easy to access. The individualized feedback from the instructors pushed him to learn more.

Anytime you do an asynchronous type of web discussion, you need to have quick feedback and I felt like the feedback that I was getting from the Oceans course was very prompt and very directed. It wasn't like the professor was just looking over your stuff and saying "Great, you did the assignment." It was also pushing you to go a little bit further with whatever you were working on, which is kind of cool, because to have access to somebody who you are never going to meet and have them actually be willing to do that is pretty nice. I was impressed with that.

The systems approach framed concepts and provided concrete classroom activities. One of the striking aspects of the course, as Dave described it, was using a systems approach to learning about oceans. Dave found that this strategy impacted his thinking and his teaching.

That definitely got me into the systems thinking, like what are the inputs into the system, what are the things that are moving and flowing throughout the system? We did an activity where we had to follow a drop of water as it went through different kinds of currents, including the surface current of the Gulf Stream, and follow it around the earth and estimate how long it would take for it to travel. I now do a similar thing with the kids with the water cycle, just getting them think about how water moves and then how it returns and how long that could take for that to happen.

Increased content knowledge enhanced graduate field studies. Through the SoS online course, Dave said that he learned a lot more about ocean ecosystems, such as the organisms that thrive at hydrothermal vents through chemosynthesis. Unexpectedly, he found that another topic he explored in the SoS online course—Mangrove swamps—was the focus of a graduate field study course he took through the Cincinnati Zoo.

I actually am in a graduate class right now where we went to Belize and we did some coral reef studies and we did some mangrove studies. I thought, "Oh yeah, I remember talking about different kinds of mangroves." We did some population sampling to find out what creates different kinds of mangroves. I had a little bit to pull from when I saw the mangrove swamps in Belize because I had done the readings from the SoS course. I wouldn't have had that had I not taken that ocean systems course. That definitely gave me some advantage, when I was out there mucking around in the mangrove swamp and trying not to get eaten alive down there.

The Oceans course provides a middle school teacher with up-to-date research and interactive materials for her classroom, as well as enrichment for her interest in SCUBA

Clare Wagstaff teaches 6th grade Physics and Chemistry and 8th grade Earth Science at a small private K-8 school in Buffalo, New York. She describes herself as "really lucky" with great students, small class sizes and plenty of resources. She loves the SoS online courses (she has participated in five courses to date) because they are flexible, and they are concentrated in terms of content and expectations. She described the courses as

“Ideal for teachers...they start very basic and for someone who doesn't know anything...in the end you can come out with degree level stuff. “ She enrolled in the Ocean System course in the summer of 2005 in part for graduate credit towards her master's, but mostly because as a SCUBA diver she has a great interest in the oceans and knew that the course provided a good survey of oceanography in a six-week period.

Meeting the needs of online students: a well-designed course. Clare found that the design of the SoS course met all of her needs for graduate level learning. She appreciated that researchers who are currently working in the field provided course content.

In terms of what I actually got out of the course, I thought it was super. I liked the way I could talk directly to people who are doing research right in the field, it is current, it is there. It is not textbook with the same thing for ten years. These essays are from people who are actually in the field doing it right now.

Even though the course was online, Clare said it provided her with opportunities to do hands-on research, and the video links helped her feel connected to her instructors.

What I'm learning about needs to be something that I can see, touch. I am dyslexic, not severely, but the fact that this course has so many different teaching styles, it really adapts to me beautifully...The video links, I loved that—it felt like I was actually in a classroom and talking to these people directly.

Clare thought the online format provided another advantage in that she had time to think carefully and iteratively about her answers to questions posed by the instructors and her classmates.

I was talking with my fellow students every day. There was often someone who would comment on my writing, or ask me a question that would make me stop and think and go away and research and come back. Whereas, in a normal graduate class, where I sat in a classroom, I wouldn't have a chance to go away and look up and research my answers again, I would be on the spot there. With this class, I found I could go away, really think about the questions that were being asked and come back and reply. I had a whole week to do that.

A greater understanding of the world: a richer personal and professional life.

Clare reported that the SoS course increased her understanding of ocean systems, and this knowledge has had both professional and personal pay-offs. Professionally, she found it enriched her teaching by making her a more enthusiastic and confident teacher.

The course made my teaching easier. It made me understand what I was teaching. I could easily teach something without having to completely understand it, but the fact is it made my enthusiasm greater, because I had a better grasp of what was going on. It made me feel more confident in the classroom.

The knowledge she gained also enhanced her diving experiences and her understanding of the world around her.

It made me appreciate what I was looking at when I was diving out there and some of the physical effects that were occurring. I lived in England and I never really realized why the water was warmer there than I expected it to be at that latitude. But, when you think about it in terms of the North Atlantic current, and the warm water that it takes over there, it makes sense.

Up-to-date research: time to adapt it to the classroom. As her final project for the SoS course, Clare developed a detailed lesson plan for three or four lessons, using the knowledge and resources she had gained through the course.

I produced probably the most detailed and extensively thought out lessons I ever have. And to spend that much time on something like that is great, but in every day life, you can't do that, unfortunately. That is probably what I took away most—the fact that I managed to summarize and use it productively in a classroom session.

One of the activities Clare adapted for her 8th grade Earth Science course was a simulation of ocean currents available through the American Museum of Natural History's website. Clare wove the model into a discussion that began with physical properties of water, such as salinity, density and temperature, and moved from there to ocean currents and environments. Clare described ocean currents as a concept that is typically very confusing to students when learned from a textbook, but is much clearer when learned through an interactive model.

On the web site, the American Museum of Natural History gave us a really good interactive example of how the currents move, actually making it more visual and interactive. I could go on there and change different parameters and so the students could see the effects. For example, with global warming, melting polar ice and how that would cool the surface current and how that would have an overall effect on things like climate. The students loved it. They are exactly like myself. Give them something they can get their hands on and you have got them straight away.