

FINDINGS FROM AN INDEPENDENT EVALUATION OF THE AMNH's ONLINE SEMINARS ON SCIENCE COURSE: *EARTH: INSIDE AND OUT*

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 *Earth: Inside and Out*, along with profiles of three teachers who took the course.

SURVEY RATINGS FOR *EARTH: INSIDE AND OUT*

Course takers report on our annual follow-up surveys that **Earth: Inside and Out** 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 the 125 learners from 21 states who have completed follow-up surveys about the quality and value of the course. The majority of survey takers (78%) 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 *Earth: Inside and Out*?¹

- *"additional background knowledge of science"* (81%)
- *"a bank of resources for my own learning"* (79%)
- *"a deeper insight into the work of scientists"* (65%)
- *"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"* (78%)
- *"I made some course resources available to my students"* (59%)

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"* (65%)
- *"It helped me to learn a new content area that I may teach in the future"* (53%)
- *"I am better able to assist students in meeting our state or district standards"* (43%)

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 do teachers say that this course helps their students?

- *“Students now better appreciate the natural world” (69%)*
- *“Students better connect science in school with the real world” (63%)*
- *“Students gain a better understanding of scientific inquiry” (60%)*
- *“Students have better access to and knowledge of latest research” (60%)*

How does the course compare with other professional learning opportunities?

- *“The course was more valuable than other professional development available to me locally” (73%)*
- *“The course is more valuable than other distance learning courses I have taken” (57%)*

Do teachers recommend the course?³

- *“I have recommended the course to colleagues” (65%)*

TEACHER PROFILES FOR EARTH: INSIDE AND OUT

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

A secondary chemistry and earth science teacher uses the SoS course experience to restructure a geology course and introduce students to “the realm of discovery”

A college humanities instructor uses her SoS course experience to design and teach an integrated physical and social science unit on Global Warming

A first-year pre-school teacher with high school science background discovers science as a way of knowing in the SoS course

³ Percentages represent teachers who checked “yes.”

A secondary chemistry and earth science teacher uses the SoS course experience to restructure a geology course and introduce students to “the realm of discovery”

Ms. B. has been teaching for four years. She took the SoS online course to meet the New York state certification requirement for earth science. Ms. B. teaches both chemistry and earth science in a small “democratic” 6-12 school. Enrollment is by application and students have a say in school policy. The students are exempt from most of the state required tests for graduation; instead, graduation is based on performance.

Changing the school’s geology course: A new structure and new approach

Because of the SoS course, the geology course is now a different course at my school. I split the course into two semesters—one of Earth and the other Astronomy. I had not taken a well-rounded content course in earth science, so I had to learn as I taught. This course filled in the gaps for me.

As a result of her experiences in the SoS class, Ms B. took advantage of a nearby road cut to provide an inquiry experience for her students. It was “*an entry into the realm of discovery.*”

The approach of having my students go out, observe and figure out what they saw, decide what rules [about geology] they would make, based on what they saw. Why would you make these rules and how do they apply to this rock formation? And then compare this to the fundamental rules of geology. If you find something in a layer above something else, what do the rules tell you?

Ms. B. related the changes she had made in her course directly to the way the Earth course had worked for her:

At the base of it, the SoS course increased my content understanding and made me better at leading discussions with my students. Part of it was the material and how it was organized and the online discussions. When you listen to the questions that the other students ask, it broadens the way you think.

Having first-hand access to a scientist’s ideas. In particular, Ms. B. noted the importance of having the AMNH scientist engaged in the online discussions:

She [the scientist] was very good at responding to comments and asking students what they were thinking. She increased the depth of the conversations. When I learned most was when I was thinking about things she said, and asking questions about her responses to my comments. Having a scientist there definitely elevated the discussions.

The convenience and accessibility of online learning

The logistics—the course availability—was very big for me. I live near the college, but they do not offer content courses when I was not teaching, so I couldn't take them. I could take these courses in the summer and in my own time frame. I could work it into my life.

A college humanities instructor uses her SoS course experience to design and teach an integrated physical and social science unit on Global Warming

Dr. Helen Doss is in her fifth year of teaching as an associate professor in the Department of Communications and Fine Arts at Malcolm X College, a two-year community college in Chicago. She teaches a variety of humanities courses for a diverse student population, some of whom are beginning college students while others have degrees and are seeking career changes.

Experiencing a well designed and content-rich science course. Dr. Doss enrolled concurrently in the Genetics and Earth courses in the summer of 2005. She took the Earth course as preparation for a unit on Global Warming in the sophomore humanities curriculum.

The quality of the course content and instruction was just great. The textbook was very approachable and it was easy to use, both for beginners and advanced students. The field studies were excellent and the instructors were good at inviting participation. They posted interesting discussion questions and each student responded to the thread that they were investigating.

The assignments were carefully structured and sequenced so that each successive question built on the knowledge and experience that we had acquired early on. I always knew where to go to find information because I had enough prior knowledge to understand the why of the question.

Integrating social science and physical science in a humanities course. Dr. Doss wanted to teach the unit on Global Warming from a social science and a physical science perspective. The SoS course had an impact in two ways— in the content and in the course structure. She used the Earth course as a template for designing the Global Warming unit, both for the investigations that she incorporated, and also in the use of online assignments and discussions.

Originally Dr. Doss set up the discussion forums and posed the discussion questions but as the unit progressed, her students began to take charge of their own learning. They posed their own questions and initiated their own learning communities. She said this about the influence of the Earth course on her teaching and her students' learning:

When teachers are also learners, they teach better. Because I was excited about this and had learned in this way, I could bring my students along. At first my class was quite reticent, but they began to engage in interesting discussions about the topic among themselves, which they initiated via the

electronic medium. They could access this collaboration from their own sites and since many were in distant and dispersed locations, 75% felt that this greatly helped them learn. It became a different learning process.

At the end of the unit, we had a Global Summit and each student presented his or her research at the gathering. They were scared at first, but then they realized that they were the experts. They had the information and the resources and could talk about the topic with authority.

The convenience and surprising efficacy of online learning

I think I approached it (the course) in a suspicious way. I did not think it could be as interesting or as rigorous as a face-to-face course. But it certainly was. It allowed me to learn differently and better—at my own pace and on my own schedule. And I had 24-hour access to materials and resources. It changed my opinion of electronic courses.

A first-year pre-school teacher with high school science background discovers science as a way of knowing in the SoS course

Ms. R. B. was student teaching in a New York City public elementary school when she enrolled in the SoS Earth. The next year she became a teacher in a small private Jewish pre-school for 2 and 3 year-old children.

Her motivation for taking the SoS course was to fulfill a science certification requirement. She had attended a fine arts high school where she concentrated on music and took little science. She came to the SoS course with no formal science training beyond high school.

Gaining content knowledge and confidence in learning science. The SoS course was a real challenge for this new teacher.

It was hard and challenging and I was constantly working. I don't think I have ever had anything that stretched my mind so much, but I became a real participant in the conversation, as fully as anyone else. I learned so much in such a short time—from absolutely zero to being a competent part of a professional community of learners about earth.

I proved myself to myself in this course—hey, if I can learn this hard stuff, I am not intimidated by any subject.

Gaining understanding about teaching science. For Ms. R. B., the most important experience in the course was the rock unit that she developed for her final project and that she later used in her classroom. The unit connected the Earth course and her teaching in a particular way.

In the course you learned you could use different materials to teach science to children in different ways. Our [pre-school] classroom looked out on a pile of rocks. I took the kids out to measure, describe, and draw the rocks. A living classroom. We filled the library with books about rocks and we created a rock museum in the classroom. These young children were able to do amazing things. What is compelling to younger children is that which is commonly experienced in their world and curriculum where they can be the experts. The final project is the really important part of the SoS course—until then you are grappling with vocabulary, concepts, etc. The project is where you start thinking how to use this knowledge to create a curriculum, exciting and just right for the children you are teaching.

She explained how her experience in the Earth course merged with her musical background to create a deeper understanding of how children learn science.

The music stuff is related to the nature stuff—they are both about ways of knowing the world. The same kind of curiosity that a child brings to explore rocks is the same kind of concentration they bring to listening to music. That what the kernel of learning is all about—give them authentic things, new materials, to work with... I would never have felt comfortable with this on my own—integrating science into the whole world of learning.