

## **FINDINGS FROM AN INDEPENDENT EVALUATION OF THE AMNH'S ONLINE SEMINARS ON SCIENCE COURSE: *GENETICS, GENOMICS, GENETHICS***

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 *Genetics*, *Genomics*, *Genethics*, along with profiles of three teachers who took the course.

### **SURVEY RATINGS FOR *GENETICS, GENOMICS, GENETHICS***

Course takers report on our annual follow-up surveys that ***Genetics, Genomics, Genethics*** 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 104 learners from 25 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 *Genetics, Genomics, Genethics*?<sup>1</sup>**

- *"additional background knowledge of science" (81%)*
- *"a bank of resources for my own learning" (73%)*
- *"a deeper insight into the work of scientists" (63%)*
- *"motivation to continue learning about the course topics on my own" (68%)*

#### **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" (80%)*
- *"I made some course resources available to my students" (60%)*

#### **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" (69%)*
- *"It enhanced my content knowledge in a subject area I teach regularly" (66%)*

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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."

## Genetics, Genomics, Genethics

- *"It helped me to learn a new content area that I may teach in the future" (60%)*
- *"I am better able to assist students in meeting our state or district standards" (35%)*

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

- *"Students have better access to and knowledge of latest research" (69%)*
- *"Students better connect science in school with the real world" (59%)*
- *"Students gain a better understanding of scientific inquiry" (46%)*
- *"Students are motivated to continue investigating the topic(s) on their own" (42%)*

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

- *"The course was more valuable than other professional development available to me locally" (76%)*
- *"The course is more valuable than other distance learning courses I have taken" (73%)*

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

- *"I have recommended the course to colleagues" (69%)*

## TEACHER PROFILES FOR GENETICS, GENOMICS, GENETHICS

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

A high school biology teacher uses cutting-edge information from the SoS course to make genetics more relevant to her students

A teacher applies her experience in the SoS course to engage her 7<sup>th</sup> graders in a debate on a current topic in genetics

SoS course inspires a museum educator to convey excitement about genetics to her students

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

**A high school biology teacher uses cutting-edge information from the SoS course to make genetics more relevant to her students**

Ms. C. teaches 9<sup>th</sup> grade biology in a culturally and socio-economically diverse high school in an Illinois suburb. She has been teaching for five years. She enrolled in the SoS online course in Winter 2005 because she was interested in genetics and encouraged by her school to enrich her content knowledge.

**Making genetics more interesting: Bringing real issues into the classroom.** Ms. C. appreciated the opportunity to learn about advances in Human Genetics that may affect her own life. She knows that this information is relevant to the lives of her students as well, and feels it will help her to interest them in learning more about genetics.

*The course was valuable to me because there were things that I didn't know about that will affect me as a person—for example, genetic testing and how it may affect insurance and visits to doctors. That's what I tried to reiterate to my students—'Even if you aren't interested in these materials—this is coming—it will affect you.'*

**Gaining a new teaching tool: Current articles about genetic research.** In the SoS course, Ms. C. and the other learners read numerous articles about current genetic research. When her students were studying genetics this year, she had them read three of these articles. She wanted to open their eyes to the advances in the field of genetics and bring home the point that these advances may well affect their lives.

*I brought in several articles. One described the difference between Genetics, Genomics, and Genethics, another described sequencing and the human genome, and the third described genetic microchips. This is more difficult reading than they usually do and they read them in their small groups—then they looked at their misconceptions. The kids were amazed by some of the things scientists are able to do. Several students were surprised and naïve about what is going on—for example, genes being transferred from one organism to the other and pre-natal testing.*

**Gaining content knowledge: Updating and enriching unit content.** Ms. C. found that the course helped her to update the content of her Genetics unit to include current research findings and projects.

*The SoS course explained that a lot of things we thought were true aren't. For example, genes we used to think were simply dominant or recessive are now known to be governed by multiple alleles. Now I talk to my students about the exceptions. I used to just do Mendelian genetics, now I talk about the Human Genome Project.*

**A challenging and user-friendly online course.** The genetics course was her first online course, and she described it as “*incredibly well-organized and easy to maneuver through.*”

*It was good—it was pretty challenging. The parameters were clear and the teachers' expectations were clear. You had opportunities to re-do work. There were interesting assignments to do outside of class—for example, look at food in your kitchen and see what could be genetically modified.*

Ms. C. also particularly enjoyed the opportunity that an online course affords to learn with a very wide range of people.

*I would say it's neat interacting with people all around the country—it was interesting reading where they were from—they weren't all teachers.*

**A teacher applies her experience in the SoS course to engage her 7<sup>th</sup> graders in a debate on a current topic in genetics**

K. Chaloner teaches 2<sup>nd</sup>, 5<sup>th</sup> and 7<sup>th</sup> grade science at a small, private school in New York. Students at the school are well supported and motivated to learn. She has been teaching for eight years. Recently, she had her first child and found the online course fit her schedule. She enrolled in the SoS online course in Summer 2005 to update her knowledge about genetics.

**Gaining a new teaching tool: A classroom debate on genethics.** The instructional approach modeled in the SoS discussion included the steps for examining the ethical implications of a current genetics issue. In the SoS course, K. Chaloner and the other learners identified stakeholders and their positions regarding the issue of genetically modified corn. She applied the SoS model to structure a week-long debate in her classroom about a topic of interest to her students, genetic enhancements in Olympic athletes.

*I used a lot of the exercises from the SoS class to have the kids identify stakeholders and come to a conclusion about what the consequences of supporting or not supporting genetic enhancement would be. I don't think I would have been able to do that without having had a good discussion about it in the Genetics class....it ended up being a really rich project.*

**Gaining content knowledge: Going beyond the textbook.** The course added to K. Chaloner's own learning about genetics, a topic she is interested in and excited about. And it helped her to impart that learning and excitement to her students.

*The course gave me in-between tools to figure out where textbooks leave off and where the real world starts. Anything I can add to the class, if I am interested and it relates to the real world, will make it a better class.*

*I really feel like the course made it possible for me to know where to take things next, instead of just saying, 'well your book says.' I had at the ready some ideas for the kids, so when their inspiration hit, I could go on with them.*

**Having first-hand access to a scientist's ideas.** She particularly appreciated the opportunity the online format afforded her to find out what the scientists leading the course had to say about course materials.

*I hadn't read Richard Lewontin's book, The Triple Helix, before and it was exciting to have the course scientists there to discuss the book with and to be able to read their thoughts about the readings. I really enjoyed having that; it made it a deeper,*

*intellectual exercise of reading the book. If I read the book on my own, I would have been interested in it, but had no one to share it with.*

**The convenience of online learning.** The fact that K. Chaloner could take the SoS course from home while teaching was appealing to her.

*I could do it from home and was still getting a good exchange out of the material. The course seemed very doable, it didn't seem overwhelming. The readings weren't too much—I could spend an hour at the end of the day—and it was really satisfying. It really did fit into my schedule pretty well.*

### **SoS course inspires a museum educator to convey excitement about genetics to her students**

K. Hunding is a science educator at a science museum in Minnesota. She teaches a culturally diverse group of students ranging from pre-school to high school age, and spends anywhere between 30 minutes and 3 weeks with each group of students. Ms. Hunding has been teaching in this capacity for 20 years. Ms. Hunding enrolled in the online course in Winter 2005 because she was interested in learning more about genetic engineering and wanted to update her knowledge of the rapidly changing field of genetics.

**Gaining a new understanding of her role: Inspiring students to learn more.** As part of the SoS course, teachers design a lesson for their final project. One of the unexpected benefits of the course for Ms. Hunding was that in deciding on her final project, she came to a new understanding of how she could best use her limited time with students at the museum.

*As I started putting this project together, I tried to figure out how I was going to make it useful for me. I could just pretend that I had a regular classroom, but I didn't want to do that. I always felt frustrated because I have these kids for such a short time and I don't want to become an entertainer. I figured out in the SoS course that my job is not to be entertaining, but to light that little spark and get kids thinking 'hey, that fun thing that we did at the museum... I want to know more.' It was like a big light went off and suddenly the frustration I felt about not having kids for very long was gone. That was really one of the best things about the whole experience.*

**Gaining a new teaching tool: A model of a nucleus and DNA.** For her final project, Ms. Hunding developed a teaching tool that would not only help students understand DNA better but would convey to them the miracle of DNA.

*I have to do these DNA courses that are just DNA extraction from cheek cells and it is such an abstract thing for kids. So I made a model—I took a plastic egg to stand for the nucleus of the cell and then I measured out 6 feet of yarn, because you have 6 feet of DNA in every cell of your body that has a nucleus. It is sort of a graphic example to show kids and you can see jaws drop. While that doesn't necessarily convey some amazing understanding of it all, it is that spark thing that I am looking for, that you have this incredible thing going on inside of you and what else do you want to know about it?*

**Gaining more confidence in teaching genetics: Updating content knowledge.** The SoS course updated Ms. Hunding's knowledge of genetics and helped her to feel more confident teaching it.

*I do feel more confident in my genetics knowledge now. Things change so fast that sometimes before when I would teach a course on DNA, I would worry that maybe I was presenting the wrong information—for example, for the numbers of genes that we have. At the science museum, you kind of have to be on top of the science. Otherwise, teachers and parents are going to say 'why didn't you know that?' The course has helped me be more confident that my knowledge is current.*

**Exposure to different points of view through course essays and online discussions.** Ms. Hunding particularly enjoyed the different points of view she was exposed to while taking the SoS course since it is her job to provide students with objective information.

*I liked the different points of view because that is part of my job, to try and include everything that I can possibly think of. There were a lot of essays that would explain concepts and then present the good things and some of the criticism. You got to make your own judgments. Then the discussion format with the other students was good too. Some people would just say things I never thought of.*

**Building bridges between museum educators and classroom teachers.** Ms. Hunding felt the course provided an opportunity for museum educators and classroom teachers to better understand each other's role.

*The web classes are valuable because they bring people together who wouldn't be together. I like listening to classroom teachers to find out how I could help with what they are dealing with, even though I have students for such a short time. Hopefully they can see my perspective, too.*