

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

Inverness Research studied the AMNH Seminars on Science (SoS) program in depth for eight years, from its inception in 1998 to 2006. Since then Inverness has continued to evaluate newly developed courses. In 2015, Inverness Research evaluated the AMNH's newest online course, *The Brain*. Below we present teacher survey ratings for *The Brain*, along with profiles of two teachers who took the course.

SURVEY RATINGS FOR THE BRAIN

Course takers report on our follow-up survey that *The Brain* 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 32 learners from 11 states who completed our follow-up survey about the quality and value of the course. A majority of survey takers (69%) are K-12 teachers, but college instructors have also provided feedback about how the course has benefited them personally and as educators. Over one third of the survey takers (38%) took the course in part because of prior positive experience with AMNH's SoS courses, and close to half (45%) were attracted to the course because it was taught by AMNH scientists.

What do teachers gain for their own learning from The Brain?¹

- *"enhanced knowledge and appreciation through learning with others enrolled through the same university or organization" (79%)*
- "additional background knowledge of science" (78%)
- *"a deeper insight into the work of scientists" (69%)*
- *"a bank of resources for my own learning" (66%)*
- *"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" (81%)
- "I made some course resources available to my students" (69%)
- "I used the lesson plan I developed as my final project" (39%)

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" (64%)
- *"It helped me to learn a new content area that I may teach in the future" (64%)*
- *"It made me feel more confident teaching science (43%)*
- *"I am better able to assist students in meeting our state or district standards" (37%)*

How do teachers say that this course helps their students?

- "Students better connect science in school with the real world" (74%)
- "Students are more curious about the course topic(s)" (61%)
- *"The work of scientists is more understandable to students" (57%)*
- "Students' access to and knowledge of latest research on the course topics has increased" (44%)

How does the course compare with other professional learning opportunities?

- "The course was more valuable than other professional development available to me locally" (85%)
- "The course is more valuable than other distance learning courses I have taken" (58%)

Do teachers recommend the course?³

- *"I have recommended the course to colleagues" (69%)*
- *"I have shared the materials and resources with colleagues" (46%)*

³ Percentages represent teachers who checked "yes."

TEACHER PROFILES FOR THE BRAIN

An AP Biology teacher uses her new understanding of the 'teenage brain' to help her students recall content for the AP Biology exam.

AMNH course work inspires high school AP and Honors Biology teacher to retire his position as 'Lord at the Board.'

An AP Biology teacher uses her new understanding of the 'teenage brain' to help her students recall content for the AP Biology exam

Monika Biro teaches high school AP and Honors Biology in one of the top-rated districts in Ohio, about 40 minutes from Cleveland. Originally from Hungary, she has been teaching for about 20 years and has a rich science background. She has a Masters degree in Chemistry and Biology, participated in a two-year lab science program for teachers at Columbia University, and is currently a reader for the AP Biology exam.

An intellectually satisfying course

When she signed up for the Brain course in the summer of 2014, Ms. Biro wanted to learn more about neuroscience and wanted a course that was rigorous and intellectually satisfying. The course exceeded her expectations, offering multi-disciplinary content:

I really liked the course. I liked the combination...of biology but it had some psychology, history of science and so it covered a lot of ground.

She also appreciated the multi-media approach to learning. Essays, textbooks, videos, lectures and discussions gave her many different sources to learn from. Not only was the course interesting in its content but it also gave her new insight into her students:

The other reason why I found this course really helpful is because it helped me to understand the kids' developmental stages... It really helped me to see all of those new discoveries and differences that we see in the teenage brain or just developing brain and how the rewiring occurs during the teenage years.

New insights into her students' learning

Ms. Biro used her new understanding of the developing brain to modify her teaching methods so that students would be more likely to be able to recall what they had learned during the year when taking the AP Biology exam.

One of the things that they mentioned [in the course]...is that those connections that were built are not going to remain there unless they are constantly used over and over and over again because there is such a fast rewiring process going on in the teenage brain...It is the same thing with my students because the AP Biology curriculum is so gigantic...They have much to learn all year and what we learned in September, if I don't keep reviewing it with them periodically during the year, by the time the AP exam comes over, it is long gone. So, I really made sure this year that I review constantly with them...they said that they remembered the material so [much better] this year than in the past.

New resources for students

The Brain course introduced Ms. Biro to an essay and a Ted Talk that she then used to launch her unit about neuroscience:

It was a Ted Talk on the Human Connection. It was such a great introduction to the human nervous system and my students were really so interested in it. They dove right into the science afterwards.

When Ms. Biro wanted to teach her students how to make presentations and have discussions about science topics, she drew from materials in the Brain course. The SoS course included a number of publications in the field of neuroscience that were at the appropriate level for high school students. She gave her students a list of articles to choose from, and they had to read an article, present it to their peers (without back-up notes or a PowerPoint presentation), and then ask each other follow-up questions. She said,

It turned out to be a very, very successful project. The kids really enjoyed digging into the brain more. We did this right after a brain dissection where they dissected a sheep brain and they looked at the various parts and then they looked at microscope images of sections of the nervous tissue. I asked them to do these presentations afterwards, and it just turned out to be a great project. At the end when I asked them to evaluate the course, most of them said that they really enjoyed the presentations.

The Brain was Ms. Biro's first AMNH SoS course; a few months later, she enrolled in the SoS Genetics course. She said the only thing that could make the Brain course better would be a trip to the Museum of Natural History with her students!

AMNH course work inspires high school AP and Honors Biology teacher to retire his position as 'Lord at the Board.'

Dennis Dagounis teaches high school AP and Honors Biology in Roosevelt Park, a suburb in New Jersey. His students are of diverse backgrounds and most come from working class families. He has taken no less that five AMNH SOS courses. He said, "I am always looking at [AMNH SoS] lists and hoping that some new course will pop up." He enrolled in The Brain as soon as he saw it in Spring 2014. The Brain course interested him because he hadn't taken a course about the nervous system since he was in college, and he wanted exposure to new research and topics.

Online discussions are engaging

The flow of online discussion during the course appealed to Mr. Dagounis, and is one of his favorite features of all SoS courses. He commented:

I liked the discussion questions and just going back and forth. I think that is what I liked about all of the classes that I took through [AMNH]. I like the fact that you can get direct with other teachers, and the professor interacts on the discussion topics as well.

Opportunities to create new lessons and units

Mr. Dagounis also enjoyed reading articles he normally wouldn't come across and learning about cutting-edge neuroscience research. He particularly appreciated the opportunity to create a lesson plan to use in his classes and found this experience to be highly beneficial for him and his students. The new curriculum unit has the benefit of review by other teachers taking the course:

I have been teaching for 14 years and creating lesson plans and unit plans my entire career, but I find this makes me create a lesson plan for something that I haven't really changed up in a few years. I also have the feedback from the other teachers in the class and the professors themselves. At the end of all of these classes, you always end up with a very well thought out, well reviewed lesson plan or unit plan that you can use in your classes. I definitely think it helped in my curriculum.

Facilitating the transition to the Next Generation Science Standards

In 2015-16, the Next Generation Science Standards will be introduced in New Jersey. These standards emphasize inquiry-based teaching strategies as well as hands-on and group work. Mr. Dagounis explained that taking courses like The Brain is helping him to transition more easily to the new standards. In particular, he is inspired by what the other teachers in the course have created, and he has found new resources through them. He says that the SoS courses are encouraging him to move away from 'the Lord at the Board' role and to involve his students more in hands-on activities and group-work:

I used to do a lot of PowerPoint and now I am getting away from it. It [the AMNH courses] has forced me to revamp some of the units that I did where I had those PowerPoints pre-made. Even just talking to the other teachers, and finding out what they were doing, made me change what I was thinking of doing.

New lesson plans lead to richer student learning experiences

This year, Mr. Dagounis used the 2-week unit plan he designed for The Brain in his AP and Honors Biology classes. He modeled his unit on the basic model he experienced in the SoS course, where there were discussion topics and articles to read that involved students in discussion:

The way the online program is done, where you read this article and then you discuss it with the class, I did the same thing in my classroom. I think the kids really took a lot out of that. This is instead of all right, go read it, here is what I took out of it and this is what you should have taken out of it, write it down in your notes. The kids enjoyed it... It is much better than the old here is a PowerPoint, look at it.

This new unit began with an article from *National Geographic* called "Beautiful Brains." The students read this and started diving into neuroscience to understand teenage thinking, feeling and behavior. From there they explored the process of development from infancy to adulthood. The students worked in groups to research how the brain changes from ages 0-4, 4-8, to adulthood. Each group presented to the class, and the other students added to their working notes. This work opened up some dynamic and powerful discussions where the students' interests in the material led the class in unexpected and fruitful directions. Mr. Dagounis describes some of the class discussions:

The students would go back and forth and share information. We had a big discussion on why do things happen at certain ages, and why you feel certain things. We got into discussions about how drugs affect the brain and then we got to a whole tangent about how sugar affects the brain... I told the class that an experiment had just happened where they noticed that with somebody addicted to sugar and somebody addicted to cocaine...the same parts of the brain are firing, showing that sugar is as addictive as cocaine. We started talking about why some people get addicted to drugs and why some people don't.

Mr. Dagounis said he was hoping his excitement about the brain would be contagious for his students, and it seems that is definitely the case. It also seems that the SoS courses have opened new doors to a teaching practice that promotes student engagement.