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January 29, 2015

Dr. Carolyn Noyes
Center for Enhancement of Teaching and Learning

Dear Dr. Noyes:

The School of Biology Faculty Teaching Awards committee nominates Dr. Chrissy Spencer, Academic Professional in the School of Biology, for the Innovation and Excellence in Laboratory Teaching Award.

Dr. Spencer has made numerous contributions to innovating teaching in the School of Biology, but for this award I will describe how she re-imagined the Biol 2355 Honors Genetics Laboratory, from an instructor-led to a more student-driven, authentic research experience. The Genetics Lab courses (Biol 2345 and 2355) are taken by Biology majors to partially fulfill their core lab requirement for the BS Biology degree. The goal is to teach basic lab skills, enhance understanding of genetics concepts, and practice doing science while learning modern genetics laboratory techniques.

Although the Honors Genetics Lab had been a project-based laboratory, students were given defined projects and protocols to follow, and they were expected to replicate previously published results. Students learned the laboratory techniques, but they expressed uneven levels of satisfaction and the course did little to stimulate student interest in genetics. Given the high-level students in an Honors course, Dr. Spencer sought to stimulate their interest and have them learn and practice true scientific research, starting from hypothesis generation.

Her course learning objectives are listed below. Each is paired with one or more assessments of student work.

1. Generate genetics hypotheses using the European Honey Bee.
2. Design experiments and interpret results using basic statistical analysis.
3. Create and troubleshoot genetics lab protocols.
4. Cite relevant genetics primary literature.
5. Write effective and accurate notebook entries, and lab reports in the style accepted by genetics scientific journals.
6. Use appropriate lab safety standards and precautions.

In Dr. Spencer's revision of the lab curriculum, the entire class works as a group to propose and complete a research project. The research project-based lab structure allows students to practice every component of scientific inquiry or methodology, from developing an initial question, through experimental design, to data collection, analysis, interpretation, and communication to peers.

She opens the semester with a scientific literature reading activity with a three-fold goal: to orient students to the study system for the semester, teach them how to read the primary scientific literature, and to introduce them to a good example of scientific writing. These initial readings are selected to guide students into a basic area of genetics research that will be manageable by novices on a short timeline.

Students propose research ideas, the class narrows the field to 3-4 questions. Students develop those into short proposals and explore methodology for those, and then the class (one laboratory section) settles on one proposal. The project must include key elements central to genetics work: DNA isolation, PCR, gel electrophoresis, data collection, and data interpretation. The proposed projects are also arbitrated and subject to rejection or revision based upon time, materials costs and feasibility considering the skill levels of the students.

The class then works as a team to further develop the project ideas, and search and read the published literature as background. In lab they generate, troubleshoot and revise protocols and practice the bench skills needed to carry out those protocols and execute their experiments. Students then pool and collectively analyze their data.

Throughout the semester, Dr. Spencer and her TAs mentor students on scientific thinking. Her training of the TAs via weekly meetings in such mentoring is another key to the success of the revised laboratory course.

Dr. Spencer conducts a mid-semester course evaluation and final evaluation. Student responses to these surveys and on CIOS indicate that they very much like more scientific freedom. The authenticity is so important to them that they chafe at the practical course constraints. No student has yet asked for the course to be more like a traditional lab, though some are initially uncomfortable with the reality that things will go wrong and cause schedule disruptions, forcing them to repeat an experimental procedure. Here are some student comments from Fall 2015:

"Is fantastic at simplifying difficult concepts and making them simple to understand!

"Was obviously very passionate about Biology and the subject as a whole. She cares about students and is genuinely very nice and easy to talk to."

"allowed us lots of opportunities to ask questions and go over drafts of lab reports to make sure we understood what was going on in the lab."

"is excellent at explaining techniques and facilitating the planning and execution of the projects we did this semester."

"Connected all procedures to other applications and helped us understand the concepts behind each"

"allowed us to develop our own project but was present enough to guide us in a fruitful direction."

"Was really good at answering questions in an appropriate manner helping me to understand better."

"gave us the correct amount of guidance without holding our hands or throwing us in the deep and leaving us all completely lost."


"no student feel like there question was a stupid question but rather help them to learn! SHE directed us but yet knew what we would be doing so that she could help us with the skills and we would not go in blind"

"Was enthusiastic and excited about our experiment! Made me all the more interested in the topic"

The accompanying student responses to the CIOS item: "instructor stimulates interest" in Fall 2015 were: 4.8 from 23 of 25 students in the two lab sections. Clearly, the laboratory course experience positively engaged the students.

Dr. Spencer has been teaching and refining the course since Fall 2011. The course takes advantage of the Urban Honeybee project initiated and maintained by Dr. Jennifer Leavey, and is a source of student volunteers who want to continue working with and studying honeybees. We expect this unique synergistic relationship to be sustainable and fruitful for years to come. Dr. Spencer is a remarkable asset to the undergraduate education mission of Georgia Tech and deserving of recognition for her imaginative, practical, and effective redesign of this laboratory course.

Sincerely,

A handwritten signature in black ink that reads "Jung H. Choi". The signature is written in a cursive style with a large, looping initial "J".

Jung H. Choi, Associate Professor
Director of Teaching Effectiveness for the School of Biology

Endorsed by:

A handwritten signature in black ink that reads "Terry W. Snell". The signature is written in a cursive style with a large, looping initial "T".

Terry Snell, Professor and Chair, School of Biology
Elizabeth Smithgall Watts Chair in Animal Behavior and Conservation

Nomination of Dr. Chrissy Spencer for the 2016 Innovation and Excellence in Laboratory Instruction Award

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January 14, 2016

Re: Letters of support for the nomination of Dr. Chrissy Spencer for Innovation and Excellence in Lab Instruction Award

Dear Awards Committee:

It is my great pleasure to support the nomination of Dr. Chrissy Spencer for the CETL Innovation and Excellence in Lab Instruction Award. I believe that Chrissy has been one of the most dynamic and innovative instructors at Georgia Tech. I can think of no more deserving candidate for this award.

Chrissy was hired in 2010 as an Academic Professional by the School of Biology to teach core courses and serve as an academic advisor for Biology majors. In the five subsequent years, she has taken on oversight of Undergraduate Biology Advising, served on numerous School, College, and Institute committees, and established strong working relationships with key members of the Georgia Tech community.

Chrissy exhibits teaching excellence in the Biology introductory and core courses in a myriad of ways. She has promoted the use of classroom technology to facilitate active learning, service-learning projects, and project-based labs. Moreover, she has received grant support for several of these projects. She has mentored colleagues in the teaching and advising, and run faculty workshops at the school and college level on interactive teaching strategies.

Chrissy has taught a great number of our most important courses including Biological Principles, Math Models in Biology, Ecology, Evolution, Genetics, Genetics Lab, Honors Genetics Lab, among others. She almost always uses innovative strategies that specifically address the challenges associated with teaching in the core curriculum. In larger lecture courses, she uses the on-line platform Learning Catalytics for in-class activities to make the classroom more intimate and to facilitate Team-Based Learning. She strives to make interdisciplinary content connections to engage non-majors in Biological Principles. And she is co-coordinating with Drs. Jung Choi and Shana Kerr to write webpage content to replace the introductory textbook as part of the process to “flip the classroom.”

Dr. Spencer’s dedicates time in service to the School, the College, the Institute, and the greater Atlanta community. In the School of Biology, Chrissy has been an active member to the Biology Undergraduate Committee and the Committee on Academic Initiatives. She is working to create a new minor housed in the School, and taking the lead in creation of a new Core Area D Biology lab science offering (more below). She has served as Chair of the Introductory Biology Committee and the Undergraduate Awards Committee. Chrissy’s service to the College is demonstrated by her membership on the College’s Diversity Council. At the Institute level, she served a full term on the Faculty Senate, on search committees in CETL and CAS, the Registrar’s DegreeWorks Taskforce, the International Plan Committee, and has agreed to serve on the Provost’s new taskforce on Creating the Next in Education. Her service-learning endeavors have connected her students with the Georgia Tech Urban Honey Bee Project, the Piedmont Park Conservancy, and most recently with Trees Atlanta.

I could spend a great deal more time discussing Chrissy's list of remarkable achievements. But the Excellence in Lab Instruction Award specifically targets lab instruction, and so I will now focus on Chrissy's excellence in this arena. Chrissy has successfully taught and developed several different lab courses while at Georgia Tech, including Math Models (BIOL 2400), Bioethics Advanced Reading (BIOL 4801), Honors Genetics Lab (BIOL 2355), and Genetics Lab (BIOL 2345). I will now detail the importance of her efforts in some of these classes

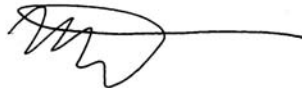
Chrissy was one of the main developers of Math Models. This course specifically addresses how mathematical frameworks can be used to understand biological systems. It meets our School's 'Quantitative Requirement' and therefore represents a key lab class in Biology. Chrissy helped develop this course into an active learning experience where students work in class to develop mathematical models on their own.

Chrissy has been the primary instructor and developer of the Honors Genetics Lab. She has made every effort to keep this class interesting and fresh. For example, I worked with her this year to help her students genetically analyze honeybees sampled from colonies housed on the CULC roof. I know firsthand that Chrissy worked extremely hard behind the scenes to make sure that the new experiments developed properly and that the students had an exciting and real-world academic experience. .

Finally, I would like to note a very exciting project which Chrissy has pioneered. The School of Biology is developing a new 4 credit combined lab-lecture course entitled the Biology of Sex & Death. This class will ultimately fulfill the Core D requirements at Georgia Tech. Chrissy has been the primary developer of both the lecture and the lab portions of this course. The proposed class is about to be approved by the IUCC. We all believe that this could be an extremely important and exciting class both for our School and for the Georgia Tech community. We anticipate that it will be taught for the first time in the FA16 semester and Chrissy will be the primary instructor in both the lecture and the lab.

In conclusion, Dr. Spencer constantly updates her creative approaches to teaching and learning, is dedicated to the success of the undergraduate programs in the College of Sciences, and is able to build collaborations and mentor others in creating successful academic programs. I recommend her most strongly for this award.

Sincerely,

A handwritten signature in black ink, appearing to read 'M. Goodisman', with a long horizontal line extending to the right.

Michael Goodisman,
Associate Professor of Biology,
Associate Chair of Undergraduate Program



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1/24/16

Dear Selection Committee,

I am writing to recommend Chrissy Spencer for the Innovation and Excellence in Lab Instruction award. I have known Chrissy since she started at Georgia Tech, and I co-teach several courses with her on a regular basis. Chrissy is an innovator both in lecture and laboratory courses and she emphasizes the need for experiential learning and authentic learning in both contexts. Most recently, I have worked with Chrissy as she revised our Genetics Laboratory course to become an introductory research experience for students. She and her students are working with me to determine how urban habitats affect honey bees. The Genetics lab is a sophomore level course offered to both biology and nonbiology majors.

The honey bee-based honors genetics course engages students as partners in exploring the important problem of urban habitats affect bees while allowing them to learn fundamental genetics concepts and methods. In the first year of the project, students evaluated the genetic diversity of several of the beehives we have on the roof of the Clough Commons building using patrilineage analysis (basically paternity testing for bees). Honey bees are polyandrous and queens mate with up to 20 males during their mating flight. The more males they mate with, the more genetically diverse the colonies are. The diversity of the colony affects its susceptibility to disease. In a normal genetics lab course, students might track traits (phenotypes) and create pedigrees, but in this course students are exploring the same concepts while using modern molecular methods. I think the most important aspect of this lab is that there is no known outcome for the students work. Students are conducting REAL research!

I meet with the genetics lab students once or twice during the course of the semester to explain the purpose and goal of the urban honey bee project and provide context for their work. I am always impressed by the astute questions that the students ask me. Clearly, having a real-world problem to work on is engaging for them. Over the last few semesters, the results of the students work in this course have advanced our ability to analyze genetic diversity in honey bee colonies and has also confirmed that honey bee queens reared in urban settings mate with multiple drones (this had not been studied before) and that the number of drones they mate with correlate inversely with their burden with the parasitic *Varroa* mite, implicated in the increase in colony collapse in the US.

Each semester Chrissy has her students prepare posters or give oral presentations on their experiments. During their presentations, the students have clearly developed their ability to reflect on what can go wrong when conducting research and how to problem-solve and adapt their methods to elucidate answers. After participating in the genetics lab course, I have had several students continue working with the urban honey bee project on a volunteer basis. I cannot think of any better metric for success in engaging students in a course than discovering that they want to continue working on the project even when they are no longer receiving credit.

Chrissy's innovations in Genetics Lab have benefited students, the urban honey bee project, and has had the side effect of increasing what we know about bees. Chrissy defines "innovation and excellence in lab instruction" and is very deserving of this award.

Sincerely,

A handwritten signature in cursive script that reads "Jennifer Leavey". The signature is written in dark ink and is positioned above the typed name and title.

Jennifer Leavey
Director, Georgia Tech Urban Honey Bee Project
bees.gatech.edu

To Whom It May Concern:

I would like to express my support for Dr. Spencer in nominating her for the faculty award in Innovation and Excellence in Laboratory Instruction. Overall, Dr. Spencer provided an exceptional environment for learning and taught me important skills while making the lab a truly enjoyable experience. I learned so much throughout the semester and felt like a true scientist, and the experience I gained through this lab helped in my decision to pursue research at Georgia Tech and as a possible career. She is excited about what she does, supportive to her students, and innovative in her ideas for the class, and she is definitely deserving of this award.

One aspect of the lab that I really loved was how we were able to work on a semester long research project that we as the students researched and decided the experimental basis for. It was amazing being able to see our ideas brought into action and to actually be able to gain the research skills necessary to bring our ideas to fruition. Dr. Spencer began the lab by providing us with some resource sources and scientific papers to read, and she was helpful in teaching us research skills as well. Each lab we would be able to learn new techniques as well such as DNA precipitation, DNA purification, ABI Genotyping, and other skills as well. Having a background in these skills helped me in gaining a position in a Biology lab, and her plans for the course were spot-on.

Another aspect of the course that was influential was how we were able to work with the Urban Honeybee Project and have a real-world application to what we were doing in lab. Dr. Spencer had Jennifer Leavey come and speak to our class about the Urban Honeybee project and connected students to the program. I was able to go on top of the CULC and help harvest the bees, which has been one of my favorite experiences so far at Tech. Learning about Colony Collapse Disorder and the Varroa Mites affecting these bees really allowed us all to feel like our work was actually making an impact and inspired us with ideas of what to research throughout the semester.

I also loved how the techniques and procedures we used in lab, we also learned about in Honors Genetics lecture as it was helpful being able to apply this knowledge and solidified a lot of the information. In addition, Dr. Spencer was always more than willing to clarify anything I was confused on, and she would go into the why and how of the procedures we performed. Having this background knowledge really added purpose to the work being performed and made it more interesting. We were able to do a lot of the work on our own and collaborate with other students while also work independently, which was a really great environment as a whole.

We worked on our lab reports throughout the semester as well and got feedback throughout the semester, and I really appreciated how they didn't expect us to be perfect the first time around but rather were extremely helpful in giving feedback and teaching us how to properly write a good lab report. I know I went to Dr. Spencer's office hours, and she was always happy to help and very supportive as a professor. She truly is dynamic in her interactions with the class and has an obvious passion for biology. It was also amazing to me how while we all worked with the honeybees, each student had their own hypothesis of what the results were going to be, and everyone used the data we collected in different ways in order to come to conclusions related to their hypotheses. Dr. Spencer

really let people have individuality while working with a group, which is a task that is not easy to achieve.

Dr. Spencer also taught me a lot about what to do when things do not go exactly according to plan, which I also think is an important thing to realize when performing any experiment. She really helped us to brainstorm and think about why we may not have seen bands in our gels at the beginning and about all of the factors that may influence the results in any way. We really worked collaboratively to troubleshoot issues that we encountered and then improved upon these issues each lab by trying out new ideas and procedures. This kind of learning and working together to work out the initial issues really provided me with a more realistic idea of what research is like while also helping us to work with our classmates to develop new ideas.

Dr. Spencer has truly been one of my favorite professors at Georgia Tech so far and is an excellent representative of the School of Biology and of someone who truly loves what they do. She made me excited to come to lab and really incited a newfound passion for research as well. She truly created an exceptional lab experience for students and would be an excellent candidate for this award.

Megen Wittling