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# Application Summary

## Competition Details

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**Competition Title:** 2019 Undergraduate Educator Award

**Category:** Institutional Awards - CTL

**Award Cycle:** 2019

**Submission Deadline:** 02/01/2019 at 6:00 PM

## Application Information

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**Submitted By:** David Garton

**Application ID:** 2998

**Application Title:** Emily Weigel

**Date Submitted:** 01/30/2019 at 8:03 PM

## Personal Details

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**Applicant First Name:** David

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### Primary School or Department

School of Biological Sciences

**Primary Appointment Title:** Senior Lecturer

## Application Details

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### Proposal Title

Emily Weigel

January 14, 2019

Re: Letter of nomination for Dr. Emily Weigel for Undergraduate Educator Award

It is my great pleasure to nominate Dr. Emily Weigel for the Georgia Tech Undergraduate Educator Award. We believe that Emily has been one of the most energetic and determined instructors at Georgia Tech. We can think of no more deserving candidate for this award.

Emily was hired into the School of Biological Sciences as an Academic Professional. Her main duties are to teach core courses in Biological Sciences and serve as an academic advisor for Biology majors. Emily has taken great strides to improve education for our undergraduate students in the few years she has been working in our School.

Emily has successfully taught several of our largest and most important Biology classes. For example, she has been an instructor in Biological Principles, General Ecology, General Ecology Lab, Introduction to Organismal Biology, Honors Organismal Biology, Undergraduate/Graduate Teaching Assistant Preparation, Behavior Biology, and Project Lab. Thus Emily reaches hundreds of our major and nonmajor undergraduates each year, and her teaching impacts multiple diverse student populations. Thus she has already extended herself above and beyond, and demonstrated her great interest in teaching our undergraduate students.

Importantly, Emily has also worked to make our curriculum and classroom environment as exciting as possible. She updated the Ecology curriculum to meet with national standards in line with Biological Core Curriculum group and the Ecological Society of America. She also refined our introductory biology learning objectives to make that core class meaningful and contemporary. Emily has also started to build students' metacognitive skills through research-supported methods in our introductory courses. She always uses contemporary pedagogical methods in her classroom and incorporates active learning or flipped classroom designs.

Emily has gone beyond standard classroom teaching and has taken a real interest in including scientific research in her students' curriculum. For example, Emily tries to include authentic research and quantitative skills into her Behavioral Biology class. Data that her students gathered in Ecology Lab contributed to the United States Fish and Wildlife and Environmental Protection Agency water quality monitoring of Proctor Creek as a part of the Urban Waters Federal partnership. Emily is also planning on studying succession and biodiversity at the future site of the Living Building. She is training undergraduate students in the program 'R', which is the platform used by professional statisticians, in Ecology Lab and Project Lab. She is also working with Stamps Health Center and the Quantitative Undergraduate Biology Education faculty mentoring group to develop mathematical biology labs based on real-campus data associated with disease outbreaks. Finally, she is actually supervising students in undergraduate research. It is extremely unusual for an Academic Professional to supervise students in this manner. However, Emily is, once again, going above and beyond to provide her students with an outstanding education.

Emily has also become interested in conducting Discipline Based Educational Research. She has particular interests in scientifically studying the quantitative understanding of students in our foundational and upper-level life science courses. She is currently studying the School's

teaching assistant preparation course in order to uncover factors that make good student instructors. She is also an active member of our local science education reading group. She has served on the editorial board for the National Association of Biology Teacher's journal for the past 4 years. I look forward to her research in this area and anticipate seeing her work published and incorporated into our classrooms.

Emily has also put considerable effort into working in the Serve-Learn-Sustain program at Georgia Tech. She has modified her Ecology labs, which will be taught in the soon-to-be constructed Living Building. These labs will be quite extraordinary as they will align with the new goals of Georgia Tech to focus on environmental sustainability. And the new Ecology labs will be a centrally important function of what will be one of the most important structures on our campus.

Emily is also the School of Biological Sciences Internship coordinator. She works with entities outside of Georgia Tech to find internship opportunities for our Biology majors. She then places students in these internships and monitors their progress in the programs. The internships have become a centrally important part of the experiential learning programs that make up the Biology undergraduate major.

Emily has acted as a member of our advising team within the School of Biological Sciences. She advises ~100 Biology majors and helps them reach their goals. She also advises students interested in the International Plan. She has an 'open door' policy and clearly cares about our students beyond their academics.

Finally, Emily is a great 'team player' and engages in many outreach activities. She has worked with individuals within and outside of Georgia Tech to facilitate the development of important programs that aid student education. Overall, we recommend Emily extremely highly for this award. She is very deserving and has a great future here at Georgia Tech.

Sincerely,



Michael Goodisman,  
Associate Professor of Biological Sciences,  
Associate Chair of Undergraduate Education



J. Todd Streelman  
Professor of Biological Sciences,  
Chair of School of Biological Sciences

NOMINATION OF DR. EMILY WEIGEL FOR CENTER FOR TEACHING AND LEARNING  
UNDERGRADUATE EDUCATOR AWARD

February 1, 2019

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Ms. Isabel Veith

Ms. Gigi McGaughey

Mr. Joshua Heaton

## Reflective Statement on Teaching

“Where are your pants?” This is a phrase I utter far too often to young adults. No, nothing scandalous is taking place. But what is happening is real science, and for that, they need to be prepared. Pants are only a part of being prepared for lab (as is appropriate footwear), but what I care about most is preparing students’ minds for the challenges *outside* of the classroom.

Frankly, the problems our students will face are virtually unprecedented. So, too, is the talent they possess. I therefore empower my students to take charge of their own learning and ‘do’ as much as possible, including synthesizing, analyzing, and revising their own work. This evidence-based process of active inquiry allows students to reorient their thinking as they acquire new knowledge and integrate it within their framework of prior experiences. Also—and important to me as a scientist—the evidence repeatedly shows active learning works better than lecture-based approaches (see Freeman et al 2014 for a nice meta-analysis).

It is my goal to promote and develop students’ skills in discovering and integrating diverse information: reading, reasoning, problem-solving critically, and confidently communicating their understanding to others. These are all fundamental elements of biological literacy, and, more broadly, mastery of nearly any subject. Therefore, my teaching focuses on three methods of cultivation: **(1) promoting collaboration, (2) ensuring authentic science practices, and (3) engaging in continual assessment.**

### 1. Promoting Collaboration

Because science is collaborative, and because virtually all future occupations require some degree of working with others, I often have my students work in groups. Group work stimulates discussion and gives my students the chance to develop good collaboration and communication skills and the opportunity to learn from others—future scientist or not.

In the same vein of collaboration, I have found a home at Tech with the wonderful colleagues with whom I teach. Although a significant portion of my graduate and postdoctoral training involved the scholarship of teaching and learning, here I am encouraged to use evidence-based pedagogies and collaborative efforts to create quality educational experiences. With this freedom, I have grown extremely fond of organizing my teaching around authentic research—both for the students to conduct and for the design of my courses to reflect. I have had the blessing (and, some would say, the curse) of instructing eleven different courses since I began at Tech a little over two years ago. These courses range from team-taught, large courses for non-majors, to major-specific labs, to upper-level electives, to TA training courses, and even to the senior research capstone course exclusive to a small subset of our majors. The experience garnered from working with students at all levels of their discipline, as well as students from a breadth of other majors, has reinforced the importance of collaboration.

For example, to foster collaboration as a regular aspect of my courses, from the first day, I use various technologies, in-class activities, and assignments that get the students thinking in groups. Whether in Introductory Biology, where students complete in-class active learning exercises and group video projects, or my upper-level Behavioral Biology course, where the students frequently transform into troops of baboons, molecular biologists, and ethologists to act-out science on the savannah, the students drive their own learning. I see myself as a facilitator, where my main goal is not to get in the way of exploration!

In this same regard, I have had the pleasure of influencing new courses among my colleagues. For the laboratory of BIOL1220: Biology of Sex and Death, I have collaborated with

our laboratory manager and the postdoc in charge of labs to bring my sexual selection research into their classroom. We co-designed a multi-week unit investigating the mate choice behavior of fiddler crabs (see Angra *et al* 2018). Students are coached through the process of developing team research projects using observations of courtship experiences to create hypotheses. They soon realize that human courtship (the look from afar, the pickup line, etc.) proceeds in steps not all that unlike crab courtship (approaching a female, waving a claw, etc.), and success or failure in courtship can have very real consequences for species survival and evolution. Relating such abstract concepts to 'real life' for students is critical to knowledge transfer between relevant topics. Their natural curiosity often drives further questions, and students leave not only knowing more about biology, but themselves as people.

## **2. Ensuring Authentic Science Practices**

As the Vision and Change and Next Generation Science Standards promote, students need to integrate science content and practices. This makes exposure to research and real data critical to understanding how science works. This obviously happens through the work of my undergraduate research mentees (13 total, 11 from underrepresented groups), and through my Senior Research course (taught in collaboration with researchers at Zoo Atlanta). However, aspects of authentic research can be integrated into curricula in a variety of ways (CUR, 2007; Healey and Jenkins, 2009) and can be as influential as research-laboratory experiences (Lopatto, 2007; Hunter et al., 2007; Laursen et al., 2010). I believe all students need meaningful research experience as early and often as possible. Although I have worked to double the size of our for-credit internship program in the major since taking it over last year, our courses need embedded, authentic practices to truly reach our students.

To this end, I've worked for the past year in redesigning the undergraduate Ecology Lab, which is often the first biology lab course students take exclusively in their major. The course now has a strong, innovative emphasis on necessary skills for 21<sup>st</sup>-century biologists: coding statistics and the communication of data through graphs— done through real research collaborations. For example, in collaboration with officials from EPA and USFW, as well as West Atlanta Watershed Alliance and the Emerald Corridor Foundation, I designed a multi-week field lab for students to compare sites within Proctor Creek Watershed using USDA, EPA, and US Fish and Wildlife protocols. The students collected biological and chemical data to compare the health of the stream at different sites and then completed reflections to connect the history and building activity of Atlanta to the ecological effects that result. The student-generated ecological data has been collected for integration into ongoing stream monitoring efforts by these professional organizations and the City of Atlanta. Additionally, a full 25 percent of the entire class in Fall 2017, along with additional students from the prior semesters, chose to showcase their work at the Fall 2017 Serve-Learn-Sustain Showcase; two of those students were invited to present at the Proctor Creek Stewardship Council meeting later that month. Our work has been successful enough to garner other collaborations with students in Ivan Allen (for science communication) and Building Construction (for aerial photography for long-term campus greenspace monitoring).

## **3. Engaging in Continual Assessment**

As a scientist, I prefer data-driven approaches to teaching. Thus, I gauge my students' understanding through a variety of formative and summative assessments and track affective responses across the semester. These assessments help me to actively meet my students' needs by both pacing the course and tracking learning gains relative to each course objective set. It also helps students to receive feedback often so that they can adjust accordingly. In these assessments, I strive to incorporate questions and activities that span Bloom's taxonomy levels, gauge confidence in the materials, and address how students think about the material

metacognitively. This helps to both place the material into a broader context and discover where gaps in students' knowledge remain.

As for what's next: I have been able to draft an agenda for curriculum change based upon preliminary analyses of the success of students across our curriculum. The integration of specific learning objectives around quantitative reasoning is a focus of this change. To help me in this effort, I successfully applied for the University System of Georgia Scholarship of Teaching and Learning fellowship. In this role, I am formalizing my efforts in improving student attitudes and skills around mathematics and computing in biology. In short, I am working to assess and connect our biology curriculum with research-supported pedagogy, and where it does not yet exist, experimentally test current pedagogical approaches to define the 'best practices' of the trade. From there, I plan to leverage my position in this selective program with my longstanding role as an editor for *The American Biology Teacher* (the National Association of Biology Teacher's journal) to spread the word about what works best and why.

In sum: I hope not to be "that super-nice instructor that let me borrow a pair of pants for lab", but an instructor that prepares students with the skills to conquer tomorrow. I seek to make my classroom, and indeed Georgia Tech Undergraduate Education, a scholarly community of respect and appreciation of others, their work, and the ways we all learn, conduct, and communicate knowledge. I'm thankful that my colleagues' have nominated me for this award, and likewise, to the students who make the extra effort so incredibly worth it.

## Illustrations of Teaching Excellence

### 1. Conferences and Professional Development

- University System of Georgia Teaching and Learning Fellow for Georgia Tech (2018-2019)
- Smithsonian Institute BESPOKES Meeting: Big Data in Ecology- Invited talk on the state of modeling in K-16 Ecology Education
- US Department of Education Luncheon at Georgia Tech Serve-Learn-Sustain - Invited talk on sustainable education using Ecology Lab as a case study
- Quantitative Undergraduate Biology Education and Synthesis (QUBES) Discrete Mathematics Faculty Mentoring Network- Faculty working together to improve Math-in-Biology teaching tools
- *The American Biology Teacher* Editorial Board- Ecology and Evolution article revision and direct interaction with instructor-authors on measuring and sharing effectiveness of their teaching efforts
- National Association of Biology Teacher's (NABT) Meeting (2017) and the Society for the Advancement of Biology Education Research (2018)- Presented research showing the use of graph teaching materials improves student graph choice, construction, and interpretation



## 2. Course Development and Enhancements

### BIOL 4471: Behavioral Biology Course Development

Designed Behavioral Biology course from scratch in completely flipped format. Students use online course tools and textbooks to prepare for class, then in-class conduct a variety of experiments, discussions, and modeling exercises to dive-deeper into the material. Integrated into this course was a weekly exercise (as part of a larger study) to focus on graphical representations of data. Results of this work showing student improvement in graphical ability were presented in 2017 and 2018 are currently drafted for publication. Materials created through this course have been modified for use now in 2 other Tech courses (BIOL2336 and BIOL4590) and have been shared in pilot form with instructors across the country.

### BIOL 2336: Ecology Lab Development

Redesigned the laboratory course to reflect the need for quantitative skill training. Students code statistics in R based on inquiry experiments they help design. The curriculum is now fully aligned with the BIOCORE, Vision and Change (AAAS Biology), and Ecological Society of America's educational goals and standards, is funded by three educational grants to Weigel, and includes collaboration with national science bodies (e.g. EPA) and community groups for data collection and management (see figure 1). Some of the new labs include leveraging the data from Stamps Health Center to study the dynamics of flu and the recent norovirus outbreak (see Breitbart and Weigel, in press), to using drone aerial footage to monitor the changing landscape of Tech around the living building (Clopton and Weigel, 2019), to a long-term project monitoring the trees of the Campus Arboretum



*Figure 1. Students collecting chemical and biological data for long-term monitoring as part of the Urban Waters Federal partnership, winner of the 2017 Samuel J. Heyman Service to America medal*

Although the students were admittedly initially less enthusiastic about the tree monitoring project, as were their TAs, here are some quotes which capture the overall student response at the end:

- *“This is a great project and I'm glad I got to participate in it. This lab really helped me become more aware of the phenotypic changes around me. I really enjoyed the campus tree study, and it gave me a greater appreciation for the changing of the seasons. I liked the experiment and by the end, I felt very attached to my trees.”*
- *“Observing the trees every week did not feel like a school assignment. It felt like I was doing something bigger.”*
- *“I had never done a long-term observation in Biology and I thought it was really cool to see the small changes from week to week. If I look at my pictures from the beginning of the semester to the end, all of the small changes I noticed ended up completely changing the phenotype of tree as winter approached.”*
- *“My biggest take-away is learning how to organize and manage my time while committing to a long-term monitoring project. I had to work efficiently yet quickly to get the work done on top of my other assignments, so it definitely taught me how to be better organized and maximize the time available in my day.”*

### BIOL 2335: Ecology Lecture Course: Accessible Design

Implemented a flipped-format video lecture series to replace the standard ecology lecture course. Utilized a team of 9 TAs to create transcripts of each of the lecture videos of the course for accessibility.

### BIOL 1520/1: Learning Objectives and Textbook Creation

In collaboration with leads Dave Garton and Shana Kerr, I have worked to write and revise a new, free online textbook for the 1520/1521 classes to replace our traditional textbook. This development began with the first draft of the textbook in Spring 2017 and continual revision of the text and associated learning objectives in each section. To test its effectiveness, I received IRB approval to investigate the role of customized textbooks in student learning gains and metacognitive skill building between our majors and non-majors; the results of this work were presented at NABT 2018 and are in draft for publication.

### BIOL 1510/1: Learning Objectives and Textbook Revision

Led the effort, in collaboration with Dave Garton, Joe Montoya, and Chrissy Spencer, to develop new and revise existing learning objectives for the Ecology module of 1510/1511. Objectives for each class session are now in alignment with national standards (BIOCORE, Vision and Change (AAAS Biology), and Ecological Society of America), as well as the AP Biology framework; these alignments ensure that students reaching subsequent biology courses are adequately—and equally—prepared to succeed. These objectives have subsequently been used to refine, rewrite, and reorganize the online course textbook website, as well in-class activities and formative and summative assessments.

Sample Learning Objectives from 1510/1 Ecology Module:

1. Define population, population size, population density, geographic range, exponential growth, logistic growth, and carrying capacity.
2. Compare and distinguish between exponential and logistic population growth equations and the resulting growth curves.
3. Compare and contrast models of population growth in the presence and absence of carrying capacity (K)
4. Analyze graphs to determine if regulation is influenced by density

Sample website entry:

<http://bio1510.biology.gatech.edu/module-2-ecology/population-ecology/>

The following select CIOS comments regarding the 1510 website:

- *The best aspect was the flipped classroom component. I liked reading the concepts ahead of time on the website because it helped me feel more prepared for lecture and easier to follow.*
- *The best aspect of the course is the online website. It keeps everything pertinent to the course in one place.*

3. Table 1. Average CIOS scores for all undergraduate BIOL and CETL courses (N=25; avg. response = 81%)

<u>Criterion</u>	<u>Mean</u>	<u>Median</u>
Instructor: Clarity	4.65	4.74
Instructor: Communicated how to succeed	4.65	4.75
Instructor: Respect for students	4.70	4.79
Instructor: Enthusiasm	4.72	4.80
Instructor: Stimulates interest	4.51	4.65
Instructor: Availability	4.64	4.73
Instructor: Feedback helpfulness	4.51	4.61
Instructor: Overall effectiveness	4.65	4.76

4. CIOS student comments

#### **Biology 1510: Biological Principles**

- *Dr. Weigel was very accommodating and accessible. Quick to respond via email, and available to meet outside of office hours.*
- *Dr. Weigel is genuinely enthusiastic about the course, which is really effective and a good atmosphere to be in.*
- *Dr. Weigel is so nice! She really cares about the students and tries to be as accommodating as possible. She knows everything there is to know about bio and it shows, she is capable of covering a topic completely in a very short span of time. The IKEs and TICAs were a great indicator to me whether staying on track. She was also very conversational and liked to check in with students personally, especially people who sat by themselves like me.*
- *Dr. Weigel's enthusiasm for the course made it very enjoyable. Even the ecology unit, which I thought would be boring, was presented in manner that made me excited.*
- *She seemed like she really respected us and took the time to make us aware of that.*
- *Reached multiple learning styles*
- *After doing horribly on an exam, she was able to meet with me and discuss what I did/where I went wrong and then gave me useful pointers as to how I could do better next time, which all helped me to improve on every exam thereafter.*
- *Overall a great instructor -- always provided helped when needed, kept the class interesting, taught the information well, increased my interest in biology!*
- *Approachable and relatable making it easy for students to ask for help and learn from her*

#### **Biology 1520/1: Organismal Biology**

- *She was very engaging, and I loved the way she explained concepts in class. She always tried to make her discussions as relatable as possible.*
- *Dr. Weigel is also very caring about us as students and tries to do things to help keep us engaged and interested in the material*
- *She does everything possible to help us understand the material by breaking each concept down and giving clear objectives. She encourages class participation.*
- *The greatest strength for Dr. Weigel would be her enthusiasm in teaching the course. She also introduced new perspectives into lecture and emphasized making associations with the material being taught, as opposed to just regurgitating content.*

- *She clearly communicated her material and was engaging with the class and used relevant examples which made the course easier to relate to and understand.*
- *Dr. Weigel is exceptional and bringing in real-life examples of biological concepts so that students can greater understand the context of biology in our lives.*
- *She is enthusiastic, highly intelligent, and her love for the subject was palpable. She would often ask the class what we cared to know about, and would spend time there to further inspire students to enjoy the wonders of biology. Despite the fact that I was in this class to graduate, I found myself sharing her awe and excitement regarding the subject. Also, she's hilarious. Really fascinating course with her*
- *You can easily tell that Dr. Weigel enjoys teaching because she would...bring in other things for us to try like a heart monitor when we were learning cardiac functions. She was very engaging in lecture and accessible outside of class.*
- *Explaining the concepts in a way that was fun and helpful. Also in office hours she was soo helpful and literally helped me turn my study habits around in order to succeed in the class the way that I had strived & hoped to.*

### **Biology 2335: Ecology**

- *Dr. Weigel has made me consider a career in ecological research rather than medicine*
- *Dr. Weigel is very dedicated to ensuring students with ODS accommodations participate to the fullest extent.*
- *Fun facts that related lecture content to real life applications engaged the class. In addition, a lot of assigned homework asked us what difficulties we had from the learning objectives; this was an interesting idea and should be continued.*
- *The best aspect was Dr. Weigel's attitude about ecology. She was engaging and made the class fun while trying to make it more worth our time. She really seemed like she gave us every opportunity to succeed.*
- *Truly cares about the students and their wellbeing and success. Favorite biology professor by far.*
- *She is considerate of the entire class and asks/answers questions accordingly. She also slows down her teaching pace when she notices a majority of people struggling with what is taught at the current time, a rare characteristic of professors that I admire.*
- *She was always so open and eager to teach. She clearly identified what we needed to know from each chapter. She listened to our concerns and used them to improve so that we could better understand the material.*
- *She's such a good teacher, and I really admire her drive to work hard for her students in order for us to do well. She's so good about answering questions and trying her best to make sure students have a fair shot at doing well, which is so difficult in a class our size*
- *She was a great communicator and also very helpful in office hours. She was always willing to help, and would not give up until the student truly understood the material.*

### **Biology 4471: Behavioral Biology**

- *I can't think of a "best" aspect. It was just a really good course. It got me interested in a field that I had little experience, and I'm leaving feeling like I know a lot more than I knew coming in. Very valuable.*
- *The best aspect of this course was the focus of in-class discussion. Though this could be a very textbook-centered course, and the book certainly played a role, class time was spent applying the material to real-world scenarios. Overall a very effective and interesting way to teach!*
- *Interesting projects make the class fun and engaging. It is not a typical classroom environment which is refreshing and makes it easy to be excited to come to class and stay interested.*
- *Wasn't what I was expecting (ended up being a lot more project-based and teamwork class*

atmosphere), but it was a pleasant surprise. At first I wasn't sure how I felt about all the in-class activities, but I honestly think they're what made the class.

- The instructor's focus on discussion and interactive activities rather than the standard lecture format.
- Dr. Weigel really helped us to understand the material rather than just memorize facts. The in-class activities kept me very interested, and I loved the paper and project she created for us.
- Open minded, understanding, helps students think deeply about subject.
- Dr. Weigel helped us learn the material rather than memorize things. In the end, I learned more from her class than I have in any traditional biology class where memorizing is the top priority.
- Responsiveness to feedback, respect and concern for students, and enthusiasm about teaching the course.
- I loved the interactive aspects of the course, like the optimal foraging and the hawk-dove activity. Even though I was allowed to miss several classes, I still came to class because I was genuinely excited to come to class.
- Dr. Weigel is amazing. There's no other way to put it. She relates to students, she's excited about her field, and she's not afraid to put herself out there for the sake of teaching a great lesson. I would HIGHLY recommend her, and I hope she teaches more courses in the future here at Tech. She will easily go down as one of the best professors I have had at Tech.
- This is my first major biology class that I've truly enjoyed, and Dr. Weigel really helped me get my motivation back for biology and excited to take on more bio classes my last semester at tech. I've been struggling with upper-level bio classes the last year, and started losing motivation with other things happening in my life, but this class really got me out of the slump and I started focusing all my energy into classes and I'm a lot happier because of it.

### **Biology 4590: Research Project Lab**

- Her ability to relate to students and yet still expect the best from us.
- Her patience with us, especially when we were trying to code in R
- It was such a fun class and really taught me to persevere even when I'm frustrated with work
- Dr. Weigel is an amazing teacher and a stats pro! I loved that she pushed us to learn R code, because now we can put it on our resumes! She inspires me as a woman in science. I wish I had taken more classes with her.

## Nomination Support Letter, Dr. Shana Kerr, School of Biological Sciences

29 January 2019

Dear Dr. Weinsheimer and the CTL Awards Committee,

I am delighted to provide this letter in support of Dr. Emily Weigel's nomination for the CTL Undergraduate Educator Award. I have had the great pleasure of co-teaching multiple courses with Dr. Weigel, including BIOL 1510, and 1520, the first and second semester introductory biology courses for nonmajors, and BIOL 1521, the second semester introductory biology course for Biology majors. I have also enjoyed serving with her on the Introductory Biology Committee and as members of the Biological Sciences undergraduate academic advising team. Throughout these interactions and many discussions, I have consistently observed that Dr. Weigel utilizes innovative and evidence-based pedagogies in her classes, incorporates authentic research projects in her teaching, and actively engages with students both in and out of the classroom to help them improve their performance.

Dr. Weigel's primary focus in the classroom is to help students learn and apply course concepts. She uses the evidence-based "flipped class" approach in introductory biology courses, where students first read or watch course materials and complete a short online homework before class, then practice working in groups with the information during in-class activities, and finally complete homework assignments based on the material after class. Importantly, this approach creates time in class for students to integrate concepts and practice testing themselves on information they have already been exposed to before class, rather than passively listening to a lecture on information they are seeing for the first time. While this model of instruction already existed in the introductory biology sequence when Dr. Weigel began teaching at Tech, she readily embraced and enhanced it by developing new classroom activities and revising course learning objectives and pre-class readings. I will elaborate on each of these efforts below.

As part of implementing a flipped class, Dr. Weigel utilizes real-life case studies to make complex biological processes more accessible to first-year students. In one memorable instance in BIOL 1520, Dr. Weigel presented a case study, which she had personally developed, on the case history of a newborn with a congenital intestinal cyst obstructing the small intestine. She proceeded to use the case history to illustrate the basic structures and functions of animal digestive systems, the consequences of their dysfunction, and diagnostic information that would help identify the location of the blockage. In addition to dramatically illustrating each of these concepts, Dr. Weigel tapped into the career interests of the students in her class: the medical aspect of the case made it highly engaging to BIOL 1520 students, many of whom take the course as a medical school prerequisite.

Dr. Weigel's dedication to implementing the flipped class includes significant "behind-the-scenes" efforts. Each class session in the introductory biology series is based around a set of committee-developed learning objectives (LOs) and supported by an open-source, instructor-developed website containing the background reading and videos, rather than a commercial textbook. Though both the LOs and the website had been developed prior to Dr. Weigel joining the Biological Sciences faculty, she readily jumped into the ongoing effort to revise and update both the LOs and

the associated website pages. In Spring and Summer of 2017, she made substantial modifications to the LOs and website readings for the Ecology module of BIOL 1510 to raise them to higher levels of Bloom's Taxonomy. In Fall 2018, she was a critical contributor to a team effort to substantially revise the LOs for the first module of BIOL 1520 and 1521, in order to reframe the module away from simply an overview of modern biodiversity to instead emphasize the evolutionary history that has resulted in today's biodiversity. Over the 2018-2019 winter break, she then substantially re-wrote (and in some cases, developed from completely from scratch) several of the pre-class webpage readings to better align with these newly revised LOs.

Dr. Weigel blends her passion for teaching and learning with her passion for science by incorporating authentic research experiences into her courses, and she utilizes the GT campus as a laboratory for that experience. In BIOL 2335, Ecology lab, Dr. Weigel initiated a campus tree study to monitor changes of the Campus Arboretum. She also partnered with a student organization to capture drone-based photography across campus to monitor changes to campus ecology. Last year, she took advantage of campus construction for the future Living Building to for students to study ecological succession and biodiversity. In fact, BIOL 2335 lab will ultimately be housed in the Living Building once it opens in Spring 2019. Dr. Weigel also created water quality monitoring projects along Proctor Creek, and shared student-collected data as part of the Urban Waters Federal partnership. In support of these efforts, her BIOL 2335 course is now affiliated with Georgia Tech Serve-Learn-Sustain. Finally, during the Fall 2018 norovirus outbreak, she collaborated with Stamps Health Center and the Quantitative Undergraduate Biology Education faculty mentoring group to develop mathematical biology labs based on the disease outbreak.

Dr. Weigel is proactive and accessible when working with students outside of class. She utilizes Piazza, an online discussion forum, for outside-of-class discussions and responds promptly to questions posted to the forum. She also responds promptly to student emails, and makes herself widely available for in-person office hours. She has even held "virtual" office hours online when necessary to accommodate a student's individual schedule. Dr. Weigel also reaches out proactively to students who are struggling in the class. After each exam, she emails low-scoring students to invite them to meet with her one-on-one to discuss study strategies and other circumstances which could be contributing their poor performance. She also monitors student engagement in online assignments, reaching out to students whose answers reveal that they are not productively engaging with the material. Her proactive initiatives reveal to students that they are not anonymous to her, and that she wants to be a resource to them no matter how successful they currently are in the class.

Dr. Weigel seeks to help students understand the how they learn, and how to improve in their study strategies. She builds metacognitive activities into her classes, including pre-class preparation prompts, end-of-class synthesis questions, and post-exam reflections to prompt students to explicitly identify their study strategies and habits and consider ways in which they could take steps to improve their class preparation. As a scientist, she also collects and analyzes student feedback about the course to identify ways she can restructure the course to better support student learning. In Spring 2018, she initiated a project to study differences in metacognition in majors

and nonmajors in BIOL 1520 and 1521 students, and to assess whether metacognitive reflection correlated with improved student performance. Building on this study, she continues to incorporate opportunities for metacognition into weekly course assignments to create opportunities for student reflection and self-assessment of learning.

With her dedication to active learning, emphasis on authentic research experiences, and thoughtful mission to help students develop effective study strategies, I believe that Dr. Weigel embodies all the traits associated with excellence in undergraduate education. I am extremely pleased to support her nomination for the CTL Undergraduate Educator Award.

Sincerely,

A handwritten signature in black ink, appearing to read 'Shana C. Kerr', with a stylized, cursive script.

Shana C. Kerr, Ph.D.  
Senior Academic Professional (Teaching Faculty and Academic Advisor)



## Nomination Support Letter, Ms. Isabel Veith

Selection Committee:

I am pleased to be able to support Dr. Weigel in her recommendation for this year's Undergraduate Educator Award and to share with you why she has made such an impact on my academic life and professional development. I first met Dr. Weigel in Ecology lab my sophomore year as she was the head instructor for lab that semester. Multiple times she conducted experiments with us in the field which is the only time I have interacted with a head instructor of a lab in that capacity. She was actively engaging each student ensuring they not only understood the purpose of the experiment but also had a positive experience in the field. Normally invertebrate studies would not spark my interest, but Dr. Weigel made the activity relatable and stimulating. She is intentional about cultivating young scientists and appealing to each students' scientific interest.

After Ecology Lab, I was quick to sign up for Behavior Biology the next summer because I saw that Dr. Weigel was teaching the course. I have never been more excited to wake up for a 9:30 a.m. class. Even in class, her intentionality is apparent. Dr. Weigel engages every type of learning style in the classroom, and her lessons are extremely interactive. In many undergraduate classrooms I have felt the lack of motivation and regard for lessons amongst my classmates; however, Dr. Weigel's classroom is so different. In my Behavior Biology class, students would participate without hesitation. She promotes a culture in her classroom where students feel empowered to share what they know and engage in inventive methods of learning without the fear of embarrassment. In one lesson plan, we simulated a research study on monkeys which required students act as if they were monkeys. Although it seems silly, I still remember it almost a year later. Dr. Weigel anticipated the needs of students such that the entire schedule was designed to work students up to piloting their own research study at the Zoo. It took us through the entire research process which showed us we can be autonomous as researchers and should be confident in our abilities to apply our knowledge to the "real world."

As a young scientist, it is overwhelming to picture myself post-graduation making an impact on my field of study, but Dr. Weigel has inspired me to lean into my interests and explore what I wish to do with the rest of my life. I began research with Dr. Weigel in Fall of 2018, and now I consider her both my teacher and mentor. She has this method of keeping track of goals that has honestly changed the way I approach my life. She sends a Google Form every week that asks you what you accomplished the previous week and to set goals for your next week. This method helped me recognize my accomplishments, realize my setbacks, and prepare me to tackle the next steps in my long-term goal. At the beginning of the semester, my research goal of cataloguing features of over 100 species of animals was daunting, but with Dr. Weigel's support I achieved it. This method of goal tracking was so effective, I have successfully used it as the President of my sorority in helping my officers achieve their goals over the semester.

It seems that even the seemingly littlest of things she has done have made a great impact, and I feel privileged to have worked with her. Her ability to connect with and support students in their studies is unparalleled, and she is an invaluable educator at Georgia Tech. I cannot imagine a more deserving candidate of this award than Dr. Weigel.

Isabel Veith

Georgia Institute of Technology || B.S. Biology  
Alpha Xi Delta || Chapter President

## Nomination Support Letter, Ms. Gigi McGaughey

Dear Members of the Selection Committee,

Emily Weigel has my unconditional support for the Undergraduate Educator Award. As a student in her General Ecology class, I was able to witness firsthand her skills in adapting a lecture to meet a variety of student needs. Throughout class, Dr. Weigel engages students with open-ended problems that require critical thinking and application of course concepts to answer fully. She consistently demonstrates her mastery of course material, especially when finding ways to answer student questions on the spot. After the first exam of the semester, a feedback survey for the course was sent out. While I have participated in similar surveys in the past, Dr. Weigel is the first instructor I have had that made significant changes to better accommodate the needs of students based on their feedback. For example, many students expressed the concern that their score on the first exam would prevent them from achieving their goal grade. In response, Dr. Weigel created a grade replacement policy in the course to alleviate some stress common at Tech.

Dr. Weigel has also helped me personally with finding funding for my summer research position in Germany. When I told her I had the opportunity to extend my semester in Europe if I could cover the costs, she personally reached out to some of her contacts in the Georgia Tech German department and encouraged me to apply for an award from the German Foundation Fund. Because of her, I will be able to spend eight weeks working in a geomicrobiology lab in Jena, Germany under a postdoctoral fellow that completed her undergraduate degree at Georgia Tech.

Whether it's increasing office hour availability or staying well after class ends to answer questions, it is clear to anyone that Dr. Weigel truly cares about her students. I cannot think of anyone more deserving for this award than the professor who has inspired me to explore my major to the fullest.

Sincerely,

Gigi McGaughey (Biology B.S., 2020)

## Nomination Support Letter, Mr. Joshua Heaton

Members of the CTL Selection Committee

Dr. Emily Weigel helped me see the power of data driven investigation to identify solutions to real world problems. Going well beyond philosophically relating the importance of well structured scientific inquiry, Dr. Weigel exemplified sound experimental planning and execution. Her lectures were always engaging and her lab section was well-designed and highly edifying. Outside of class, Dr. Weigel made time to address her students' individual concerns and gave us an experience much akin to private tutoring in the moments of insight she regularly shared before and after class.

Perhaps the most inspiring memory from my semester learning under Dr. Weigel was her handling of an academic deficiency she identified in our department. Rather than passing the problem to someone else, she designed and tested a pedagogical intervention that proved very effective at elevating student performance. The consistent extra effort given to better her students distinguishes Dr. Weigel among her peers. At every turn, she has proven herself supremely contemplative and ethical. Being her student was a joy and everyone in her class was bless by her efforts.

Sincerely

Joshua Heaton