

## Application Details

---

### Manage Application: ALG Textbook Transformation Grants

---

**Award Cycle:** Round 6

**Internal Submission Deadline:** Monday, August 1, 2016

---

**Application Title:** 235

**Application ID:** #001144

**Submitter First Name:** Shana

**Submitter Last Name:** Kerr

**Submitter Title:** Academic Professional

**Submitter Email Address:** shana.kerr@biosci.gatech.edu

**Submitter Phone Number:** 4043850065

**Submitter Campus Role:** Proposal Investigator (Primary or additional)

**Applicant First Name:** Shana

**Applicant Last Name:** Kerr

**Applicant Email Address:** shana.kerr@biosci.gatech.edu

**Applicant Phone Number:** 4043850065

**Primary Appointment Title:** Academic Professional

**Institution Name(s):** Georgia Institute of Technology

**Submission Date:** Monday, August 1, 2016

---

**Team Members (Name, Title, Department, Institutions if different, and email address for each):**

David Garton, Senior Lecturer, School of Biological Sciences, david.garton@biosci.gatech.edu; Shana Kerr, Academic Professional, School of Biological Sciences, shana.kerr@biosci.gatech.edu; course development TAs (2), to be identified

**Sponsor, (Name, Title, Department, Institution):**

Dr. Terry Snell, Chair, School of Biological Sciences, Georgia Institute of Technology

**Proposal Title:** 235

**Course Names, Course Numbers and Semesters Offered:**

Introductory Organismal Biology, BIOL 1520, offered every Fall and Spring semester, and in Pacific Study Abroad Program;

Honors Introductory Organismal Biology, BIOL 1521, offered every Spring semester

<b>Final Semester of Instruction:</b>	Fall 2017
<b>Average Number of Students per Course Section:</b>	80
<b>Number of Course Sections Affected by Implementation in Academic Year:</b>	4
<b>Total Number of Students Affected by Implementation in Academic Year:</b>	400
<b>List the original course materials for students (including title, whether optional or required, &amp; cost for each item):</b>	Freeman et al. Biological Science w/ Mastering Biology and Learning Catalytics, required. 3 options available: ebook (\$129.50), looseleaf (\$137.00), and hardcover (\$254.70)
<b>Proposal Category:</b>	Specific Top 100 Undergraduate Courses
<b>Requested Amount of Funding:</b>	\$25,800
<b>Original per Student Cost:</b>	\$129.50 (with e-text) to \$254.70 (with hardcover)
<b>Post-Proposal Projected Student Cost:</b>	\$12 for Learning Catalytics subscription to replace online homework platform bundled with textbook cost
<b>Projected Per Student Savings:</b>	\$117.50-\$242.70
<b>Projected Total Annual Student Savings:</b>	\$47,000-\$97,080

**Creation and Hosting Platforms Used ("n/a" if none):**

Departmental Web Server

**Project Goals:**

In academic year 2015, we were awarded a Round 3 ALG transformation grant to develop no-cost-to-student learning materials for the first semester introductory biology courses, BIOL 1510 and 1511. We successfully piloted, revised, and transitioned to web-based, no-cost materials on a department-wide basis. Importantly, anonymous student surveys have indicated that these materials are well-received by students, and student assessment data has also

revealed that these materials are strongly supportive of student learning. We now seek funding to develop and use transformative materials for the second semester introductory biology courses, BIOL 1520 and 1521, as anticipated in our previously funded proposal to transform BIOL 1510/1511. The transformation of BIOL 1520/1521 will also be adopted on a department-wide basis. This proposal is therefore aligned with our BIOL 1510/1511 proposal and a logical second step for our initial, and successful, ALG-funded project.

We will develop and deliver targeted, online, open-source materials (text, video, interactives, and online homework) that more closely align to the student learning objectives than the current textbook and at substantially lower costs for students. We will assess student usage of the web content, comments on web pages, and performance on formative quiz questions to revise and refine the websites in just-in-time fashion to better facilitate student learning. This project will positively impact approximately 400 students each academic year, and will be adopted on a department-wide basis.

## **Statement of Transformation:**

### **Transformation**

With support from Affordable Learning Georgia, we will:

1. Create on-line website content for every learning objective in the course, divided into a webpage for each class session. This content will be hosted and backed up on departmental servers. Building our own website content will allow us to align each learning objective to a required reading on the website, in-class content, homework, and ultimately the graded assessment of student learning (exams). We have already implemented this approach in the first semester introductory biology courses, BIOL 1510 and 1511. Anonymous student surveys of students in these courses since this implementation have indicated that students found the webpages to be extremely beneficial, targeted to the course learning objectives, and preferable to lengthy textbook readings. Anonymous student surveys of students who had completed 1510/1511 (using the website) followed by 1520/1521 (using the textbook) indicated that students strongly preferred the website-supported model. To see an example of how these web pages will look, based on the model in 1510/1511, please view:

<http://bio1510.biology.gatech.edu/module-3-molecules-membranes-and-metabolism/biological-molecules-2/>

Though content for the BIOL 1520 and 1521 websites has not yet been created, the websites themselves already exist: <http://bio1520.biology.gatech.edu> and <http://bio1521.biology.gatech.edu>

2. Create online assessments/quizzes/homeworks for all class sessions using an online system, Learning Catalytics (<http://learningcatalytics.com>). Currently we use a textbook-associated online homework platform, Mastering Biology, which students must purchase

access to either as a stand-alone product or as part of a textbook bundle. The transformation described in this proposal allows for a deliberate shift away from the textbook's proprietary material. Writing effective assessment questions for this large format course is a significant undertaking that will require release time for the content experts who will develop on-line question-based assessments. The use of Learning Catalytics for formative assessment is crucial, as the 1520 text-replacement website will not have built-in assessment features.

### 3. Reduce cost to students

By completing the two items above, we will substantially reduce student cost from \$117.50(e-text)-242.70(hardcover) per student to \$12 per student. The post-transformation cost to the student is solely for the purchase of access to Learning Catalytics, replacing the textbook-associated online homework platform, Mastering Biology. Our motivation to reduce cost for students is heightened by the fact that the first semester course no longer utilizes the textbook, and thus students taking the second semester course are currently required to purchase a textbook and homework system for only a single semester's use.

## Stakeholders

The student constituents who will benefit from these cost savings are Biology majors, Biology minors, and multiple groups of non-majors. BIOL 1521 is a required course for Biology majors and an option for students in the Georgia Tech Honors Program. BIOL 1520 is a required course for Biochemistry pre-health track, Chemistry pre-health track, and Psychology majors. BIOL 1520 is also taken by nearly all pre-health students regardless of major. This project will impact approximately 400 students each academic year, and this number is expected to increase as more students recognize Georgia Tech as a pre-health destination university.

Faculty in the Georgia Tech School of Biological Sciences and at other Institutes also gain access to the on-line textbook materials, because the content will be publicly available for anyone on the internet to view and use. The interactive quizzing/homework features can be shared with other faculty members who have Learning Catalytics instructor accounts, which are free to faculty members.

## Transformation Action Plan:

### **Our action plan aligns with the three transformation goals as follows:**

1. Create on-line website content for every learning objective in the course  
Course Learning Objectives for each class session were developed by committee two years ago, and so course redesign is not required. The transformation team of Dave Garton and Shana Kerr, who are both experienced instructors in these courses, will build website content to meet these learning objectives for webpages to be housed at <http://bio1520.biology.gatech.edu> and <http://bio1521.biology.gatech.edu>. Creation of each page will entail writing a content explanation for each learning objective, identifying open

source images and examples to support the explanation (or creating such images when content is not freely available) linking to open source video content, and establishing hyperlinks and keywords to make the site searchable. Sources for material will include (but are not limited to) OpenStax Biology, Wikimedia Commons, and YouTube. For students who prefer a print version, the website pages export readily to pdf, retaining text, formatting, and images but losing the video interactives.

This content will be hosted and backed up on departmental servers, as is currently done for BIOL 1510/1511 course content. New hardware and software purchased from funds requested in this proposal will provide a new layer of redundancy for the School of Biological Sciences online course content servers. The new hardware will allow for live migration of servers, which will improve uptime which is viable for this type of service. The backup software requested will allow for faster recovery times.

2. Create online assessments/quizzes/homeworks for all class sessions.

The current website does not have any assessment built in. We already use Learning Catalytics for in class active-learning activities, and we will also adopt the Learning Catalytics platform for homework assessments to replace Mastering Biology, the proprietary online homework platform currently in use. All questions used in class and in the homework will need to be written by Garton and Kerr to remove the possibility that the course retains any proprietary questions owned by the textbook publisher.

3. By completing the two items above, we will substantially reduce student cost from \$117.50(e-text)-242.70(hardcover) per student to \$12 per student. The post-transformation cost to the student is solely for the purchase of access to Learning Catalytics instead of the textbook bundled with Mastering Biology and Learning Catalytics.

### **Team Members and Roles**

Building accurate and complete original website content using pre-existing student learning objectives is more time-consuming than allowed by normal faculty schedules, we will use ALG funding to support teaching release time for content experts to envision, build, and review these materials.

Shana Kerr - faculty and subject matter expert, instructor of BIOL 1520 and 1521, and content developer for modules on reproduction/development and chemical/electrical signals. Also a member of the BIOL 1510/1511 transformation team to serve as a continuity expert on this transformation of BIOL 1520/1521, the second semester courses in the introductory biology sequence.

David Garton - faculty and subject matter expert, instructor of BIOL 1520, and content developer for modules on biodiversity and nutrition/transport/materials balance. Also Director of Pacific Study Abroad Program and instructor of BIOL 1520 on this program.

Course Development TAs – two experienced graduate and/or undergraduate teaching assistants (TAs) will assist in identification and curation of existing, open-access videos and tutorials to include on the website. Finding existing, open-access videos and tutorials which are both well-matched to course learning objectives and briefly and accurately explain course content is a highly time-consuming and challenging process. Thus experienced course development TAs are essential for the initial screening and curation of these videos and tutorials. Course development TAs are regularly used in the School of Biological Sciences on new course development projects. The ideal candidates will be graduate students interested in pedagogy who have served as TAs for the course multiple times in the past, and/or high-achieving senior undergraduate students who have successfully completed and subsequently served as TAs for the course. We anticipate no problems identifying students who meet these criteria.

Both subject matter experts will review each other's content and work closely with course development TAs to identify and curate open source video content.

The two subject matter experts will also be instructors for the BIOL 1520 and 1521 courses in AY 17, and for the foreseeable future, with other faculty rotating in as co-instructors. Following completion of the transformation, the two course development TAs will be invited to serve as course TAs during the initial textbook-free offering of the courses.

### **Open Access Plan**

Web page content will be hosted and backed up by the School of Biological Sciences web server. These pages will be publicly available for viewing. Should we develop quizzing functions directly into the website, those will be restricted to users registered as current students. All content will be open-access and licensed CC-BY (Creative Commons – by attribution).

**Quantitative & Qualitative Measures:** Qualitative Measures 1) Student comments serve as a strong feedback mechanism to assess and improve specific issues with the website content. During the semester, students can report their questions and confusion in the comments section of each webpage, and we will respond to these by revising the website in real-time. 2) We will formally survey students at the end of each module of instruction (the course is divided into 4 four modules) to determine their level of comfort and satisfaction with the web page materials. These qualitative data will be collated with data from the quantitative website usage data to assess if level of satisfaction correlates with engagement with course material. 3) Student anonymous feedback on the website in the end-of-semester Course Instructor Opinion Survey will be used to debrief the transformation team and provide an overview of areas for revision for the website and assessments. Quantitative Measures 1) We will collect site statistics to monitor page views and student comments, and compare these to student performance on in-class questions and informal quizzes to determine the effectiveness of web page content. 2) We will compare course grades and DFW (D or F grades, and withdrawn) rates pre- and post-transformation to determine if course materials more closely aligned with course learning objectives help students succeed in the course. 3) We will identify highly similar exam questions which tested the same concepts to compare student performance on exams from the past two years, with the commercial textbook, versus their performance during the 2017-2018 academic year with only the web pages.

**Timeline:**

**Spring 2017**

Build a preliminary set of questions for interactive quizzes and homeworks  
Solicit applications for course development TAs from existing pool of experienced TAs

**Summer 2017**

Identify and curate videos and tutorials for inclusion on course web pages  
Develop and write web page content to replace the textbook  
Continue building questions for interactive quizzes and homeworks  
Purchase and implement hardware and software needed for backup of existing (BIOL 1510/1511) and newly developed (BIOL 1520/1521) course materials

### **Fall 2017**

Offer course without the textbook, relying only on the web pages  
Build any remaining questions for interactive quizzes and homeworks

### **December 2017**

Assess student performance and DFW rates compared to previous years  
Review student feedback from webpage comments & surveys to alter materials as necessary for Spring 2018

### **Budget:**

Release time for Garton - \$5,000

Release time for Kerr - \$5,000

Stipend support for two course development TAs - \$5,000 each (\$10,000 total); the amount requested will support two graduate students for two months as course development TAs or two undergraduate students for one semester as course development TAs followed by one semester as course TAs during the initial textbook-free course implementation.

New equipment and software for hosting and backup of content - \$5,000; equipment and software includes storage, backup storage, hypervisor (server hardware to run a Virtual Machine of the web server) and software license for backup software

Travel to ALG kickoff meeting for 2 - \$800

Total \$25,800

### **Sustainability Plan:**

BIOL 1520 is offered every fall and spring, including a study abroad session, while BIOL 1521 is offered every spring. Following full development of the web site (all course content modules, quizzes, and homework assignments) these web-based materials will form the foundation for all future offerings of BIOL 1520/1521 in department-wide adoption.

The School of Biological Sciences has already committed to providing IT support to host and maintain the course websites for BIOL 1510/1511, and has pledged to continue providing IT



support to create and maintain the new web pages for BIOL 1520/1521. Funds from this proposal will be used to purchase backup hardware and software to ensure this content is not lost due to failure of existing server equipment.

Once the course website pages are established, correcting, altering, supplementing, and basic maintenance are straight-forward as web pages are created in Wordpress and hosted by the Biological Sciences department, thus any instructor with editorial privileges can modify and update content quickly and easily. In addition, Learning Catalytics allows for easy sharing of assessments with other faculty who also have Learning Catalytics instructor accounts (free for faculty).

**Final Semester of --  
Instruction:**

**Proposal Categories: --**

---

31 July 2016

Affordable Learning Georgia  
[ALG@gatech.edu](mailto:ALG@gatech.edu)

To Whom It May Concern:

The School of Biological Sciences strongly supports the proposal for the ALG Textbook Transformation Grant program by Drs. Garton and Kerr. These instructors have already developed learning objectives for each class session of our Biol 1520 Introductory Organismal Biology and Biol 1521 Honors Introductory Organismal Biology courses. Drs. Garton and Kerr already incorporate active-learning strategies, and are in the process of “flipping” these courses. These efforts are an important part of an ongoing transformation of our two-semester introductory biology sequence; the first semester courses, Biol 1510 Biological Principles and Biol 1511 Honors Biological Principles, have already been transformed into textbook-free courses via a previous ALG Textbook Transformation Grant.

The funds from this grant will be used to provide release time so these instructors can create the web pages and develop online quiz and homework question sets, to support course development TAs to assist in development of course resources, and to purchase new hardware for hosting and backup of online course materials. These are the steps necessary for the courses to rely on these web pages as a suitable replacement for Pearson's textbook and on-line homework system.

Given that faculty-developed web pages have already successfully replaced the commercial textbooks and on-line homework system for the first semester courses, Biol 1510 and 1511, the Introductory Biology committee and the Undergraduate Committee are prepared to support a similar effort for the second semester courses, Biol 1520 and 1521. These web pages will be adopted for all future offerings of our two-semester Introductory Biology sequence. The School of Biological Sciences commits IT support to maintain these pages and will continue to do so in the future.

These web pages are open and freely available to other institutions in both Georgia and the rest of the world. They will be a highly visible part of Georgia Tech's leadership in the transformation of undergraduate biology education.

Sincerely,



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

## Affordable Learning Georgia Textbook Transformation Proposal

Shana Kerr and David Garton  
Georgia Institute of Technology

Proposal Title: Learn Free II: the study of organismal biology without the cost of a text

### References:

Representative example of a completed website page, currently used as student reading for BIOL 1510:

<http://bio1510.biology.gatech.edu/module-3-molecules-membranes-and-metabolism/biological-molecules-2/>