

Fall 2015

Introduction to Environmental Science

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Authors

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Caralyn Zehnder, Kalina Manoylov, Samuel Mutiti,
Christine Mutiti, Allison VandeVoort, Donna Bennett

Introduction to Environmental Science





Grants Collection

Affordable Learning Georgia Grants Collections are intended to provide faculty with the frameworks to quickly implement or revise the same materials as a Textbook Transformation Grants team, along with the aims and lessons learned from project teams during the implementation process.

Each collection contains the following materials:

- Linked Syllabus
 - The syllabus should provide the framework for both direct implementation of the grant team's selected and created materials and the adaptation/transformation of these materials.
- Initial Proposal
 - The initial proposal describes the grant project's aims in detail.
- Final Report
 - The final report describes the outcomes of the project and any lessons learned.



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Syllabus

Introduction to Environmental Science ENSC 1000-Fall 2015

Instructor:
Office:
Office hours:
Office phone:

Email:
Class location:
Class meeting time:

Course Description

This course uses the basic principles of biology and earth science as a context for understanding environmental policies and resource management practices. Our planet is facing unprecedented environmental challenges, from oil spills to global climate change. In ENSC 1000, you will learn about the science behind these problems; preparing you to make an informed contribution to Earth's future. I hope that each of you is prepared for each class and engaged with the course material.

Environmental Science Laboratory (ENSC 1000L) is a separate class and you will receive a separate grade for that course.

Course Objectives

As a result of this course, you will be able to:

- Evaluate the diverse responses of peoples, groups, and cultures to environmental issues, themes and topics.
- Use critical observation and analysis to predict outcomes associated with environmental modifications.
- Demonstrate knowledge of the causes & consequences of climate change.
- Apply quantitative skills to solve environmental science problems.
- Demonstrate knowledge of environmental law and policy.
- Design and critically evaluate experiments.
- Interpret data in figures and graphs.

Evaluation

Exams (3)	300 points (100 points each)
Online quizzes (9)	90 points (10 points each)
Current event summaries (3)	30 points (10 points each)
Participation/homework	60 points
<u>Final exam</u>	<u>150 points</u>
Total:	630 points

The letter grading scale will be as follows: A = $\geq 90\%$, B = 80-89.5%, C = 70-79.5%, D = 60-69.5%, F = $< 60\%$.

Prior to mid-semester you will receive feedback on your academic performance in this course. To receive credit for any in-class work, including exams, you must be present in your correct section.

Exams: There will be three **cumulative**, in-class, closed-book exams. Exams will contain multiple choice and/or short answer questions. You will need a 100-question scantron for each exam. The final exam will be given during finals week. Any student with an average exam grade of **92.00%** or higher may opt out of the final exam. The average exam grade will replace the final exam grade.

Makeup Exams. If a student knows that they are going to miss an exam because of a legitimate excuse, then they should arrange to take the exam early. If a student misses an exam (illness, family emergency), then the missed exam grade will be replaced by the grade on the final exam.

Quizzes: There will be ten 1-hour online quizzes administered on GaView within a 48-hour window. You can use any notes you want, but you need to work individually. These 5 or 10 question multiple choice quizzes will cover upcoming lecture material. The point of these quizzes is to ensure that you read the textbook material before lecture. For each quiz, I will indicate which topics and textbook pages will be covered. **You cannot make up missed quizzes. The lowest quiz grade will be dropped.** To earn a good grade on the quizzes, I recommend reading the assigned chapters or articles and taking notes while reading before starting the online quiz.

Current Events: An essential component of environmental science is awareness of the world around you. Therefore, you will be expected to submit 3 current event summaries of not more than 600 words. Details and an example will be posted online. You should submit all current event summaries online by 11:59PM on their due date.

Participation: Your participation grade will be based on in-class activities, in-class quizzes, and/or short assignments. You cannot make up missed in-class work.

Textbook (required): Our free, OER (open educational resource) textbook is available online. This resource was created by faculty in the Environmental Science program at Georgia College specifically for this course. This link will take you to your textbook. Each textbook chapter is a separate tab. The separate chapters are also posted on GeorgiaView.

<http://libguides.gcsu.edu/ensc1000/course-overview>

Course Format. Our course will consist of lectures, discussions, individual activities, small group activities, and whole-class exercises. I strongly encourage you to participate and am happy to address questions at any time: before, during, or after class. We will be using GeorgiaVIEW / D2L for course communications, announcements, and assignment submissions. It is your responsibility to check our page regularly for announcements, assignments, clarifications, etc. Please communicate with me through. Lecture notes will be posted. The notes are meant to assist you with taking notes and organizing information in class. Online lecture notes will **not** contain all the information necessary to pass exams. You will need to bring the notes to class, pay attention, take notes and think during class. All assignments are expected to be submitted on time and online via GeorgiaVIEW. It is your responsibility to check to make sure that your submissions go through. Assignments are due by MIDNIGHT of the due date. All assignments must be submitted as .pdf, .doc or .docx files

GeorgiaView: <https://gcsu.view.usg.edu/>

Username: firstname_lastname

Password – original pin from Banner (Birthday: mmddyy) or PAWS password

Academic Atmosphere

Attendance. I will not be taking attendance in class. However, you cannot make up missed quizzes or graded class work. Additionally, it will be very difficult for you to pass the exams if you do not attend class.

Time Commitment. You should expect to spend a minimum of 6 hours per week on this class: 2.5 hours in the classroom, 3.5 hours reviewing/studying/reading.

Integrity. We will all treat each other with respect and dignity. You are expected to abide by all policies on academic honesty, as stated in the Georgia College and State University Honor Code. It is your responsibility to complete and represent your work honestly and to demonstrate respect of others' academic endeavors. Violations of the honor code (including all plagiarism - from web sites, books, other students, etc.) will be treated seriously and will result in you failing the assignment and/or the entire course. **If a student is caught cheating on an exam, then that student will receive a failing grade for the course.** For more information, see the GC&SU catalog, or http://www.gcsu.edu/student_affairs/Student_Handbook/honor/honor.html

Cell phone policy: Cell phones off during class and no texting. There is no point in showing up to class if you are going to chat with your friends throughout the lecture.

Religious Observance Policy. Students are permitted to miss class in observance of religious holidays and other activities observed by a religious group of which the student is a member without academic penalty. Exercising of one's rights under this policy is subject to the GC Honor Code. Students who miss class in observance of a religious holiday or event are required to make up the coursework missed as a result from the absence. The nature of the make-up assignments and the deadline for completion of such assignments are at the sole discretion of the instructor. Failure to follow the prescribed procedures voids all student rights under this policy. **If you are going to miss class because of a religious holiday, then you need to contact me at least 1 week prior to class and arrange to makeup the missed work.**

Assistance for Student Needs Related to Disability. If you have a disability as described by the Americans with Disabilities Act (ADA) and the Rehabilitation Act of 1973, Section 504, you may be eligible to receive accommodations to assist in programmatic and physical accessibility. Disability Services, a unit of the GCSU Office of Institutional Equity and Diversity, can assist you in formulating a reasonable accommodation plan and in providing support in developing appropriate accommodations to ensure equal access to all GCSU programs and facilities. Course requirements will not be waived, but accommodations may assist you in meeting the requirements. For documentation requirements and for additional information, we recommend that you contact Disability Services located in Maxwell Student Union at 478-445-5931 or 478-445-4233.

Student Opinion Surveys statement. Given the technological sophistication of Georgia College students, the student opinion survey is being delivered through an online process. Your constructive feedback plays an indispensable role in shaping quality education at Georgia College. All responses are completely confidential and your name is not stored with your responses in any way. In addition, instructors will not see any results of the opinion survey until after final grades are submitted to the University. An invitation to complete the online opinion survey is distributed to students near the end of the semester. Your participation in this very important process is greatly appreciated.





Academic Honesty. The integrity of students and their written and oral work is a critical component of the academic process. The submission of another's work as one's own is plagiarism and will be dealt with using the procedures outlined in the following link <http://catalog.gcsu.edu/ugrad/student-academic-dishonesty.htm>. Remember that allowing another student to copy one's own work violates standards of academic integrity. Also see the student Honor Code at the website: <http://www.gcsu.edu/studentlife/handbook/code.htm>






Fire Drills. Fire drills will be conducted annually. In the event of a fire alarm, students will exit the building in a quick and orderly manner through the nearest hallway exit. Learn the floor plan and exits of the building. Do not use elevators. If you encounter heavy smoke, crawl on the floor so as to gain fresh air. Assist disabled persons and others if possible without endangering your own life. Assemble for a head count on the front lawn of main campus or other designated assembly area. For more information on other emergencies, please visit <http://www.gcsu.edu/emergency/actionplanmain.htm>




Topics

- Population Ecology
- The Human Population
- Energy – Fossil fuels
- Energy – Nuclear energy
- Energy – Alternative energy
- Air pollution
- The Clean Air Act
- Carbon Cycle
- Greenhouse effect
- Global Climate Change
- Water management
- Water pollution

ENSC 1000
Introduction to Environmental Science
Course schedule

Week	Topic	Textbook link and information
Week 1	Intro	Chapter 1: Introduction http://libguides.gcsu.edu/ensc1000/introduction
Week 1	Introduction	Author: Dr. Kalina Manoylov
Week 1	Scientific method activity	Attribution - Noncommercial - ShareAlike 3.0 Unported  This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.
Week 2	Population Ecology (exponential & logistic)	Chapter 2: Population Ecology http://libguides.gcsu.edu/ensc1000/population-ecology
Week 2	Population Ecology (logistic & survivorship curves)	Author: Dr. Caralyn Zehnder
Week 2	Population ecology handout	Attribution - Noncommercial - ShareAlike 3.0 Unported  This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.
Week 3	Human demography	Chapter 3: Human Demography http://libguides.gcsu.edu/ensc1000/human-demography
Week 3	Human demography	Author: Dr. Caralyn Zehnder
Week 3	Human demography	Attribution - Noncommercial - ShareAlike 3.0 Unported
Week 4	<i>Labor Day - no class</i>	
Week 4	Human population handout	 This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.
Week 4	Exam 1	
Week 5	Fossil fuels - coal	Chapter 4: Non-renewable energy http://libguides.gcsu.edu/ensc1000/non-renewable-energy Author: Dr. Christine Mutiti Attribution - Noncommercial - ShareAlike 3.0 Unported  This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License
Week 5	Mercury case study	Tuna for Lunch? Case Study http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=549&id=549
Week 5	Review Exam 1	
Week 6	Oil & natural gas	Chapter 4: Non-renewable energy http://libguides.gcsu.edu/ensc1000/non-renewable-energy
Week 6	Nuclear	

Week 6	nonrenewable energy handout	<p>Author: Dr. Christine Mutiti</p> <p>Attribution - Noncommercial - ShareAlike 3.0 Unported</p>  <p>This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License</p>
Week 7	Alternative energy	<p>Chapter 5: Alternative Energy</p> <p>http://libguides.gcsu.edu/ensc1000/alternative-energy</p> <p>Author: Dr. Kalina Manoylov</p> <p>Attribution - Noncommercial - ShareAlike 3.0 Unported</p>  <p>This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.</p>
Week 7	Alternative energy	
Week 7	Alternative energy	
Week 8	Air pollution	<p>Chapter 6: Air Pollution</p> <p>http://libguides.gcsu.edu/ensc1000/air-pollution</p> <p>Author: Dr. Christine Mutiti</p> <p>Attribution - Noncommercial - ShareAlike 3.0 Unported</p>  <p>This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License</p>
Week 8	Air pollution	
Week 8	Exam 2	
Week 9	<i>Fall break - no class</i>	
Week 9	Review Exam 2	
Week 9	Carbon cycle	<p>Chapter 7: Climate change</p> <p>7.1: The carbon cycle</p> <p>http://libguides.gcsu.edu/ensc1000/climate-change</p> <p>Author: Dr. Allison VandeVoort</p> <p>Attribution - Noncommercial - ShareAlike 3.0 Unported</p>  <p>This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License</p>
Week 10	Global Climate Change	<p>Chapter 7: Climate change</p> <p>7.2: The Science of Climate Change</p> <p>http://libguides.gcsu.edu/ensc1000/climate-change</p> <p>Author: Dr. Allison VandeVoort</p> <p>Attribution - Noncommercial - ShareAlike 3.0 Unported</p>  <p>This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License</p>
Week 10	Global Climate Change	
Week 10	Global Climate Change - handout	
Week	Consequences of climate change	Chapter 7: Climate change

11		7.3: The consequences of climate change http://libguides.gcsu.edu/ensc1000/climate-change Author: Dr. Allison VandeVoort
Week 11	Consequences of climate change	Attribution - Noncommercial - ShareAlike 3.0 Unported
Week 11	Consequences of climate change	
Week 12	Climate change jigsaw	This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License
Week 12	Climate change jigsaw	
Week 12	Properties of water	Chapter 8: Water http://libguides.gcsu.edu/ensc1000/water Author: Dr. Sam Mutiti
Week 13	Water cycle (groundwater / surface water)	Attribution - Noncommercial - ShareAlike 3.0 Unported
Week 13	Water cycle (groundwater / surface water)	
Week 13	Water handout	This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License
Week 14	water scarcity, desalination	
Week 14	Water review	
Week 14	Exam 3	
Week 15	Review Exam 3	
Week 15	<i>Thanksgiving - no class</i>	
Week 15	<i>Thanksgiving - no class</i>	
Week 16	Water pollution	Chapter 8: Water http://libguides.gcsu.edu/ensc1000/water Author: Dr. Sam Mutiti
Week 16	Water pollution	Attribution - Noncommercial - ShareAlike 3.0 Unported
Week 16	Water management & Clean Water Act	
Week 16	Water management & Clean Water Act	This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License
Week 17	Review & final exams.	

Initial Proposal

**Affordable Learning Georgia Textbook Transformation Grants
Round 2
Summer 2015, Fall 2015, Spring 2016
Proposal Form and Narrative**

Institution Name(s)	Georgia College & State University				
Team Members (Name, Title, Department, Institutions if different, and email address for each)	Caralyn Zehnder, Associate Professor, caralyn.zehnder@gcsu.edu Kalina Manoylov, Associate Professor, kalina.manoylov@gcsu.edu Samuel Mutiti, Associate Professor, samuel.mutiti@gcsu.edu Christine Mutiti, Lecturer, christine.mutiti@gcsu.edu Allison VandeVoort, Assistant Professor, allison.vandervoort@gcsu.edu Department of Biological and Environmental Sciences Donna Bennett, Associate Director for Collection and Resource Services, Russell Library, donna.bennett@gcsu.edu				
Sponsor, Title, Department, Institution	Kelli Brown, Provost, Academic Affairs, Georgia College & State University				
Course Names, Course Numbers and Semesters Offered	ENSC 1000 Intro to Environmental Science, Fall 2015, Spring 2016, Summer 2016				
Average Number of Students Per Course Section	24-60	Number of Course Sections Affected by Implementation in Academic Year 2016	9	Total Number of Students Affected by Implementation in Academic Year 2016	452
Award Category (pick one)	<input type="checkbox"/> No-Cost-to-Students Learning Materials <input type="checkbox"/> OpenStax Textbooks <input type="checkbox"/> Course Pack Pilots <input checked="" type="checkbox"/> Transformations-at-Scale				
List the original course materials for students (including title, whether optional or required, & cost for each item)	<i>Essential Environment: The Science behind the Stories - 5th edition by Jay H. Withgott, Pearson (required)</i>			[Cost] \$152.00/student Total Cost \$68,704	
Plan for Hosting Materials	<input type="checkbox"/> OpenStax CNX <input checked="" type="checkbox"/> D2L <input checked="" type="checkbox"/> LibGuides <input type="checkbox"/> Other _____				
Projected Per Student Cost	\$0/student		Projected Per Student Savings (%)	100%	

Title: Ditching the textbook! Developing material for a textbook free Introduction to Environmental Science (ENSC 1000)

1. Project Goals

Our project goals are to 1) reduce the cost to students in all sections of our Introduction to Environmental Science (ENSC 1000) course by replacing the traditional textbook with no-cost, open access learning materials, 2) develop Environmental Science educational materials that are sustainable, current, and specific to the learning outcomes of our course, and 3) design and share materials on a LibGuide (Library-Specific Springshare Product) that will serve as an easily accessible resource guide for students, as well as faculty at other institutions.

1.1 Statement of Transformation

Description of transformation: Each year, the Department of Biological & Environmental Sciences offers nine sections of ENSC 1000 (4 fall, 4 spring, 1 summer) to approximately 452 students. This course satisfies the Area D science requirement for non-science and science majors and it is a required course for Environmental Science (ENSC) majors and minors. Over the past 8 years the ENSC Committee has tried three different textbooks. However, we have not been satisfied with any of them because of two major drawbacks associated with all Environmental Science textbooks: 1) the books are out of date as soon as they are printed because Environmental Science is such a rapidly advancing field and 2) the books are too broad and include many chapters that we cannot cover in a single semester course. For example, in our current text we assign 9 of the 18 chapters. Drawback #2 leaves students extremely dissatisfied with the textbook and frustrated that they have to spend so much money and use so little of the book. Most ENSC 1000 students are non-science majors, so they have little interest in retaining their textbooks for later use. In two fall 2011 sections of ENSC 1000, we surveyed 118 students using a Student Assessment of their Learning Gains (<http://salgsite.org/>) and 25% of the students responded that the textbook provided “little” or “no help” in their learning and another 27% rated the textbook as only moderately helpful. A mere 4% of students gave the textbook the highest rating (great help). Student comments about the textbook include “I didn’t really use the book.” “The book didn’t help me much at all compared to the lecture. It was a waste of money.” “I never opened the book.” “I feel like students did not need the book.” By replacing our traditional textbook with freely available course materials, **each student will save \$152, for an estimated annual savings of \$68,704.**

For a majority of our students, ENSC 1000 is one of only two college science courses that they will enroll in. We want this course to be exciting, relevant and to ‘hook’ students onto science. Environmental Science can be extremely engaging and many students are motivated to learn this subject because it has direct connections to their lives and to events in the news. A traditional textbook cannot keep up with this rapidly changing field or include the latest environmental news. Developing our own material will give us the flexibility to include the latest scientific breakthroughs and news stories. And the committee will review our course material annually to ensure that it stays up-to-date.

Stakeholders affected by the transformation and a description of this impact: Our students will be the direct beneficiaries of this textbook transformation. Our students will save money and they will have course materials that are well aligned with ENSC 1000 course requirements. Additionally, this transformation will directly benefit the 5 faculty in the Department of Biological and Environmental Sciences who regularly teach ENSC 1000, since access to better aligned, more current resources favorably impacts the quality of our teaching. And as we share these materials with colleagues at other USG schools and publish these materials on MERLOT, (a curated collection of free online learning materials), then other faculty will also benefit.

Impact on the program and department. ENSC 1000 is one of the top core courses offered by our Department, and all faculty who teach ENSC 1000 are on board for replacing the textbook with freely available course material. Moreover, ENSC 1000 is a required course for all Environmental Science majors and minors and it is often the first college science course that our students take. While majors makeup less than 10% of the students enrolled in ENSC 1000/1000L, retaining these students is of upmost importance to us. Science majors typically spend hundreds of dollars per semester on textbooks, so reducing this cost in any way can help with retention. Additionally, many of our students, both majors and non-majors, enroll in ENSC 1000 because they are interested in going 'green' and not requiring students to purchase a textbook saves resources and supports the idea of sustainability. Some of the course material that we develop for ENSC 1000 can also be used in other courses within the department, so these materials will benefit students beyond the ones enrolled in ENSC 1000.

1.2 Transformation Action Plan

1. Identify and review appropriate no-cost materials that align with ENSC 1000 learning outcomes. In ENSC 1000, students learn about a wide range of topics including population ecology, demography, energy, climate change, air pollution, and water, in addition to applying the scientific method, and developing skills in reading and interpreting graphs. Additionally, this course has a Global Perspectives Overlay and, therefore, all of the topics include examples from multiple countries and students examine environmental issues from multiple perspectives. Course material available on open access sites such as MERLOT already meets some of our learning outcomes. Additionally, a National Science Foundation -funded consortium of community colleges recently developed a suite of open access course materials including a track on Environmental Technology. These materials will be available in Spring 2015, and will also be included in our review. Additional resources include articles from National Geographic and Scientific American, which are available through Galileo, as well as datasets and Open Educational Resources (OER) available from government websites (National Oceanic and Atmospheric Administration, Environmental Protection Agency, United States Geological Society) and scientific organizations (American Association for the Advancement of Science, Ecological Society of America, Geological Society of America).
2. Map available resources to learning outcomes and identify gaps. These gaps will provide the blueprint for the new material that we will create.
3. Develop new materials. This will include identifying relevant textbook chapters, formative assessment (self quizzes), class handouts for group activities and summative assessments (exams). Each environmental science faculty member will write and develop appropriate material for their topic.
 - a. C. Zehnder (project leader): Population ecology & human demography
 - b. K. Manoylov: Energy (renewable resources: solar, biofuels, wind, geothermal)
 - c. C. Mutiti: Energy and air pollution (non-renewable resources: coal, oil, natural gas, nuclear)
 - d. S. Mutiti: Water (water management, water pollution)
 - e. A. VandeVoort: Climate change (causes and consequences)
4. Organize materials for open access. After we review each other's course material, we will consider how to best present these materials using both D2L and LibGuides.
 - a. D. Bennett: Develop LibGuide and provide LibGuide training for ENSC faculty.
5. Review our current ENSC 1000 syllabus and instructional activities. We plan on keeping the basic ENSC 1000 course structure and student learning outcomes. However, we will need to revise our assessments and in-class activities based on the new material. Additionally, we will

also develop mini video lectures of some topics, so instructors can use a ‘flipped’ classroom approach when this pedagogy is appropriate.

6. Teach course. In Fall 2015, Drs. Zehnder and VandeVoort will teach two sections each of ENSC 1000, Drs. Manoylov and C. Mutiti will each teach two sections in Spring 2016 and Dr. S. Mutiti will teach one section in summer 2016. All instructors will use the new course materials in place of the previously required textbook. Based on assessment data, we will revise course material as necessary. We will share challenges and successes through regular meetings.
7. Assessment. Please see the section on Quantitative and Qualitative measures below.
8. Dissemination of material. Some of the material developed for ENSC 1000 will also be used in our new, proposed, core, online course, ENSC 1050: Sustainability and the World Population. Additionally, ENSC 1000 is similar to other USG courses including Ecological Basis of Environmental Issues (ECOL 1000) and Environmental Science (ENVS 2202), so some of our materials will be transferable to these courses. We will present our results at state and regional meetings including the USG Teaching & Learning Conference and the USG STEM-SOTL conference. If our proposal is funded, we will submit a proposal to the Georgia College IRB to collect data on student learning and course satisfaction both pre and post textbook transformation. We will publish our results in suitable journals such as *Innovative Higher Education* or the *Journal of College Science Teaching*. As appropriate, we will publish our course material on open access sites such as MERLOT.

1.3 Quantitative and Qualitative Measures

Quantitative Measures. We will assess student performance using exam questions and assignments that align with the course learning outcomes. These results will be compared with student performance in previous, textbook-based versions of the course. We hypothesize that more students will meet the course outcomes after we replace the textbook because the new material will be more closely aligned with the course learning outcomes. Additionally, we will compare DFW rates both before and after the textbook transformation to determine if the no-cost format increases student retention and decreases course failure rates.

Qualitative Measures. Students in the 2015 spring and summer sections taught with a traditional textbook and in all transformed sections (Fall 2015 and onward) will complete a Student Assessment of their Learning Gains (www.salgsite.org) at the end of the course. Part of this survey specifically asks students to rate how well the course resources such as the textbook and online materials, helped their learning. Students also self-describe the learning gains they made for each student learning outcome. We will compare student scores and comments both before and after the textbook transformation.

1.4 Timeline

Action	Timeframe
Review available OERs (MERLOT, NSF, USGS, AAAS, etc).	Spring 2015
Map available resources to student learning outcomes.	Spring 2015
Submit interim status report to ALG.	Late Spring 2015
Develop materials.	Summer 2015
Organize materials into a LibGuide. Organize course on D2L.	Summer 2015
Revise ENSC 1000 instructional activities	Summer 2015
Teach ENSC 1000, 4 sections (~200 students) using new material.	Fall 2015
Assessment in ENSC 1000.	December 2015
Analyze assessment data.	December 2015
Submit final report to ALG.	December 2015

1.5 Budget

Drs. Zehnder, Manoylov, Mutiti, Mutiti, and VandeVoort will receive summer pay totaling \$5,000 salary and benefits. Ms. Bennett will receive a contract overload totaling \$5,000 salary and benefits. The total budget request is \$30,000.

1.6 Sustainability

The Department of Biological & Environmental Sciences is committed to offering ENSC 1000 every semester and the ENSC faculty members are committed to using our new material in all subsequent sections and not requiring students to purchase a traditional textbook. ENSC 1000 is regularly assessed by our program, both as part of Area D core assessment and as part of our regular program assessment. Therefore, we regularly review how well students meet the learning outcomes and we also evaluate student feedback. We will review course material on an annual basis, create new material as needed and delete outdated information.

All ENSC 1000 instructors currently use D2L in their classes, so it makes sense for us to continue to use this course management software. D2L allows instructors to easily rollover course content into future classes or to share content across concurrent courses. In addition to the material that we create and post on D2L, the course also will rely on articles provided to students via GALILEO, the University System of Georgia's virtual library. Course materials will also be shared using a LibGuide. LibGuides are easy to create and edit, offer flexible design, and can be edited by multiple users. Files, links, widgets, video and more can be embedded in the guides. Russell Library currently provides many course guides containing research help and supplemental materials, so students are already comfortable using these resources. In addition, LibGuide usage can be tracked through page views, providing feedback to guide creators. Sharing is encouraged and facilitated in the LibGuides Community, and so course materials can be easily shared with USG and other interested schools.

1.7 References

- Klymkowsky . 2007. Teaching without a Textbook: Strategies to Focus Learning on Fundamental Concepts and Scientific Process CBE Life Sci Educ. 6(3): 190–193. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1964522/>
- Hoskins & Stevens. 2009. Learning our L.I.M.I.T.S.: less is more in teaching science. Adv Physiol Educ. 33(1):17-20. <http://www.ncbi.nlm.nih.gov/pubmed/19261755>
- M. W. Klymkowsky. 2010. Thinking about the Conceptual Foundations of the Biological Sciences Vol. 9, 405–407. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2995756/pdf/cbe405.pdf>



**Provost and Vice President
for Academic Affairs**

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Milledgeville, Georgia 31061-0490
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Fax 478-445-5151

December 2, 2014

Dear Review Board,

On behalf of Georgia College in Milledgeville, I am pleased to offer this letter of support for our institution's **Affordable Learning Georgia** Textbook Transformation grant application. Georgia College is requesting funding for the creation of "No-Cost-to-Students" Learning Materials for college Environmental Science courses, the development of which will be spearheaded by a team of faculty from Biological and Environmental Sciences and supported by Associate Director for Collection and Resource Services of Russell Library, Donna Bennett. Each year, Georgia College provides 6,600 undergraduate and graduate students with an exceptional learning environment that extends beyond the classroom, with hands-on involvement with faculty research, community service, residential learning communities, study abroad, and internships. We are the only public institution named as a "College of Distinction" in Georgia for the 8th consecutive year, and our institution is regularly named as a "Best Southeastern College" by the Princeton Review, which places us in the top 25 percent of the nation's four-year colleges.

In 2012, colleges and universities across the nation learned of the one million STEM graduates needed to fill projected employment needs in the next decade. Georgia College is making great strides to advance STEM education by implementing activities such as STEM grant awards for faculty and staff, service learning courses that enable students to work with students and teachers in STEM, and supplemental instruction programs to encourage STEM retention and achievement. Georgia College is also one of seven partner institutions that participate in the USG *STEM Initiative*, which seeks to increase the success and completion rates of college STEM majors. As an additional measure, reducing the financial burden of STEM courses at our institution by providing no-cost learning materials will promote greater student engagement and achievement in STEM fields.

This project will support the creation of online learning materials for ENSV 1000, Introduction to Environmental Science, which is a required course for environmental science majors and also satisfies the science requirement for non-science majors. Approximately 450 students in nine course sections will benefit from replacing the textbook *Essential Environment: The Science Behind the Stories* (5th edition by Jay H. Withgott, Pearson, \$152) with free open access materials. Resulting materials will be sustainable, current, and specific to the learning outcomes of the course. Library-Specific Springshare Products (LibGuides) will enable faculty to design and share materials with students and faculty at other institutions. The Office of the Provost, along with the Office of Grants and Sponsored Projects, will ensure compliance with all State, Board of Regents, and institutional policies and procedures, should we receive funding.

Thank you for your favorable consideration of Georgia College's application. Please contact me should you have any questions regarding this project.

Best Regards,

Kelli Brown, PhD
Provost & Vice President
for Academic Affairs

Milledgeville • Macon • Warner Robins

Georgia College, the state's designated public liberal arts university, combines the educational experience expected at esteemed private liberal arts colleges with the affordability of public higher education.

Final Report

Affordable Learning Georgia Textbook Transformation Grants

Final Report

Date: Dec. 15, 2015

Grant Number: 109

Institution Name(s): Georgia College & State University

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

- Caralyn Zehnder, Associate Professor, Department of Biological and Environmental Sciences, caralyn.zehnder@gcsu.edu
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- Allison VandeVoort, Assistant Professor, Department of Biological and Environmental Sciences, allison.vandervoort@gcsu.edu
- Donna Bennett, Associate Director for Collection and Resource Services, Russell Library, donna.bennett@gcsu.edu

Project Lead: Caralyn Zehnder

Course Name(s) and Course Numbers: ENSC 1000. Introduction to Environmental Science

Semester Project Began: Spring 2015

Semester(s) of Implementation: Fall 2015

Average Number of Students Per Course Section: 24-60

Number of Course Sections Affected by Implementation: 9 per year

Total Number of Students Affected by Implementation: 452 per year

1. Narrative

Our project goals were to 1) reduce the cost to students in all sections of our Introduction to Environmental Science (ENSC 1000) course by replacing the traditional textbook with no-cost, open access learning materials, 2) develop Environmental Science educational materials that are sustainable, current, and specific to the learning outcomes of our course, and 3) design and share materials on a LibGuide (Library-Specific Springshare Product) that will serve as an easily accessible resource guide for students, as well as faculty at other institutions.

We successfully met all of our project goals and were able to use our new textbook in our four fall 2015 sections of ENSC 1000. Our program will continue to use this free, OER textbook in this class for the foreseeable future. This means that our students will not have to spend over \$150 per student on a textbook that they would only use in this one class. Importantly, our new OER textbook is focused on the information that we cover in our course, and so students are not stuck buying an expensive textbook and then not using all of it. Additionally, our textbook is relevant and up-to-date, which is very important in a field like Environmental Science the changes rapidly.

Our work began during the spring semester of 2015. Our team met multiple times throughout the semester to work on this project. We developed the framework for our open access material, assigned individuals to specific topics, developed student learning outcomes for each module, and created outlines for each module.

During the summer of 2015, we collaboratively wrote our textbook. The five Environmental Science faculty each wrote one or two chapters. Additionally, we all reviewed and commented upon each other's work. As we finished the chapters, our librarian uploaded the documents and appropriate links to our LibGuide and added the appropriate creative commons license. She also reviewed the chapters for content clarity, formatting and citations.

This fall, we implemented our new textbook in all four sections of ENSC 1000, including our majors-only section. This affected approximately 200 students. We posted links to our LibGuide in GeorgiaView and explained to students how they would access their new (free!) textbook. Our students were easily able to access the material and the student feedback was overwhelming positive. They were very excited about not having to purchase a book and they also felt that this material was worth reading since it was written by their professors. They saw how the OER textbook and lecture activities complemented each other and many students commented that they liked that our textbook didn't contain a lot of irrelevant "fluff". Mid-semester, we administered a survey in two sections of ENSC 1000 and asked students to comment on chapters 1-6. We will use this feedback in future revisions.

In terms of lessons learned, like many projects this one was very time consuming - especially writing the material. We would have preferred to have more occasions to discuss the various course topics, but it was hard to find time to bring everyone together over the summer. Ideally, it would have been great to have a week-long writing retreat. Also we need to work on making our book more cohesive. It was obvious to our students that different chapters were authored by different individuals, so in the future we will try to present a more unified voice. Additionally, some chapters included practice questions and a list of vocabulary terms, while other did not. We want to have a standardized format for our materials, so we plan on adding these additions to the chapters that originally lacked them.

For a majority of our students, ENSC 1000 is one of only two college science courses that they will enroll in. We want this course to be exciting, relevant and to 'hook' students onto science. Environmental Science can be extremely engaging and many students are motivated to learn this subject because it has direct connections to their lives and to events in the news. A traditional textbook cannot keep up with this rapidly changing field or include the latest environmental news. Our new "textbook" gives us the flexibility to include the latest scientific breakthroughs and news stories. And the committee will review our course material annually to ensure that it stays up-to-date and we will incorporate student feedback into our reviews.

2. Quotes (all from students enrolled in ENSC 1000, Fall 2015)

"I really like that I don't have to buy a book. Textbooks are so expensive and I am supporting myself through college."

"The chapter learning outcomes are very clear because they are basically an outline of the ch. 2 material. They use key terms and say exactly what you need to know about the material associated with that term."

"There was a lot of information in this chapter, but I felt like it was all incredibly necessary. I felt like this chapter was very important and a lot of the information on the exam came from this chapter."

"It's so easy for me to look up material in class since my textbook is online."

3. Quantitative and Qualitative Measures

3a. Overall Measurements

Student Opinion of Materials

Was the overall student opinion about the materials used in the course positive, neutral, or negative?

Total number of students affected in this project: __183 (this semester only more will be affected in the future). _____

- Positive: __76__ % of __72__ number of respondents
- Neutral: __14__ % of __72__ number of respondents
- Negative: __10__ % of __72__ number of respondents

Student Learning Outcomes and Grades

Was the overall comparative impact on student performance in terms of learning outcomes and grades in the semester(s) of implementation over previous semesters positive, neutral, or negative?

Choose One:

- Positive: Higher performance outcomes measured over previous semester(s)
- Neutral: Same performance outcomes over previous semester(s)
- Negative: Lower performance outcomes over previous semester(s)

Student Drop/Fail/Withdraw (DFW) Rates

Was the overall comparative impact on Drop/Fail/Withdraw (DFW) rates in the semester(s) of implementation over previous semesters positive, neutral, or negative?

Drop/Fail/Withdraw Rate:

7.1 % of students, out of a total 183 students affected, dropped/failed/withdrew from the course in the final semester of implementation.

Choose One:

- Positive: This is a lower percentage of students with D/F/W than previous semester(s)
- Neutral: This is the same percentage of students with D/F/W than previous semester(s)
- x Negative: This is a higher percentage of students with D/F/W than previous semester(s)

3b. Narrative

Overall the students were happy with the OER Environmental Science textbook that the committee created. Initially some of the students were a little confused about having an online textbook, especially since many of the students enrolled in ENSC 1000 are first semester freshmen. However, the instructors regularly explained how to access the textbook and posted links on GeorgiaView (D2L) to help students find the resource. Many of the students chose to print off the chapter pdfs so that they could write notes and highlight the material. Some of the student learning outcomes were unclear and need further clarification. Additionally, some chapters need to include more examples and explanations – based on student feedback. However, a majority of the students found the material to be clear and easy to understand.

Students regularly accessed the LibGuide material. There were 6890 separate LibGuide accesses by students during the fall semester, which means that each student accessed the LibGuide 37 times during the semester. Figure 1 shows the number of times that each chapter was accessed by students each month. You can see the pattern of chapters taught throughout the semester. Chapters 1 and 2 were taught in August, so that is when students access this material and then they accessed this material again before exam 1 in September. We were initially surprised by how few students accessed the LibGuide in December during finals weeks. However, it is likely that many of the students downloaded the chapter pdf during a previous visit to the LibGuide. Also the December data only includes Dec. 1-4, and finals were Dec. 8-11. So it is very likely that many students returned to the LibGuide while studying during finals week.

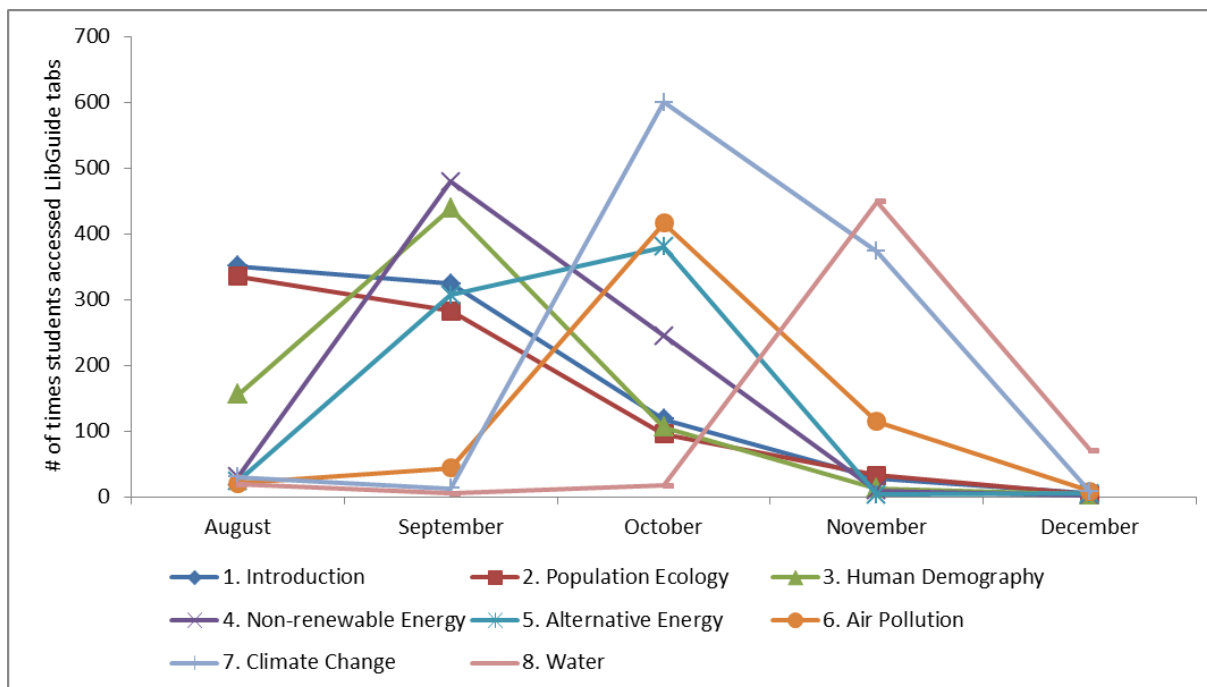


Figure 1: The number of times that students accessed the Libguide material each month. Each line represents a different chapter.

In terms of student performance, a higher percentage of students earned “As” in 2015 than in 2014. However, a greater percentage of students dropped the course or failed the course in 2015 compared to 2014. Taken together, the data indicate that the textbook transformative did not have a strong impact on student performance in terms of learning and grades.

Table 1: Compares the grade distribution for Fall 2015 (implementation of new textbook) and Fall 2014 (traditional textbook). The instructors for ENSC 1000 were the same for both years.

	A	B	C	D	F	W	TOTAL
Fall 2015	49 (26.8%)	77 (42.1%)	32 (17.5%)	12 (6.6%)	5 (2.7%)	8 (4.4%)	183
Fall 2014	45 (23.1%)	90 (46.2%)	44 (22.6%)	12 (6.2%)	3 (1.5%)	1 (.5%)	195

When the ENSC committee discussed the slightly higher number of withdrawals in 2015 compared to 2014, we decided that it seems unlikely that the withdrawals can be attributed to the textbook. Two of this year’s withdrawals were because of medical reasons and the other students who dropped the class before midterm were all student who were not attending class, failed to turn in assignments, and subsequently did very poorly on the first two exams. It is unlikely that these students were using the OER textbook and it is unlikely that the textbook affected their decision on whether or not to drop the class. The DWF rates for ENSC 1000 are comparable to other Area D non-science majors courses. For example, the W rate for BIOL 1100 was 4.5% in Fall 2015. We will continue to examine the DFW rates in the future.

4. Sustainability Plan

Our plan is very sustainable. The Department of Biological & Environmental Sciences is committed to offering ENSC 1000 every semester and the ENSC faculty members are committed to using our new material in all subsequent sections and not requiring students to purchase a traditional textbook. ENSC 1000 is regularly assessed by our program, both as part of Area D core assessment and as part of our regular program assessment. Therefore, we regularly review how well students meet the learning outcomes and we also evaluate student feedback. We will review course material on an annual basis, create new material as needed and delete outdated information.

5. Future Plans

This project has helped us also reflect on how students use our course materials. Additionally, we have noticed that many of our students come to college lacking the ability to read college-level textbook materials. We are considering adding more study guides to our OER material to help students learn the content and also develop their reading skills.

We will continue collecting student feedback on our OER textbook and also continue collecting data on student learning outcomes. We hope to publish our work in an appropriate STEM-SOTL journal in the future and potentially present at the USG Teaching and Learning Conference or the STEM-SOTL conference at Georgia Southern.

6. Description of Photograph

Environmental Science students participating in a class activity in Dr. Mutiti's class.