

Affordable Learning Georgia Textbook Transformation Grants

Final Report

To submit your Final Report, go to the Final Report submission page on the ALG website:

http://affordablelearninggeorgia.org/site/final_report_submission

Final report submission requires four files:

- This completed narrative document
- Syllabus or syllabi
 - (if multiple files, compress into one .zip folder)
- Qualitative/Quantitative Measures data files
 - (if multiple files, compress into one .zip folder)
- Photo of your team or a class of your students w/ at least one team member, minimum resolution 800x600px
 - (nearly all smartphones take photos larger than this size by default)

Follow the instructions on the webpage for uploading your documents. Based on receipt of this report, ALG will process the final payment for your grant. ALG will follow up in the future with post-project grantee surveys and may also request your participation in a publication, presentation, or other event.

General Information

Date: July 3, 2020

Grant Round: 13

Grant Number: 408

Institution Name(s): Georgia Southern University

Project Lead: Weitian Tong until August 2019, Lixin Li after August 2019

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

- Weitian Tong, Assistant Professor, Computer Science, wtong@georgiasouthern.edu until August 2019
- Lixin Li, Professor, Computer Science, lli@georgiasouthern.edu

Course Name(s) and Course Numbers:

- CSCI 3230, Data Structures
- CSCI 3236, Theoretical Foundation

Semester Project Began: Spring 2019

Final Semester of Implementation: Spring 2020

Total Number of Students Affected During Project:

Course	Number of sections	Enrollment
CSCI 3230*	2	44
CSCI 3236	4	99
Total	6	143

* Dr. Tong was the developer and instructor of CSCI 3230. He left Georgia Southern in August 2019. Before he left, he designed and implemented cost-free learning materials for CSCI 3230. He also gave the delivery of CSCI 3230 with the new cost-free learning materials in summer 2019.

1. Narrative

A. Describe the key outcomes, whether positive, negative, or interesting, of your project. Include:

- Summary of your transformation experience, including challenges and accomplishments*
- Transformative impacts on your instruction*
- Transformative impacts on your students and their performance*

Our transformation effort achieves a great success. We have developed and implemented cost-free learning material for the two Computer Science core courses. 143 students have been impacted by our efforts. As shown in Table 1, students' opinions on the learning materials we created are quite positive. Our assessment data shows that, the cost-free learning materials we developed are as effective as the textbooks used previously in the corresponding courses.

Both investigators have committed significant amount of time and effort to collect, create, and maintain cost-free learning materials. Course contents are customized to offer equivalent or better learning experience as the textbooks. Meanwhile, collecting and organizing the learning materials helps us keep up with the rapidly developing computer science field. Without the strong support from the ALG grant, all these effort in textbook replacement of the proposed course will not happen.

The generated cost-free learning materials will be sustainably updated and appropriately maintained in the future semesters. As stated in our sustainability plan, these two Computer Science core courses will be continuously offered and thus all our materials will

be continually adopted and innumerable students from Georgia Southern University will benefit from the savings of textbooks and enjoy enhanced learning experience at the same time.

B. Describe lessons learned, including any things you would do differently next time.

Lessons learned by Dr. Weitian Tong on CSCI 3230: There are too many commonly used data structures and plenty of new ones are being created. It is hard to select the most representative ones and introduce them in an easy-to-understand way to students. The lesson learned it to keep an eye on the new data structures and categorize them appropriately to make sure only the most representative one will be introduced.

Lessons learned by Dr. Lixin Li on CSCI 3236: CSCI 3236 is a study of languages, formal grammars, and abstract representations of computation. The concepts are abstract and the COVID-19 pandemic made it more difficult to learn when classes went fully online in Spring 2020. The lesson learned here would be to develop high-quality lecture videos with interaction that go with developed cost-free learning materials so that students can learn abstract materials remotely if needed.

2. Quotes

- Provide three quotes from students evaluating their experience with the no-cost learning materials.
 1. “I felt more willing to actually study. I will purposely not buy textbooks if I can learn the info for free online. So not having to look for information is really nice. Also it is way better to have exactly what you are going to be tested on laid out. In other classes they hand you a book and say what chapters, but they sometimes will skip large parts of the chapters. I prefer this method of teaching way more.”
 2. “I really enjoy the cost-free learning material, mostly due to the free part. Also in classes that do use a paid textbook I feel like it isn't used much anyway. In most of the college courses I've taken a large majority, if not all, of the information is learned directly from the professor rather than the textbook.”
 3. “Everything was well organized in this course, I generally find that textbook free courses are easier to go back and study essential material than with a textbook. Not to mention the price, being a broke college student, I love it when professors don't require me to spend another 1-500\$ for a textbook for a course I already paid way too much in tuition for.”

3. Quantitative and Qualitative Measures

3a. Uniform Measurements Questions

The following are uniform questions asked to all grant teams. Please answer these to the best of your knowledge.

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: 143

- Positive: 88.5 % of 52 number of respondents
- Neutral: 3.8 % of 52 number of respondents
- Negative: 7.7 % of 52 number of respondents

Please refer to Tables 1 and 2 for details.

Table 1 Students' Opinion on Cost-free Learning Material, CSCI 3230, Summer 2019

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	In general, the learning modules were organized	8.00	10.00	9.00	1.00	1.00	8
2	The content, links and other leaning module materials were sufficient to help me learn.	6.00	10.00	8.13	1.62	2.61	8
3	I liked not having to buy a textbook and instead used the materials that were provided and free.	9.00	10.00	9.88	0.33	0.11	8
4	I prefer using selected open source/free learning materials rather than a paid textbook for this course.	8.00	10.00	9.75	0.66	0.44	8
5	Overall, compared to a potential paid textbook, open resource learning materials provided the necessary assistance to learn the material.	6.00	10.00	9.13	1.36	1.86	8
6	I would take another course that uses open/free learning materials.	7.00	10.00	9.63	0.99	0.98	8
7	I would have preferred having a textbook for the course	1.00	10.00	3.88	3.55	12.61	8

Table 2 Students' Opinion on Cost-free Learning Material, CSCI 3236, Fall 2019 and Spring 2020

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	In general, the learning modules were organized	1.00	10.00	9.02	1.94	3.75	44
2	The content, links and other leaning module materials were sufficient to help me learn.	1.00	10.00	8.50	2.34	5.48	44
3	I liked not having to buy a textbook and instead used the materials that were provided and free.	1.00	10.00	9.36	2.00	4.00	44
4	I prefer using selected open source/free learning materials rather than a paid textbook for this course.	1.00	10.00	9.09	2.27	5.17	44
5	Overall, compared to a potential paid textbook, open resource learning materials provided the necessary assistance to learn the material.	1.00	10.00	8.82	2.24	5.01	44
6	I would take another course that uses open/free learning materials.	1.00	10.00	9.21	2.14	4.58	43
7	I would have preferred having a textbook for the course	1.00	10.00	3.23	3.15	9.95	44

Note: in the survey, students are asked to express their opinion on a list of question using a 10-point Likert scale where 1 is strongly disagree, 5 is neutral, and 10 is strongly agree.

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?

Student outcomes should be described in detail in Section 3b.

Please refer to Tables 3 and 4 for details.

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)

Table 3 CSCI 3230 Students' grades in Spring 2019 (left) and Summer 2019 (right)

Final Calculated Grade Class Statistics	Final Calculated Grade Class Statistics
Number of submitted grades: 25 / 25	Number of submitted grades: 12 / 12
Minimum: 0 %	Minimum: 0 %
Maximum: 92.51 %	Maximum: 94.81 %
Average: 73.45 %	Average: 72.93 %
Mode: None	Mode: None
Median: 80.3 %	Median: 80.97 %
Standard Deviation: 20.65 %	Standard Deviation: 25.57 %

Table 4 CSCI 3236 Students' grades in Spring 2019, Fall 2019 and Spring 2020

CSCI 3236	Spring 2019 (with traditional textbook)	Fall 2019 (with new cost-free learning materials)	Spring 2020 (with new cost-free learning materials)
Average grade	83.6%	79.1%	83.1%

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:

Depending on what you and your institution can measure, this may also be known as a drop/failure rate or a withdraw/failure rate.

13.6 % of students, out of a total 44 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)
- ☐ Negative: This is a higher percentage of students with D/F/W than previous semester(s)

Table 5 Students' DEW rates

Course	Drop/Fail/Withdraw Rate of implementation over previous semesters
CSCI 3230	Positive
CSCI 3236*	Negative

* Two sections of CSCI 3236 were offered in the final semester, Spring 2020. Because of the COVID-19 pandemic, both sections were moved to fully online after the spring break. Some students got sick, and some students made hardship withdrawals later in the semester due to the pandemic. The disturbance of the pandemic contributed to the higher DFW rate in Spring 2020.

3b. Measures Narrative

In this section, summarize the supporting impact data that you are submitting, including all quantitative and qualitative measures of impact on student success and experience. Include all measures as described in your proposal, along with any measures developed after the proposal submission.

[When submitting your final report, as noted above, you will also need to provide the separate file (or .zip with multiple files) of supporting data on the impact of your Textbook Transformation, such as surveys, analyzed data collected, etc.]

- *Include measures such as:*
 - *Drop, fail, withdraw (DFW) delta rates*
 - *Course retention and completion rates*
 - *Average GPA*
 - *Pre-and post-transformation DFW comparison*
 - *Student success in learning objectives*
 - *Surveys, interviews, and other qualitative measures*
- *Indicate any co-factors that might have influenced the outcomes.*

We collected multiple types of data to measure the effectiveness of our cost-free learning materials quantitatively and qualitatively.

- Quantitatively, we compared students' grades, DFW rates, feedback on learning materials, and success in learning objectives.
 - Student's grades are obtained from Folio, the teaching system of Georgia Southern.
 - The DFW rates are taken from student registration system.
 - Students' feedback on learning materials are assessed via the surveys designed by investigators.
 - Students' success in learning objectives are assessed via the regular teaching evaluation. Faculties at Georgia Southern University are required to be evaluated for every course they teach for each semester. The survey includes students' success in achieving the learning outcomes.
- Qualitatively, two anonymous survey questionnaires are designed to allow students to share their learning experiences and discuss the effectiveness of the learning materials. These two surveys are conducted at the end of each semester, respectively. A numeric reporting scale of 1-10 will be applied to measure students' attitude towards the cost-

free learning materials. Qualitative comments and suggestions are also collected at the same time.

Survey results are provided. Based on the assessment data we collected, the cost-free learning materials offer the similar learning effectiveness as the textbook (in some case, even better). Students' performance outcomes and DFW also stay the same pre-implementation and post-implementation.

4. Sustainability Plan

- *Describe how your project team or department will offer the materials in the course(s) in the future, including the maintenance and updating of course materials.*

As the core courses in the Computer Science undergraduate program, both CSCI 3230 and CSCI 3236 are offered every semester at Georgia Southern University. Team members on the project teach these courses regularly and will be responsible to update the materials as needed. If these courses are assigned to instructors, the no-cost transformed courses can still be maintained and improved continuously due to the feedback from the course evaluation per semester and the ABET (Accreditation Board for Engineering and Technology) accreditation per round.

5. Future Plans

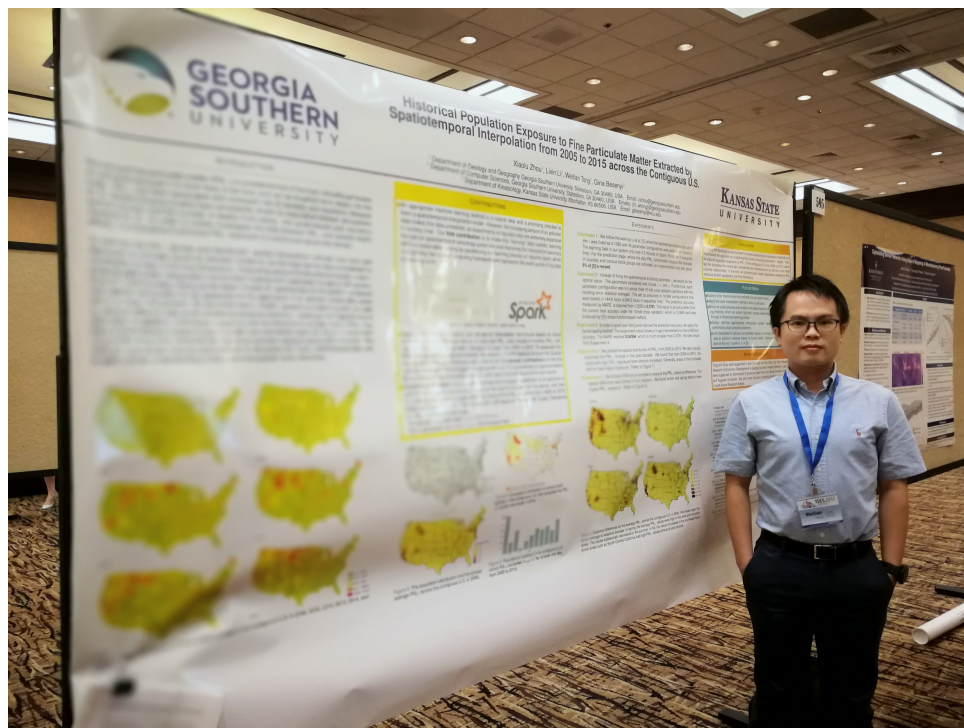
- *Describe any impacts or influences this project has had on your thinking about or selection of learning materials in this and other courses that you will teach in the future.*
- *Describe any planned or actual papers, presentations, publications, or other professional activities that you expect to produce that reflect your work on this project.*

The field of Computer Science is developing at a rapid speed, which makes some fundamental data structures and basic concepts continuously and quickly updated. Therefore, up-to-date, open-source and cost-free online resources are more advantageous compared with the traditional textbooks. Faculties in Computer Science department already completed an individual ALG project. Positive feedback from the students and our own development and implementation process will inspire more faculties in our department to get involved with developing cost-free learning material for more CS courses. Successful experience from this project will be shared with the other faculties. Potential papers will be submitted to educational conferences in the future.

6. Description of Photograph

- *On the Final Report Submission page, you will be submitting a photo. In this document, list the names of the people shown in this separately uploaded photograph, along with their roles.*

Unfortunately, we did not get a chance to take a photo together before Dr. Weitian Tong left Georgia Southern in August 2019. Here are two separate photos.



Dr. Weitian Tong, project lead from January 2019 to August 2019.



Dr. Lixin Li, project lead from August 2019 to May 2020.