

Affordable Learning Georgia Affordable Materials Grants Transformation Grants Final Report

(or Textbook Transformation Grants, if R17 or earlier)

Once you have completed this template, to submit your Final Report, go to the [Final Report submission form](#).

The final report submission form allows you to submit the following:

- This completed narrative document (required)
- Syllabus or syllabi (required)
If multiple files, compress into one .zip folder
- Qualitative/Quantitative Measures data files (optional, as needed)
If multiple files, compress into one .zip folder
- Photo of your team or a class of your students for future ALG promotions (optional)
- Invoice for the second half of the grant's award amount (optional)

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: 5/7/2024

Grant Round: 23

Grant Number: 656

Institution Name(s): Kennesaw State University

Project Lead: Dr. Kun Suo

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

Department	Name	Title	Email address
Computer Science	Kun Suo	Assistant Professor	ksuo@kennesaw.edu
Computer Science	Patrick Bobbie	Professor	pbobbie@kennesaw.edu
Computer Science	Bobin Deng	Assistant Professor	bdeng2@kennesaw.edu

Course Name(s) and Course Numbers:

Parallel and Distributed Computing, CS 4504

Semester Project Began: Summer 2023

Final Semester of Implementation: Spring 2024

Total Number of Students Affected During Project: 333

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*

Accomplishments:

- Transformed a total of 10 sections of one fundamental CS senior course, which formerly used hard-copy textbooks to free online textbooks and course materials;
- Redeveloped the whole course materials, including slides, homework, projects, exams, and presentations, for both f2f and online courses;
- Hosted on faculties' own websites and D2L, and used KSU uHoo Analytics tool to track student progress and gain their feedback;

Challenges:

- Creating a website with a cohesive theme and comprehensive content covering all course material and relevant case studies;
- Adapting the course project using open-source systems can be time-consuming and challenging, requiring thorough bug fixes to ensure seamless functionality and accessibility for students;
- Locating and restructuring freely available online resources to complement traditional textbooks used in the course;
- Maintaining and updating the website and course materials based on students' feedback requires significant time and effort;
- Tracking individual student performance, expectations, and feedback necessitates dedicated time and effort for thorough measurement and analysis;

Transformative impact on instruction and students:

- Students generally accept it positively (nearly 80%);
- Because all courseware is managed through GitHub, it is more convenient to manage and update courses by instructors;
- Most students reported that using free and online course materials helped them improve their learning and progress in the course;
- The financial burden on students has been greatly reduced, the student participation rate in this course has been increased, and the withdrawal rate has been reduced compared to before;
- The students enjoy using free and open-source materials and resources to complete course projects. Most of them already got used to digital resources and they can refer to the materials wherever and whenever they want;

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

Lessons learned:

- It may take some time for some of students to adjust to online textbooks and resources;
- Because technology is developing/changing rapidly, course materials need to be continually updated since course development;
- More time is needed to create various case studies for assignments and projects;
- More supporting materials need to be provided for students' in-depth learning.
- More feedback surveys are needed to identify issues students may be experiencing.

C. Describe any materials you created or revised/remixed that will be shared with the public. Include the [open license your materials will be shared under](#)—for most materials, this will be an Attribution 4.0 License (CC BY) as required in the Grants Request for Proposals.

Course websites (including all slides/homework/projects) Sample:

- <https://kevinsuo.github.io/teaching/2023Fall/4504/class.html>

CS 4504 Parallel and Distributed Computing

\$ Information

Instructor: Kun Suo, ksuo@kennesaw.edu
Time: check syllabus, [Calendar](#)
Location: check syllabus, [Map](#)
Office hours: D2L or through email or Microsoft Teams
Syllabus: [link](#)

\$ Lectures

Week	Topics	Homework/Project/Paper
Week 1	Introduction	Reference
Week 2	Distributed System Overview	
Week 3	Process	Warmup project
Week 4	Labor Day (no class), Thread	
Week 5	Lock	
Week 6	Pthread	Pthread project
Week 7	Lab for project pthread , Presentation for project pthread	
Week 8	Midexam, Exam answer	
Week 9	MPI, MPI-2	MPI project
Week 10	Lab for project MPI , Lab for project MPI and presentation	
Week 11	OpenMP, OpenMP-2	
Week 12	Lab for project OpenMP and presentation	OpenMP project
Week 13	Research paper presentation	
Week 14	Research paper presentation	
Week 15	Thanksgiving Break (no class)	
Week 16	Review	
Week 17	Final exam	



This course was funded by ALG R23,
<https://www.affordablelearninggeorgia.org/>

New course projects:

- <https://kevinsuo.github.io/teaching/2023Fall/4504/Project/pthread.pdf>
- <https://kevinsuo.github.io/teaching/2023Fall/4504/Project/mpi.pdf>
- <https://kevinsuo.github.io/teaching/2023Fall/4504/Project/openmp.pdf>

New open-source template and samples:

- <https://github.com/kevinsuo/CS4504>

2. Quotes

Provide three quotes from students evaluating their experience with the no-cost learning materials.

Student	Quote
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1	Very knowledgeable and super helpful. Assignments were great learning opportunities, but just a little hard for me hence my grade showing it. (but I appreciate the challenge!! and the room to grow)
2	Clear about the course content, gave good context that tied topics together based on things in the slides. Demonstrated what commands and code did in Linux terminal and C.
3	Despite of the fact that the course is in an online format, the instructor has a large active presence. He communicates to the student regarding the course schedule. To continue, the instructor is knowledgeable of the content being presented and records lectures.

3. Quantitative and Qualitative Measures

A. 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: 333

- Positive: 78.5 % of 333 number of respondents
- Neutral: 18.3 % of 333 number of respondents
- Negative: 3.2 % of 333 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?

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

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?

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

21.9 % of students, out of a total 333 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)

B. 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.]

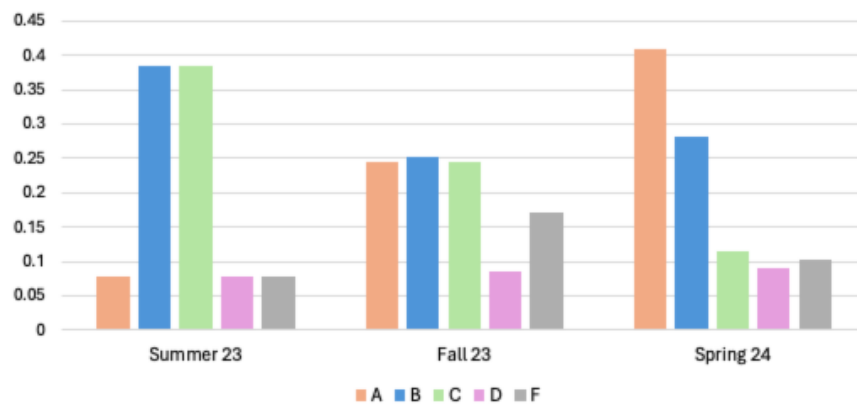
- *Include measures such as:*
 - *Drop, fail, withdraw (DFW) delta rates*
 - *Course retention and completion rates*
 - *Average GPA*
 - *Pre-and post-transformation DFW comparison*
 - *Student success in learning objectives*
 - *Surveys, interviews, and other qualitative measures*
- *Indicate any co-factors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

Table 1 shows the rubrics (number and percentage of students) for the Pass/Fail/Withdrawal (PFW) for CS 4504 Parallel & Distributed Computing courses throughout the academic year 2023-2024 at Kennesaw State University.

Table 1. Courses, number of enrolled students, and pass/fail/withdrawal percentages

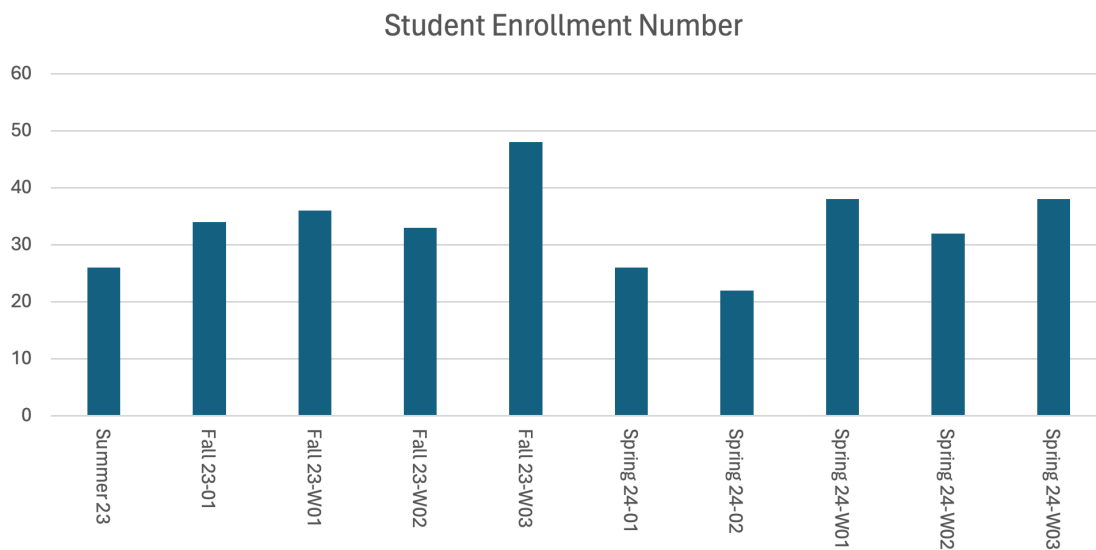
Courses	Semester & Year	Section	Instructor	# of Enrolled Students	Pass (%)	Fail or Withdraw (%)
CS 4504 Parallel & Distributed Computing	Summer 23	4504	Patrick Bobbie	26	92%	8%
	Fall 23	4504/01	Patrick Bobbie	34	91%	9%
	Fall 23	4504/W03	Patrick Bobbie	36	78%	22%
	Fall 23	4504/W01	Patrick Bobbie	33	67%	33%
	Fall 23	4504/W02	Kun Suo	48	98%	2%
	Spring 24	4504/01	Patrick Bobbie	26	96%	4%
	Spring 24	4504/02	Patrick Bobbie	22	91%	9%
	Spring 24	4504/W01	Patrick Bobbie	38	90%	10%
	Spring 24	4504/W02	Patrick Bobbie	32	81%	19%
	Spring 24	4504/W03	Bobin Deng	38	92%	8%
	Total			333	87%	13%

Figure 1. Grade distribution in different semesters.



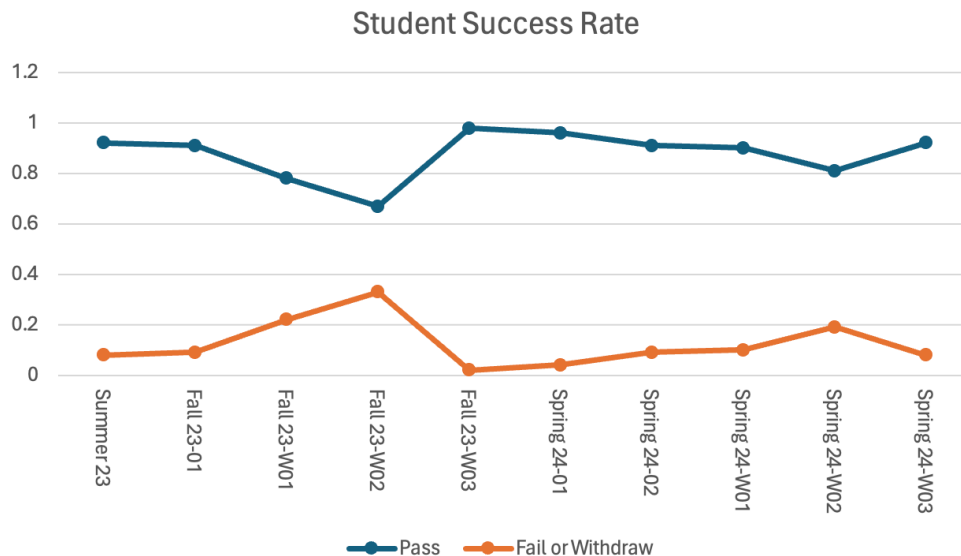
After analyzing the changes in student performance in different semesters, as shown in Figure 1, we found that after the introduction of online textbooks, student performance in CS4504 improved significantly. For example, the proportion of students receiving A and B increased significantly. At the same time, the proportion of students getting F's can still be controlled at a high level.

Figure 2. Enrollment in different semesters.



According to our statistics in Figure 2, the number of student enrollments in 10 sections of CS4504 has not shown a significant increase or decrease after new materials are adopted, and the average enrollment number of American courses in multiple semesters has remained at around 30 students.

Figure 3. Student success rate in different semesters.



According to our data, as shown in Figure 3, the success rate of students dropped for a little at the beginning. The specific reason may be that many students are not adaptable to new materials and open-source projects. Some students may find it challenging when started. However, as time goes on, we can observe that students' success rates have increased significantly, with the average remaining above 90%. This proves that our new materials can help more students maintain academic success while reducing the cost.

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.

For the course materials, we plan to deliver the following in the future semesters to meet different requirements from students:

- Slides: Prepare clear and concise course slides using presentation software like PowerPoint or Google Slides.
- Recordings: Consider recording lectures (with student permission) and posting them on D2L or KSU platform. This can be helpful for students with different learning styles or those who miss class.
- Interactive Lectures: Use online tools like Poll Everywhere to create interactive lectures with polls and quizzes.

- **Code Examples:** Provide well-commented code examples demonstrating parallel and distributed computing concepts. Use code repositories like GitHub to manage and share code versions with students.

In order to keep course knowledge updated and keep pace with the technology trends, our team also promises to keep maintenance and updating materials. Specifically, we will achieve the above through the following ways:

- **Schedule Reviews:** Regularly review the course materials to ensure they are up to date with the latest advancements in the parallel and distributed computing.
- **Student Feedback:** Encourage student feedback on the course materials. Ask them if the content is clear, engaging, and helpful. Use their input to improve future iterations of the course.
- **Keep with the Trends:** Follow relevant blogs, conferences, and research papers to stay current on parallel and distributed computing trends. This knowledge can be incorporated into our future course materials.
- **Collaborate with Colleagues:** Engage with other educators in my department or other colleges, discipline to share resources, exchange ideas, and collaborate on updating course materials.

5. Future Affordable Materials 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.

For this course, we will keep using all the materials benefits by this project and keep updating all course contents, homework, exams, and projects.

For other courses, we plan to borrow the experiences and lessons from this project and replace existing commercial textbooks and materials in those courses with no- or low-cost student learning materials. Potential candidate courses include CS 6041 Theory of Computation, CS 3502 Operating Systems, etc.

6. Future Scholarship Plans

Describe any planned or actual papers, presentations, publications, or other professional activities that you expect to produce that reflect your work on this project.

Our team plans to complete a teaching paper based on the experience, lessons learned and data from this project, and intends to publish it at next year's ACMSE conference ([ACMSE 2025](#)). If the paper is accepted, team members will attend the meeting and make relevant presentations.

7. Description of Photograph (optional)

This is where a team can list the names of the people shown in this separately uploaded photograph, along with their roles, if applicable.