

Table of Contents

He, Selena - #3366 - 440.....	1
Letter of Support.....	16
Proposal Narrative.....	18

Application Summary

Competition Details

Competition Title:	Textbook Transformation Grants, Round Fourteen (2019-2020)
Category:	University System of Georgia
Award Cycle:	Round 14
Submission Deadline:	04/09/2019 at 11:59 PM

Application Information

Submitted By:	Selena He
Application ID:	3366
Application Title:	440
Date Submitted:	04/09/2019 at 8:38 AM

Personal Details

Institution Name(s):	Kennesaw State University
Applicant First Name:	Selena
Applicant Last Name:	He
Applicant Email Address:	she4@kennesaw.edu
Applicant Phone Number:	470-578-6039
Primary Appointment Title:	Associate Professor
Submitter First Name:	Selena
Submitter Last Name:	He
Submitter Email Address:	she4@kennesaw.edu
Submitter Phone Number:	470-578-6039
Submitter Title:	Associate Professor

Application Details

Proposal Title

440

Final Semester of Project

Spring 2020

Requested Amount of Funding

30000

Type of Grant

No-or-Low-Cost-to-Students Learning Materials

Course Title(s)

Data Structures; Data Structures Lab; Operating Systems; Algorithm Analysis; Modeling & Simulation

Course Number(s)

CS3305; CS3305L; CS3502; CS4306; CS4632

Team Member 1 Name

Patrick O. Bobbie

Team Member 1 Email

pbobbie@kennesaw.edu

Team Member 2 Name

Jose Garrido

Team Member 2 Email

kgarrido@kennesaw.edu

Team Member 3 Name

Dick Gayler

Team Member 3 Email

dgayler@kennesaw.edu

Team Member 4 Name

Chih-Cheng Hung

Team Member 4 Email

chung1@kennesaw.edu

Additional Team Members (Name and email address for each)

Sponsor Name

Dan Lo; Jon Preston

Sponsor Title

Interim Department Chair; Dean of College of Computing and Software Engineering

Sponsor Department

Compute Science Department

Original Required Commercial Materials (title, author, price)

Data Structures and Other Objects Using C++, 4th Edition, Addison Wesley, ISBN#: 978-0-13-212948-0, by Michael Main and Walter Savitch, 2010.

Principles of Modern Operating Systems, 2nd Ed. by Jose M. Garrido, Richard Schlesinger, and Ken Hoganson. ISBN#: 978-1-44-962634-1. Jones and Bartlett, 2012.

Operating System Concept, 9th edition, Eds. Abraham Silberschatz, Greg Gagne, Peter Baer Galvin; John Wiley & Sons, Inc. ISBN 978-1-118-12938-8. (Alternative textbook)

Introduction to Algorithms, 3th Edition, by Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, ISBN#: 978-0-26-6203384-8. MIT Press. 2009.

Object Oriented Simulation: A Modeling and Programming Perspective. Garrido, José M. ISBN: 978-1-4419-0515-4. Springer, 2009.

Simulation with Arena. W David Kelton, Randall P. Sadowski, and David T. Sturrock, 5th Ed., McGraw-Hill Higher Ed, 2007. ISBN: 13-978-0-07-352341-5. (Recommended reference)

Discrete-Event System Simulation. Banks, Jerry, John Carson and Barry Nelson. Prentice-Hall, 1995. ISBN 0-13-217449-9. (Recommended reference)

Average Number of Students per Course Section Affected by Project in One Academic Year

31

Average Number of Sections Affected by Project in One Academic Year

55

Total Number of Students Affected by Project in One Academic Year

1715

Average Number of Students Affected per Summer Semester

21 per course section

Average Number of Students Affected per Fall Semester

32 per course section

Average Number of Students Affected per Spring Semester

32 per course section

Original Total Cost per Student

\$742.42

Post-Project Cost per Student

0

Post-Project Savings per Student

\$742.42

Projected Total Annual Student Savings per Academic Year

\$302,550.17

Using OpenStax Textbook?

No

Project Goals

The Computer Science (CS) Department is one of the largest department in College of Computing and Software Engineering (CCSE) at Kennesaw State University (KSU). The CS department currently has over 40 faculty and 1600 students in various programs including Bachelor of Science in Computer Science (BSCS), Bachelor of Arts in Applied Computer Science (BAACS), Minor in Computer Science, Master of Science in Computer Science (MSCS), Graduate Certificate in Computer Science Foundations, Graduate Certificate in High Performance Cluster Computing, Graduate Certificate in Robotics Programming, and Ph.D. in Analytics and Data Science. In this project, we propose to take a department-wide effort to replace the textbooks used in five BSCS core courses with no-cost-to-student learning materials. This project not only aims to reduce the financial burden imposed by high cost of textbooks, but also strives to develop free and open-access learning materials that offer equivalent or better educational effectiveness than traditional textbooks.

We expect this textbook transformation project to have profound impact. The graduates from CCSE have become a major workforce for the local community in the State of Georgia as well as nationwide. Programs from our department also advocate and promote student diversity and multiculturalism. For example, for the students currently enrolled in the BSCS program, 55% are minority students. Over the years, we are continuously improving the quality of our programs while endlessly seeking ways to make our programs more affordable so well qualified underrepresented and career-changing students will be encouraged to apply for and enter our programs. The proposed transformation project is consistent with our department goal to not only improve the quality of our programs to better prepare students for today's competitive job market, but also reduce the students' financial burden and increase affordability of our programs.

Statement of Transformation

To keep up with the ever-increasing pace of Computer Science and Technology, it is mandatory for us to update the curriculum of CS programs frequently. However, traditional textbooks used in CS core courses are not only expensive, but also insufficient to convey adequate and up-to-date knowledge to students. Nowadays is the Big Data era. Parallel and Distributed Computing permeates most computing activities. Moreover, the rapid change in computing hardware platforms and devices, languages, supporting programming environments, and research advances, more than ever challenge educators in knowing what to teach in any given semester in a student's program. The textbook cannot reflect those changes on time, especially for traditionally CS core course textbooks. Furthermore, CS courses normally cover numerous topics and it is hard to find one textbook that can include all the contents, so that students are required to purchase multiple textbooks. In order to reduce/eliminate textbook cost, design no-cost-to-student free online learning material is very critical.

Hence, we do need to design and implement no-cost-to-student learning materials to eliminate the textbook cost especially for CS core courses. The proposed textbook transformation is an economic and viable solution for the following reasons:

1. As an important feature of today's Computer Science fields, many learning materials that are part of the essential content of the proposed courses are open sourced and free of charge. These materials include open and free tutorials, books, videos, labs, test banks, software, and services. For example, the Extreme Science and Engineering Discovery Environment (XSEDE <http://www.xsede.org>) is a powerful collection of integrated digital resources and services (things like supercomputers, visualization and storage systems, collections of data, software, network, and expert support). Students can use the free platform to mimic CPU-based supercomputers and GPU clusters to design and implement parallel and distributed programs to solve practical problems. It is a great and valuable tool that can be easily adopted to create hands-on projects for CS3305L Data Structure Labs and CS3502 Operating System without any additional cost.
2. Enriched with a variety of multimedia components with engaging interventional technologies, web based learning materials provide flexible ways for the students to have two-way communications with tools related to the courses they take. Furthermore, interactive online laboratories are available by many educational institutions for free use. In contrast, many traditional textbooks may become outdated at the moment they are published. Many faculty members have to use web contents as supplemental materials to the textbook. For example, there are many available interactive web-based materials used for CS3305 data structure, and CS4306 algorithm analysis, such as animations to help understand sorting algorithms, insertion and deletion from balanced tree, graph traversal algorithms, etc. These interactive contents will not only engage the students, but also improve their learning experience. Moreover, students can discuss with each other about algorithm design and analysis via online interactive forum and share their ideas more efficiently.
3. The Computer Science discipline is dynamic, continuously evolving and requires quick updates of course contents. Thus, providing free resources available online is more advantageous than the traditional textbooks in keeping up with the fast changing computer science and technology areas. In fact, our instructors have already been researching and identifying appropriate and related no-cost web content to be used in the proposed courses involved in this project.
4. By designing our own lecture notes, study guides, power point presentations, instructional/tutorials content videos, online and offline reading materials, assignments and exercises and assessment tools, and course-tailored hands-on project, we gain the capability to dynamical adjust our courses to be consistent with the student learning and program outcomes of our BSCS program.

Furthermore, the most of our team members have more than 7 years of teaching experience, and are experts in researching unorganized massive data on Internet and organizing the state-of-the-art techniques. We will select, organize and integrate online resources and transform them into instructional sound learning materials for the proposed CS core courses. We have also created a sustainable plan to periodical review the developed no-cost-to-student learning material. All CS courses are assessed every year as part of the continuous improvement process. In addition, the project leader Dr. Selena He successfully completed the ALG Round Twelve grants. As part of a department-wide effort, we have together proposed to transform seven CS courses using no-cost-to-student learning materials. Building on our previous successful experience, we are well positioned to continue the transformation efforts and further increase the cost saving benefits to the students in BSCS program.

Impact of the Transformation: The impact of our transformation efforts will be profound. By our estimates, around 1,715 students will benefit from the no-cost learning material each year. The proposed project is expected to save

students \$1,273,250.30 in textbook cost each year. Because of the cost savings from not having to buy textbooks, students may be able to take a few more courses each year and graduate sooner. Having a series of CS core courses adopting no-cost-to-student material not only offers better and more consistent learning experience for students, but also makes our nationally renowned CS programs more affordable. As a result, we could recruit more students, and produce more qualified CS professionals. Developing no-cost-to-student materials can help us better align course content with its learning outcomes and outcomes of our program, which will create positive impact in terms of curriculum development. Moreover, the learning materials developed in this proposal will be made available to the public and can be easily adopted by other programs or institutions who want to lower the cost of education to their students. Lastly, we believe that our experience gained in this transformation project could be beneficial to the academic community. We presented our previous ALG grant experience in the conference - ACM Special Interests Group in IT Education (SIGITE'18). We submitted a proposal to host a panel discussion to discuss the no-cost-to-student learning materials in the 16th Annual Open Education Conference (OpenEd'19). Our presence in the national conferences greatly increased the academic community's awareness of no-cost-to-student learning material and stimulated intriguing discussions among our fellow educators. We plan to continue disseminate the outcomes of the proposed transformation project to other CS academic institutions. In summary, we believe the proposed project will have a positive impact in students' retention, progression, and graduation at program, department and institution level.

Transformation Action Plan

With a coordinated effort, our team of investigators plan to carry out the following activities to transform all the proposed CS core courses to completely develop the no-cost learning materials:

- Research and identify no cost readings for each of the learning modules in each course. The reading list includes both required readings and optional readings. All of these readings will be publicly accessible, free to use, or openly sourced.
- Research and identify no-cost materials that can be shared across the programs.
- Develop study guides and lecture notes for students' use to review course content and key learning points.
- Adopt or develop all assignments, project specifications, exercises and lab materials that are no cost to students to replace the ones in the textbooks.
- Develop test banks to replace the ones in the textbooks.
- Adopt open source or no-cost-to-student labware for students to gain hands-on experience.
- Update the syllabus to include major resources and no-cost materials.
- Re-develop the proposed courses in our learning management system, D2L Brightspace.

The responsibilities of each investigator is described in Table 3.

Table 3: Investigator Responsibilities

Primary Investigator	Course	Responsibilities
Dr. Jing (Selena) He	CS3305L	Project lead; Subject matter expert and developer; course coordinator; instructor of record
Dr. Dick Gayler	CS3305	Subject Matter Expert and developer; course coordinator; instructor of record ;
Dr. Patrick O. Bobbie	CS3502	Subject Matter Expert and developer; course coordinator; instructor of record
Dr. Chih-Cheng Hung	CS4306	Subject Matter Expert and developer; course coordinator; instructor of record
Dr. Jose Garrido	CS4632	Subject Matter Expert and developer; course coordinator; instructor of record

To be more specific, the textbook transformation process will be carried out in three phases:

Phase1: Initial preparation

- Analyze and complete the modification of course syllabi
- Analyze the consistency between no-cost-to-student learning materials, course learning outcomes, and BSCS program outcomes

Phase2: Implementation

- Map and design no-cost-to-student learning materials to learning modules of each course
- Design PowerPoints and video recordings for all the learning module of each course using no-cost-to-student learning materials
- Design assignments, labs and projects using no-cost-to-student learning materials
- Design exams that are consistent with no-cost-to-student learning materials

• Reconstruct the proposed courses on D2L Brightspace

Phase3: Evaluation and promotion

- Evaluate and measure our textbook transformation project using student surveys, official course evaluation and

student performance data of spring, summer and fall semesters in 2019 and compare the results with those from 2018

- Continuously update course learning modules using no-cost-to-student materials based on the evaluation and feedback
- Evaluate the change of retention rate compared to previous academic year
- Present our work to a wide range of audience through conference and workshop presentation

Quantitative & Qualitative Measures

We plan to assess the effectiveness of our project in two ways: 1) qualitatively, we will design surveys and gather inputs from the students after they used the no-cost learning material; 2) quantitatively, we will compare students' performance data gathered from sections using traditional textbooks and sections using no-cost learning material.

Moreover, the investigators will collect student performance data such as pass rates on the proposed courses. This data will be used as the baseline for comparison of student performance in courses with alternative no-cost material. The detailed assessment plan is shown in Table 4.

For each of the measurements, the investigators are going to conduct two levels of analysis:

1. Comparing them to the preset goals. Generally, 75% will be the passing rate in undergraduate courses and 80% in graduate courses.
2. Comparing them to those from past offerings where costly textbooks were used. The investigators will obtain historical data from the sections taught in the past 2 years.

Table 4: Project Assessment Plan

Source	Description
Pre-test Survey	<p>We will conduct a survey of students' opinions on using the no-cost-to-student learning material at the beginning of each semester, including such data as: student background, attitude to no-cost-to-student learning material, expectation and requirement of the course.</p>
Middle Survey	<p>We will conduct a survey of the students' opinions on using the no-cost-to-student learning material in the middle of each semester. This is to gather student feedback so we can dynamically adjust our course content according to the students' suggestions and recommendations. The questions involved in this survey will include but not be limited to:</p> <ol style="list-style-type: none"> 1. What do you think of the new no-cost-to-student learning material we used so far for this course? 2. Do you prefer the new way of using no-cost-to-student learning material or the traditional way of using hardcopy textbooks? 3. What improvement would you suggest to do according to our no-cost-to-student learning material delivery? 4. Do you think you will gain more or less knowledge

using no-cost-to-student learning materials?

5. Do you think your grade will be improved using no-cost-to-student learning materials?

We will also conduct a survey of students' opinions on using the no-cost-to-student learning material again by the end of each semester. Feedback gathered in this survey will be used to adjust the course content and arrangement of no-cost-to-student learning material for the following semester. The questions involved in this survey will include but not be limited to:

Post-test Survey

1. What changes of no-cost-to-student learning material would you suggest if this course is offered again?
2. What is your expected grade for this course?
3. Would you prefer we redesign more courses in BSCS using no-cost-to-student learning material? What would you say the impact to the program would be if we do so?

This data is from the overall class performance based on the grading of student works. The metrics will include:

Student Performance Measures

- Class average, grades distribution, pass rate for each grading item.
- Overall letter grades distribution, pass rate, withdraw rate, and failure rate.
- Percentage of students meeting or exceeding learning outcomes.

Student Evaluation of Instructor

The Formal student evaluation of the instructor can also provide information about teaching effectiveness using no-cost

materials. This evaluation is based on standardized forms for every course.

Student
Retention

The course drop rate, failure rate, withdraw rate before and after using no-cost-to-student learning materials will be compared to see how the new method affects the course retention.

Timeline

The detailed step-by-step progress of the project along with the major milestones aligned with the aforementioned Transformation Action Plan (see Section 3) are illustrated in Table 5.

Table 5: Project Milestones

Milestone dates	Milestone
05/01/2019 – 05/31/2019	<ol style="list-style-type: none"> 1. Attend the Kickoff Meeting in Middle Georgia State University Hatcher Conference Center in Macon on May 20, 2019 2. Complete the modification of course syllabi, analyze the consistency between no-cost-to-student learning materials, course learning outcomes, and BSCS program outcomes
06/01/2019 – 06/30/2019	<ol style="list-style-type: none"> 3. Progress report 1 1. Map and design no-cost-to-student learning materials to learning modules of courses, design assignments, labs and projects using no-cost-to-student learning materials, redesign exams that are consistent with no-cost-to-student learning materials 2. Complete the design of pre-test survey for the students' feedback
07/01/2019 – 08/18/2019	<ol style="list-style-type: none"> 3. Progress report 2 1. Complete the redesign of the courses (CS3305, CS3305L, CS3502, CS4306, and CS4632) learning modules, assignments, labs, projects, slides, quizzes, exams, etc. on D2L Brightspace 2. Complete the design of midterm and post-test survey for the students' feedback
08/19/2019 – 10/13/2019	<ol style="list-style-type: none"> 3. Progress report 3 1. Start the course offering for CS3305, CS3305L, CS3502, CS4306 in Fall 2019 2. Conduct the pre-test surveys for Fall 2019
10/14/2019 –	<ol style="list-style-type: none"> 1. Conduct the midterm surveys

- for Fall 2019, gather the students' feedback
- 12/01/2019
2. Adjust the courses content with no-cost-to-student learning materials based on the midterm surveys
 3. Progress report 4
- 12/02/2019 – 01/05/2020
1. Conduct the post-test surveys for Fall 2019, gather the students' feedback
 2. Conduct the official student evaluation for Fall 2019
 3. Compare student performance before and after using no-cost-to-student learning materials
 4. Adjust the courses contents with no-cost-to-student learning materials based on 1) 2) and 3)
 5. Progress report 5
- 01/06/2020 – 03/01/2020
1. Start the course offering for CS4632 in Spring 2020
 2. Conduct the pre-test survey for Spring 2020
- 03/02/2020 – 04/05/2020
1. Conduct the midterm survey for Spring 2020, gather the students' feedback
 2. Adjust the courses content with no-cost-to-student learning materials based on the midterm surveys
 3. Progress report 6
- 04/06/2020 – 05/08/2020
1. Conduct the post-test survey for Spring 2020, gather the students' feedback
 2. Conduct the official student evaluation for Spring 2020
 3. Compare student performance before and after using no-cost-to-student learning materials
 4. Adjust the courses contents with no-cost-to-student learning materials based on 1) 2) and 3)
- 05/09/2020 – 05/31/2020
1. Complete assessment data collection and analysis for the whole project

2. Deliver the final status report.
3. Complete and submit research work to target education conference

Budget

We estimate that each investigator (the coordinator of corresponding course(s)) will spend more than 100 hours in designing the no-cost-to-student learning materials, designing mid-term and end of term student surveys, updating and maintaining course curriculum using no-cost-to-student learning materials, assessing course outcomes, and coordinating the work progress of instructors teaching different sections of the same course using the new no-cost-to-student learning materials. Responsibility and compensation for each investigator in our team are summarized as follows:

- Dr. Jing (Selena) He Developer and instructor for CS3305L \$5,000
- Dr. Patrick O. Bobbie Developer and instructor for CS3502 \$5,000
- Dr. Jose Garrido Developer and instructor for CS4632 \$5,000
- Dr. Dick Gayler Developer and instructor for CS3305 \$5,000
- Dr. Chih-Cheng Hung Developer and instructor for CS4306 \$5,000

The total of investigator compensation will be $\$5,000 * 5 = \mathbf{\$25,000}$

Travel & Other Expense will be **\$2,800**, in which \$800 is the expense for two team members to attend the Kickoff Meeting at Middle Georgia State University in Macon, and the rest \$2,000 is budgeted for attending another conference related to the course development involved in this project, such as SIGITE 2020.

Equipment (computers and tablets): **\$2,200**

Total Budget: **\$30,000**

There is no cost for online textbooks, software and online tools because they are all open sources and free of charge.

Sustainability Plan

Our sustainability plan aligns with our College's and our departmental efforts to continuously improve the quality of teaching. In CS department, each course has assigned a course coordinator, who is responsible for the course content review, course content maintenance and update, assessment of the course materials, coordinating instructors teaching different sections, and teach the course regularly. All of our investigators in this textbook transformation project are course coordinators of the corresponding course(s) (see details in Table 3). Each investigator will not only develop the no-cost-to-student learning material for the proposed courses and teach the courses for the first time using the new material, but also monitor the course teaching in future semesters to make sure the course teaching is consistent by adopting the designed no-cost-to-student learning materials. Moreover, all no-cost-to-student learning materials are posted in D2L Brightspace and the department shared online repository of course contents, so that any future instructor can access and adopt the no-cost-to-student learning materials easily.

Besides the course coordination responsibilities in the CS department, we have a daylong retreat for course assessment in each semester. In the assessment retreat, each course is assessed by three different faculty in the department, and the course contents are updated based on the assessment results. Course coordinators are in charge of those assessment efforts. Thus, the project investigators are committed to continuous update the no-cost-to-student learning material for the proposed courses based on research, assessment results and feedback from students and Industry Advisory Board (IAB).

Our textbook transformation project is also supported by our department chair and the dean of our College as evidenced in their support letters to further ensure the sustainability of our transformation plan.

Acknowledgment

Grant Acceptance

[Acknowledged] I understand and acknowledge that acceptance of Affordable Learning Georgia grant funding constitutes a commitment to comply with the required activities listed in the RFP and that my submitted proposal will serve as the statement of work that must be completed by my project team. I further understand and acknowledge that failure to complete the deliverables in the statement of work may result in termination of the agreement and funding.



College of Computing and
Software Engineering

Department of Computer Science

ALG Grant Committee

University System of Georgia

College of Computing and Software Engineering

Computer Science Department

April 5, 2019

Dear Panel Reviewers,

On behalf of the Department of Computer Science, I am writing to support the textbook transformation proposal, entitled “Developing No-Cost-to-Student Learning Materials for Core Computer Science Courses in Bachelor of Science in Computer Science (BSCS) Program”. The proposed project will develop free online textbooks for three required courses and one major elective, which will impact 1,715 students and over \$1.2M student savings on textbooks annually. I clearly see the need for bringing down costs for our students. The ALG grant assists faculty to prepare no-cost-to-student learning materials that allow students to take courses without the monetary burden of expensive textbooks.

Several faculty in CS Department at College of Computing and Software Engineering (CCSE) have successfully carried out an ALG Round Twelve grant for modern computing systems courses. The current proposal addresses four CS core courses in our BSCS program. The savings already realized from the previous ALG grant encouraged our faculty to develop this new ALG grant proposal to help our students save even more money.

I strongly support this proposal. This is a very sustainable proposal as we have a large BSCS degree program. Many students take courses online as well as in-class. Creating the no-cost-to-student learning materials for CS core courses will allow students for many years to realize savings from not buying expensive textbooks. I believe that this new ALG proposal will have the same student satisfaction and success as the previous ALG grant. This new proposal will have an even larger monetary impact on our students than the previous grant. Thank you for your consideration of this proposal. Should you have any questions, please do not hesitate to contact me directly.

Yours Sincerely,

Dan C. Lo, Ph.D.

Professor and Interim Chair of Computer Science

Kennesaw State University

(TEL) 470-578-5487 | (FAX) 470-578-9032

(E-mail) dlo2@kennesaw.edu | (Web) <http://ksuweb.kennesaw.edu/~dlo2/>

1100 South Marietta Parkway • Marietta, GA 30060

Email: dlo2@kennesaw.edu Phone: 470-578-6005 • ccse.kennesaw.edu/cs



College of Computing and
Software Engineering

April 3, 2019

Dear Affordable Learning Georgia (ALG) Grant Reviewers,

It is my pleasure to write this letter in support of the proposal titled “Developing No-Cost-to-Student Learning Materials for Core Computer Science Courses in undergraduate and graduate programs (BSCS and MSCS)” submitted by Drs. He, Bobbie, Garrido, Gayler, and Hung from our Computer Science (CS) Department at Kennesaw State University.

In this project, the primary investigators will work as a team to replace existing, costly textbooks in eight core, required undergraduate and graduate courses with no-cost-to-students learning materials. Their efforts will significantly lower the cost of education for students, saving over \$300k per year and impacting over 1600 students per year at KSU. This will also generate a positive impact on the retention, progression, and graduation for the College of Computing and Software Engineering. Additionally, given the rapid change of the CS field, having digital materials available to students will improve the ability to keep them updated with the latest advances in the field of computing.

As the proposal mentions, the course materials to be developed support core, fundamental course within Computer Science – the upper-level data structures, operating systems, algorithms, and distributed computing courses. These are important courses that are required by CS programs throughout Georgia and the world, so in developing material for this course, the USG will be broadening access for students at other institutions beyond KSU.

In conclusion, I wholeheartedly support this effort to improve access to our CS program. This proposal has the full support of the College of Computing and Software Engineering.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jon A. Preston', written in a cursive style.

Dr. Jon A. Preston
Dean
College of Computing and Software Engineering
Kennesaw State University



Textbook Transformation Grants, Round Fourteen
(Summer 2019 –Summer 2020)
Proposal Form and Narrative

Notes

- The proposal form and narrative .docx file is for offline drafting and review. Submitters must use the InfoReady Review online form for proposal submission.
- The only way to submit the official proposal is through the online form in Georgia Tech’s InfoReady Review. The link to the online application is on the [Round 14 RFP Page](#).
- The italic text we provide is meant for clarifications and can be deleted.

Applicant, Team, and Sponsor Information

The **applicant** is the proposed Project Lead for the grant project. The **submitter** is the person submitting the application (which may be a Grants Officer or Administrator). The submitter will often be the applicant – if so, leave the submitter fields blank.

Institution(s)	Kennesaw State University
Applicant Name	Jing (Selena) He, Primary Investigator
Applicant Email	she4@kennesaw.edu
Applicant Phone #	(470)-578-6039
Applicant Position/Title	Associate Professor of Computer Science
Submitter Name	
Submitter Email	
Submitter Phone #	
Submitter Position	

Please provide the first/last names and email addresses of all team members within the proposed project. Include the applicant (Project Lead) in this list. Do not include prefixes or suffixes such as Ms., Dr., Ph.D., etc.

	Name	Email Address
Team Member 1	Jing (Selena) He	she4@kennesaw.edu
Team Member 2	Patrick O. Bobbie	pbobbie@kennesaw.edu

	Name	Email Address
Team Member 3	Jose Garrido	jgarrido@kennesaw.edu
Team Member 4	Dick Gayler	dgayler@kennesaw.edu
Team Member 5	Chih-Cheng Hung	chung1@kennesaw.edu
Team Member 6		
Team Member 7		
Team Member 8		

If you have any more team members to add, please enter their names and email addresses in the text box below.

Please provide the sponsor's name, title, department, and institution. The sponsor is the provider of your Letter of Support.

Dr. Dan Lo, Chair of Department of Computer Science, Kennesaw State University

Dr. Jon Preston, Dean of College of Computing and Software Engineering, Kennesaw State University

Project Information and Impact Data

Title of Grant Project	<i>Developing No-Cost-to-Student Learning Materials for Core Computer Science Courses in Bachelor of Science in Computer Science (BSCS) Program</i>
Type of Grant	<i>No-or-Low-Cost-to-Students Learning Materials</i>
Requested Amount of Funding	\$30,000
Course Names and Course Numbers	CS3305 – Data Structures CS3305L – Data Structures Lab

	<p>CS3502 – Operating Systems</p> <p>CS4306 – Algorithm Analysis</p> <p>CS4632 – Modeling & Simulation</p>
Final Semester of Project	Spring 2020
Average Number of Students Per Course Section Affected by Project	31 (See details in Table 1)
Average Number of Sections Affected by Project in One Academic Year	55 (See details in Table 1)
Total Number of Students Affected by Project in One Academic Year	1,715 (See details in Table 1)
Average Number of Students Affected per Summer Semester	21 per course section (See details in Table 1)
Average Number of Students Affected per Fall Semester	32 per course section (See details in Table 1)
Average Number of Students Affected per Spring Semester	32 per course section (See details in Table 1)
Title/Author of Original Required Materials	<p><i>Data Structures and Other Objects Using C++</i>, 4th Edition, Addison Wesley, ISBN#: 978-0-13-212948-0, by Michael Main and Walter Savitch, 2010.</p> <p><i>Principles of Modern Operating Systems</i>, 2nd Ed. by Jose M. Garrido, Richard Schlesinger, and Ken Hoganson. ISBN#: 978-1-44-962634-1. Jones and Bartlett, 2012.</p> <p><i>Operating System Concept</i>, 9th edition, Eds. Abraham Silberschatz, Greg Gagne, Peter Baer Galvin; John Wiley & Sons, Inc. ISBN 978-1-118-12938-8. (Alternative textbook)</p> <p><i>Introduction to Algorithms</i>, 3th Edition, by Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, ISBN#: 978-0-26-6203384-8. MIT Press. 2009.</p> <p><i>Object Oriented Simulation: A Modeling and Programming Perspective</i>. Garrido, José M. ISBN:</p>

	<p>978-1-4419-0515-4. Springer, 2009.</p> <p><i>Simulation with Arena</i>. W David Kelton, Randall P. Sadowski, and David T. Sturrock, 5th Ed., McGraw-Hill Higher Ed, 2007. ISBN: 13-978-0-07-352341-5. (Recommended reference)</p> <p><i>Discrete-Event System Simulation</i>. Banks, Jerry, John Carson and Barry Nelson. Prentice-Hall, 1995. ISBN 0-13-217449-9. (Recommended reference)</p>
Original Total Cost Per Student	A student must take all required core courses. The total cost for a student will be \$157.48+\$285.95+\$99+\$199.99= \$742.42 .
Post-Project Cost Per Student	0
Post-Project Savings Per Student	\$742.42
Projected Total Annual Student Savings Per Academic Year	\$302,550.17 (See detailed estimate in Table 2)
Using OpenStax Textbook?	No

Table 1: Projected Student Enrollment at KSU CS in 2019

Course	Spring 2019	Summer 2019	Fall 2019	Total sections	Total Number
CS3305	217 (01(34); 02(8); 03(35); 04(35); 05(36); 06(35); 07(34)).	35 (01(10); 02(25)).	254 (01(39); 02(35); 03(35); 04(35); 05(36); 06(35); 07(39)).	16	506
CS3305L	222 (01(23); 02(22); 03(38); 04(39); 05(31); 06(39); 07(30)).	40 (01(13); 02(27)).	175 (01(14); 02(39); 03(36); 04(8); 05(39); 06(5); 07(34)).	16	437
CS3502	171 (01(37); 02(28);	60 (01(21); 02(39)).	175 (01(35); 02(30);	12	406

	03(35); 04(33); 05(38)).		03(30); 04(40); 05(40)).		
CS4306	176 (01(37); 02(34); 03(35); 04(35); 05(35)).	15	158 (01(30); 02(38); 03(30); 04(30); 05(30)).	10	349
CS4632	17	Not Offer	Not Offer	1	17
Total	803	150	762	55	1,715

Table 2: Summary of Saving with No-Cost Learning Materials

Course	Textbook Used	Cost per Student	Projected Enrollment	Projected Costs
CS3305/ CS3305L	<i>Data Structures and Other Objects Using C++</i> , 4th Edition, Addison Wesley, ISBN#: 978-0-13-212948-0, by Michael Main and Walter Savitch, 2010. (required)	\$157.48	943	\$148,503.64
CS3502	<i>Principles of Modern Operating Systems</i> , 2nd Ed. by Jose M. Garrido, Richard Schlesinger, and Ken Hoganson. ISBN#: 978-1-44-962634-1. Jones and Bartlett, 2012. (required) <u>Alternative textbook used:</u> <i>Operating System Concept</i> , 9th edition, Eds. Abraham Silberschatz, Greg Gagne, Peter Baer Galvin; John Wiley & Sons, Inc. ISBN#: 978-1-118-12938-8. (required)	\$285.95	406	\$116,095.70
CS4306	<i>Introduction to Algorithms</i> , 3th Edition, by Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, ISBN#: 978-0-26-6203384-8. MIT Press. 2009. (required)	\$99.00	349	\$34,551.00
CS4632	<i>Object Oriented Simulation: A Modeling and Programming Perspective</i> . Garrido, José M. ISBN: 978-1-4419-0515-4. Springer, 2009. (required) <i>Simulation with Arena</i> . W David Kelton, Randall P. Sadowski, and David T. Sturrock, 5th Ed.,			

McGraw-Hill Higher Ed, 2007. ISBN: 13-978-0-07-352341-5. (Recommended reference)	\$199.99	17	\$3,399.83
<i>Discrete-Event System Simulation</i> . Banks, Jerry, John Carson and Barry Nelson. Prentice-Hall, 1995. ISBN 0-13-217449-9. (Recommended reference)			
Total:	\$742.42	1,715	\$302,550.17

Narrative Section

1. Project Goals

The Computer Science (CS) Department is one of the largest department in College of Computing and Software Engineering (CCSE) at Kennesaw State University (KSU). The CS department currently has over 40 faculty and 1600 students in various programs including Bachelor of Science in Computer Science (BSCS), Bachelor of Arts in Applied Computer Science (BAACS), Minor in Computer Science, Master of Science in Computer Science (MSCS), Graduate Certificate in Computer Science Foundations, Graduate Certificate in High Performance Cluster Computing, Graduate Certificate in Robotics Programming, and Ph.D. in Analytics and Data Science. In this project, we propose to take a department-wide effort to replace the textbooks used in five BSCS core courses with no-cost-to-student learning materials. This project not only aims to reduce the financial burden imposed by high cost of textbooks, but also strives to develop free and open-access learning materials that offer equivalent or better educational effectiveness than traditional textbooks.

We expect this textbook transformation project to have profound impact. The graduates from CCSE have become a major workforce for the local community in the State of Georgia as well as nationwide. Programs from our department also advocate and promote student diversity and multiculturalism. For example, for the students currently enrolled in the BSCS program, 55% are minority students. Over the years, we are continuously improving the quality of our programs while endlessly seeking ways to make our programs more affordable so well qualified underrepresented and career-changing students will be encouraged to apply for and enter our programs. The proposed transformation project is consistent with our department goal to not only improve the quality of our programs to better prepare students for today's competitive job market, but also reduce the students' financial burden and increase affordability of our programs.

2. Statement of Transformation

To keep up with the ever-increasing pace of Computer Science and Technology, it is mandatory for us to update the curriculum of CS programs frequently. However, traditional textbooks used in CS core courses are not only expensive, but also insufficient to convey adequate and up-to-date knowledge to students. Nowadays is the Big Data era. Parallel and

Distributed Computing permeates most computing activities. Moreover, the rapid change in computing hardware platforms and devices, languages, supporting programming environments, and research advances, more than ever challenge educators in knowing what to teach in any given semester in a student's program. The textbook cannot reflect those changes on time, especially for traditionally CS core course textbooks. Furthermore, CS courses normally cover numerous topics and it is hard to find one textbook that can include all the contents, so that students are required to purchase multiple textbooks. In order to reduce/eliminate textbook cost, design no-cost-to-student free online learning material is very critical.

Hence, we do need to design and implement no-cost-to-student learning materials to eliminate the textbook cost especially for CS core courses. The proposed textbook transformation is an economic and viable solution for the following reasons:

- 1) As an important feature of today's Computer Science fields, many learning materials that are part of the essential content of the proposed courses are open sourced and free of charge. These materials include open and free tutorials, books, videos, labs, test banks, software, and services. For example, the Extreme Science and Engineering Discovery Environment (XSEDE <http://www.xsede.org>) is a powerful collection of integrated digital resources and services (things like supercomputers, visualization and storage systems, collections of data, software, network, and expert support). Students can use the free platform to mimic CPU-based supercomputers and GPU clusters to design and implement parallel and distributed programs to solve practical problems. It is a great and valuable tool that can be easily adopted to create hands-on projects for CS3305L Data Structure Labs and CS3502 Operating System without any additional cost.
- 2) Enriched with a variety of multimedia components with engaging interventional technologies, web based learning materials provide flexible ways for the students to have two-way communications with tools related to the courses they take. Furthermore, interactive online laboratories are available by many educational institutions for free use. In contrast, many traditional textbooks may become outdated at the moment they are published. Many faculty members have to use web contents as supplemental materials to the textbook. For example, there are many available interactive web-based materials used for CS3305 data structure, and CS4306 algorithm analysis, such as animations to help understand sorting algorithms, insertion and deletion from balanced tree, graph traversal algorithms, etc. These interactive contents will not only engage the students, but also improve their learning experience. Moreover, students can discuss with each other about algorithm design and analysis via online interactive forum and share their ideas more efficiently.
- 3) The Computer Science discipline is dynamic, continuously evolving and requires quick updates of course contents. Thus, providing free resources available online is more advantageous than the traditional textbooks in keeping up with the fast changing computer science and technology areas. In fact, our instructors have already been researching and identifying appropriate and related no-cost web content to be used in the proposed courses involved in this project.
- 4) By designing our own lecture notes, study guides, power point presentations, instructional/tutorials content videos, online and offline reading materials, assignments and

exercises and assessment tools, and course-tailored hands-on project, we gain the capability to dynamical adjust our courses to be consistent with the student learning and program outcomes of our BSCS program.

Furthermore, the most of our team members have more than 7 years of teaching experience, and are experts in researching unorganized massive data on Internet and organizing the state-of-the-art techniques. We will select, organize and integrate online resources and transform them into instructional sound learning materials for the proposed CS core courses. We have also created a sustainable plan to periodical review the developed no-cost-to-student learning material. All CS courses are assessed every year as part of the continuous improvement process. In addition, the project leader Dr. Selena He successfully completed the ALG Round Twelve grants. As part of a department-wide effort, we have together proposed to transform seven CS courses using no-cost-to-student learning materials. Building on our previous successful experience, we are well positioned to continue the transformation efforts and further increase the cost saving benefits to the students in BSCS program.

Impact of the Transformation: The impact of our transformation efforts will be profound. By our estimates, around 1,715 students will benefit from the no-cost learning material each year. The proposed project is expected to save students \$1,273,250.30 in textbook cost each year. Because of the cost savings from not having to buy textbooks, students may be able to take a few more courses each year and graduate sooner. Having a series of CS core courses adopting no-cost-to-student material not only offers better and more consistent learning experience for students, but also makes our nationally renowned CS programs more affordable. As a result, we could recruit more students, and produce more qualified CS professionals. Developing no-cost-to-student materials can help us better align course content with its learning outcomes and outcomes of our program, which will create positive impact in terms of curriculum development. Moreover, the learning materials developed in this proposal will be made available to the public and can be easily adopted by other programs or institutions who want to lower the cost of education to their students. Lastly, we believe that our experience gained in this transformation project could be beneficial to the academic community. We presented our previous ALG grant experience in the conference - ACM Special Interests Group in IT Education (SIGITE'18). We submitted a proposal to host a panel discussion to discuss the no-cost-to-student learning materials in the 16th Annual Open Education Conference (OpenEd'19). Our presence in the national conferences greatly increased the academic community's awareness of no-cost-to-student learning material and stimulated intriguing discussions among our fellow educators. We plan to continue disseminate the outcomes of the proposed transformation project to other CS academic institutions. In summary, we believe the proposed project will have a positive impact in students' retention, progression, and graduation at program, department and institution level.

3. Transformation Action Plan

With a coordinated effort, our team of investigators plan to carry out the following activities to transform all the proposed CS core courses to completely develop the no-cost learning materials:

- Research and identify no cost readings for each of the learning modules in each course. The reading list includes both required readings and optional readings. All of these readings will be publicly accessible, free to use, or openly sourced.
- Research and identify no-cost materials that can be shared across the programs.
- Develop study guides and lecture notes for students' use to review course content and key learning points.
- Adopt or develop all assignments, project specifications, exercises and lab materials that are no cost to students to replace the ones in the textbooks.
- Develop test banks to replace the ones in the textbooks.
- Adopt open source or no-cost-to-student labware for students to gain hands-on experience.
- Update the syllabus to include major resources and no-cost materials.
- Re-develop the proposed courses in our learning management system, D2L Brightspace.

The responsibilities of each investigator is described in Table 3.

Table 3: Investigator Responsibilities

Primary Investigator	Course	Responsibilities
Dr. Jing (Selena) He	CS3305L	Project lead; Subject matter expert and developer; course coordinator; instructor of record
Dr. Dick Gayler	CS3305	Subject Matter Expert and developer; course coordinator; instructor of record ;
Dr. Patrick O. Bobbie	CS3502	Subject Matter Expert and developer; course coordinator; instructor of record
Dr. Chih-Cheng Hung	CS4306	Subject Matter Expert and developer; course coordinator; instructor of record
Dr. Jose Garrido	CS4632	Subject Matter Expert and developer; course coordinator; instructor of record

To be more specific, the textbook transformation process will be carried out in three phases:

Phase1: Initial preparation

- Analyze and complete the modification of course syllabi
- Analyze the consistency between no-cost-to-student learning materials, course learning outcomes, and BSCS program outcomes

Phase2: Implementation

- Map and design no-cost-to-student learning materials to learning modules of each course
- Design PowerPoints and video recordings for all the learning module of each course using no-cost-to-student learning materials
- Design assignments, labs and projects using no-cost-to-student learning materials
- Design exams that are consistent with no-cost-to-student learning materials
- Reconstruct the proposed courses on D2L Brightspace

Phase3: Evaluation and promotion

- Evaluate and measure our textbook transformation project using student surveys, official course evaluation and student performance data of spring, summer and fall semesters in 2019 and compare the results with those from 2018
- Continuously update course learning modules using no-cost-to-student materials based on the evaluation and feedback
- Evaluate the change of retention rate compared to previous academic year
- Present our work to a wide range of audience through conference and workshop presentation

4. Quantitative and Qualitative Measures

We plan to assess the effectiveness of our project in two ways: 1) qualitatively, we will design surveys and gather inputs from the students after they used the no-cost learning material; 2) quantitatively, we will compare students' performance data gathered from sections using traditional textbooks and sections using no-cost learning material.

Moreover, the investigators will collect student performance data such as pass rates on the proposed courses. This data will be used as the baseline for comparison of student performance in courses with alternative no-cost material. The detailed assessment plan is shown in Table 4.

For each of the measurements, the investigators are going to conduct two levels of analysis:

1. Comparing them to the preset goals. Generally, 75% will be the passing rate in undergraduate courses and 80% in graduate courses.
2. Comparing them to those from past offerings where costly textbooks were used. The investigators will obtain historical data from the sections taught in the past 2 years.

Table 4: Project Assessment Plan

Source	Description
Pre-test Survey	We will conduct a survey of students' opinions on using the no-cost-to-student learning material at the beginning of each semester, including such data as: student background, attitude to no-cost-to-student learning material, expectation and requirement of the course.
Middle Survey	<p>We will conduct a survey of the students' opinions on using the no-cost-to-student learning material in the middle of each semester. This is to gather student feedback so we can dynamically adjust our course content according to the students' suggestions and recommendations. The questions involved in this survey will include but not be limited to:</p> <ol style="list-style-type: none"> 1. What do you think of the new no-cost-to-student learning material we used so far for this course? 2. Do you prefer the new way of using no-cost-to-student learning material or the traditional way of using hardcopy textbooks? 3. What improvement would you suggest to do according to our no-cost-to-student learning material delivery? 4. Do you think you will gain more or less knowledge using no-cost-to-student learning materials? 5. Do you think your grade will be improved using no-cost-to-student learning materials?
Post-test Survey	<p>We will also conduct a survey of students' opinions on using the no-cost-to-student learning material again by the end of each semester. Feedback gathered in this survey will be used to adjust the course content and arrangement of no-cost-to-student learning material for the following semester. The questions involved in this survey will include but not be limited to:</p> <ol style="list-style-type: none"> 1. What changes of no-cost-to-student learning material would you suggest if this course is offered again? 2. What is your expected grade for this course? 3. Would you prefer we redesign more courses in BSCS using no-cost-to-student learning material? What would you say the impact to the program would be if we do so?
Student Performance Measures	<p>This data is from the overall class performance based on the grading of student works. The metrics will include:</p> <ul style="list-style-type: none"> • Class average, grades distribution, pass rate for each grading item. • Overall letter grades distribution, pass rate, withdraw rate, and failure rate. • Percentage of students meeting or exceeding learning outcomes.
Student Evaluation of Instructor	The Formal student evaluation of the instructor can also provide information about teaching effectiveness using no-cost materials. This evaluation is based on standardized forms for every course.

Student Retention	The course drop rate, failure rate, withdraw rate before and after using no-cost-to-student learning materials will be compared to see how the new method affects the course retention.
-------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

5. Timeline

The detailed step-by-step progress of the project along with the major milestones aligned with the aforementioned Transformation Action Plan (see Section 3) are illustrated in Table 5.

Table 5: Project Milestones

Milestone dates	Milestone
05/01/2019 – 05/31/2019	<ol style="list-style-type: none"> 1) Attend the Kickoff Meeting in Middle Georgia State University Hatcher Conference Center in Macon on May 20, 2019 2) Complete the modification of course syllabi, analyze the consistency between no-cost-to-student learning materials, course learning outcomes, and BSCS program outcomes 3) Progress report 1
06/01/2019 – 06/30/2019	<ol style="list-style-type: none"> 1) Map and design no-cost-to-student learning materials to learning modules of courses, design assignments, labs and projects using no-cost-to-student learning materials, redesign exams that are consistent with no-cost-to-student learning materials 2) Complete the design of pre-test survey for the students' feedback 3) Progress report 2
07/01/2019 – 08/18/2019	<ol style="list-style-type: none"> 1) Complete the redesign of the courses (CS3305, CS3305L, CS3502, CS4306, and CS4632) learning modules, assignments, labs, projects, slides, quizzes, exams, etc. on D2L Brightspace 2) Complete the design of midterm and post-test survey for the students' feedback 3) Progress report 3
08/19/2019 – 10/13/2019	<ol style="list-style-type: none"> 1) Start the course offering for CS3305, CS3305L, CS3502, CS4306 in Fall 2019 2) Conduct the pre-test surveys for Fall 2019
10/14/2019 – 12/01/2019	<ol style="list-style-type: none"> 1) Conduct the midterm surveys for Fall 2019, gather the students' feedback 2) Adjust the courses content with no-cost-to-student learning materials based on the midterm surveys 3) Progress report 4
12/02/2019 – 01/05/2020	<ol style="list-style-type: none"> 1) Conduct the post-test surveys for Fall 2019, gather the students' feedback 2) Conduct the official student evaluation for Fall 2019 3) Compare student performance before and after using no-cost-to-student learning materials 4) Adjust the courses contents with no-cost-to-student learning materials based on 1) 2) and 3) 5) Progress report 5
01/06/2020 – 03/01/2020	<ol style="list-style-type: none"> 1) Start the course offering for CS4632 in Spring 2020 2) Conduct the pre-test survey for Spring 2020

03/02/2020 – 04/05/2020	<ol style="list-style-type: none"> 1) Conduct the midterm survey for Spring 2020, gather the students' feedback 2) Adjust the courses content with no-cost-to-student learning materials based on the midterm surveys 3) Progress report 6
04/06/2020 – 05/08/2020	<ol style="list-style-type: none"> 1) Conduct the post-test survey for Spring 2020, gather the students' feedback 2) Conduct the official student evaluation for Spring 2020 3) Compare student performance before and after using no-cost-to-student learning materials 4) Adjust the courses contents with no-cost-to-student learning materials based on 1) 2) and 3)
05/09/2020 – 05/31/2020	<ol style="list-style-type: none"> 1) Complete assessment data collection and analysis for the whole project 2) Deliver the final status report. 3) Complete and submit research work to target education conference

6. Budget

We estimate that each investigator (the coordinator of corresponding course(s)) will spend more than 100 hours in designing the no-cost-to-student learning materials, designing mid-term and end of term student surveys, updating and maintaining course curriculum using no-cost-to-student learning materials, assessing course outcomes, and coordinating the work progress of instructors teaching different sections of the same course using the new no-cost-to-student learning materials. Responsibility and compensation for each investigator in our team are summarized as follows:

- | | | |
|-------------------------|--------------------------------------|---------|
| • Dr. Jing (Selena) He | Developer and instructor for CS3305L | \$5,000 |
| • Dr. Patrick O. Bobbie | Developer and instructor for CS3502 | \$5,000 |
| • Dr. Jose Garrido | Developer and instructor for CS4632 | \$5,000 |
| • Dr. Dick Gayler | Developer and instructor for CS3305 | \$5,000 |
| • Dr. Chih-Cheng Hung | Developer and instructor for CS4306 | \$5,000 |

The total of investigator compensation will be $\$5,000 * 5 = \mathbf{\$25,000}$

Travel & Other Expense will be **\$2,800**, in which \$800 is the expense for two team members to attend the Kickoff Meeting at Middle Georgia State University in Macon, and the rest \$2,000 is budgeted for attending another conference related to the course development involved in this project, such as SIGITE 2020.

Equipment (computers and tablets): **\$2,200**

Total Budget: **\$30,000**

There is no cost for online textbooks, software and online tools because they are all open sources and free of charge.

7. Sustainability Plan

Our sustainability plan aligns with our College's and our departmental efforts to continuously improve the quality of teaching. In CS department, each course has assigned a course coordinator, who is responsible for the course content review, course content maintenance and update, assessment of the course materials, coordinating instructors teaching different sections, and teach the course regularly. All of our investigators in this textbook transformation project are course coordinators of the corresponding course(s) (see details in Table 3). Each investigator will not only develop the no-cost-to-student learning material for the proposed courses and teach the courses for the first time using the new material, but also monitor the course teaching in future semesters to make sure the course teaching is consistent by adopting the designed no-cost-to-student learning materials. Moreover, all no-cost-to-student learning materials are posted in D2L Brightspace and the department shared online repository of course contents, so that any future instructor can access and adopt the no-cost-to-student learning materials easily.

Besides the course coordination responsibilities in the CS department, we have a daylong retreat for course assessment in each semester. In the assessment retreat, each course is assessed by three different faculty in the department, and the course contents are updated based on the assessment results. Course coordinators are in charge of those assessment efforts. Thus, the project investigators are committed to continuously update the no-cost-to-student learning material for the proposed courses based on research, assessment results and feedback from students and Industry Advisory Board (IAB).

Our textbook transformation project is also supported by our department chair and the dean of our College as evidenced in their support letters to further ensure the sustainability of our transformation plan.

8. Letter of Support

We attach two support letters herewith. One is from the Dean of College of Computing and Software Engineering, and the other is from the chair of the Department of Computer Science.