

## Table of Contents

---

Tong, Weitian - #2848 - 408 .....	1
Letter of Support .....	10
Proposal Narrative .....	11

# Application Summary

## Competition Details

---

<b>Competition Title:</b>	Textbook Transformation Grants, Round Thirteen (Spring 2019-Spring 2020)
<b>Category:</b>	University System of Georgia
<b>Award Cycle:</b>	Round 13
<b>Submission Deadline:</b>	01/14/2019 at 11:59 PM

## Application Information

---

<b>Submitted By:</b>	Weitian Tong
<b>Application ID:</b>	2848
<b>Application Title:</b>	408
<b>Date Submitted:</b>	01/15/2019 at 7:32 AM

## Personal Details

---

<b>Institution Name(s):</b>	Georgia Southern University
<b>Applicant First Name:</b>	Weitian
<b>Applicant Last Name:</b>	Tong
<b>Applicant Email Address:</b>	wtong@georgiasouthern.edu
<b>Applicant Phone Number:</b>	9124863222
<b>Primary Appointment Title:</b>	Assistant Professor
<b>Submitter First Name:</b>	Weitian
<b>Submitter Last Name:</b>	Tong
<b>Submitter Email Address:</b>	wtong@georgiasouthern.edu
<b>Submitter Phone Number:</b>	9124863222
<b>Submitter Title:</b>	Assistant Professor

## Application Details

---

### Proposal Title

408

### Final Semester of Project

Spring 2020

### Requested Amount of Funding

10,800

### Type of Grant

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

**Course Title(s)**

Data Structure; Theoretical Foundations

**Course Number(s)**

CSCI 3230; CSCI 3236

**Team Member 1 Name**

Weitian Tong

**Team Member 1 Email**

wtong@georgiasouthern.edu

**Team Member 2 Name**

Lixin Li

**Team Member 2 Email**

lli@georgiasouthern.edu

**Team Member 3 Name**

**Team Member 3 Email**

**Team Member 4 Name**

**Team Member 4 Email**

**Additional Team Members (Name and email address for each)**

**Sponsor Name**

Muralidhar Medidi

**Sponsor Title**

Professor and Department Chair

**Sponsor Department**

Department of Computer Science

**Original Required Commercial Materials (title, author, price)**

CSCI 3230 Data Structure:

1. Title: Data Structures and Algorithms in Java, Sixth edition. Wiley, 2014. ISBN: 978-1-118-77133-4
2. Authors: M. T. Goodrich, R. Tamassia, and M. Goldwasser.
3. Price: \$168

CSCI 3236 Theoretical Foundations:

- Book 1: Title: Introduction to Languages and the Theory of Computation, Fourth Edition, McGraw-Hill. ISBN-10: 0073191469; ISBN-13: 978-0073191461. Authors: John C. Martin. Prices: \$138
- Book 2: Title: Languages and Machines, Third Edition, Pearson. ISBN-10: 0321322215; ISBN-13: 978-0321322210. Authors: Thomas Sudkamp. Prices: \$118

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

23

**Average Number of Sections Affected by Project in One Academic Year**

9

**Total Number of Students Affected by Project in One Academic Year**

200

**Average Number of Students Affected per Summer Semester**

25

**Average Number of Students Affected per Fall Semester**

33

**Average Number of Students Affected per Spring Semester**

27

**Original Total Cost per Student**

\$168/student for CSCI 3230 and \$128/student for CSCI 3236

**Post-Project Cost per Student**

\$0

**Post-Project Savings per Student**

\$168/student for CSCI 3230 and \$128/student for CSCI 3236

**Projected Total Annual Student Savings per Academic Year**

\$30,000

**Using OpenStax Textbook?**

No

**Project Goals**

This project aims at transforming two core Computer Science courses into content-rich and easy-to-learn classes by not only providing better teaching effectiveness but also allowing students to access learning resources without any cost. In addition, the learning resources will be made sustainable by capturing up-to-date information and research findings. Hands-on exercises and examples will be developed to motivate students' interest by applying theoretical concepts and practical techniques to solve real-life problems.

**Statement of Transformation**

Both CSCI 3230 Data Structure and CSCI 3236 Theoretical Foundations are core Computer Science courses. CSCI 3230 introduces abstract data types such as lists, stacks, queues, and trees, and algorithm analysis, and CSCI 3236 is a study of languages, formal grammars, and abstract representations of computation. After the consolidation of Georgia Southern University and Armstrong State University, each course will be offered two sections each semester starting Spring 2019, with one on Statesboro campus and the other one on Armstrong campus.

The feasibility and impact of the proposed textbook transformation project are reflected in the following aspects.

- **No-cost-to-students:** As shown in Table 2 “Summary of Savings with Cost-free Learning Materials”, the textbooks used in the two proposed fundamental CS courses are relatively expensive and thus most of our students cannot afford the textbooks. Although there are plenty of free and open-source online resources, they are often disorganized and may even contain inaccurate information. The proposed project will release the burden of costly textbooks by offering completely free yet high-quality learning materials, which will potentially help students graduate sooner as students can afford more courses. The more affordable program will increase the recruitment rate and train more qualified CS professionals in the State of Georgia.
- **More interactive learning materials:** Both courses are quite abstruse as most students reported to have a hard time according to historical teaching evaluations. In particular, students long for more interactive learning materials instead of tedious theoretical deduction in the current textbooks. Indeed, interactive contents would help students by involving them in the learning process and therefore improve their learning experience. For example, a student can better learn how an abstract machine works through animation or a video than a printed diagram in a textbook. This project will develop and collect high-quality and cost-free learning resources such as interactive materials in order to engage students in learning difficult concepts in these courses.
- **Up-to-date learning materials:** Nowadays, 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, textbooks easily get outdated only a few years after they are published. Up-to-date, open-source and cost-free online resources are more advantageous compared with the traditional textbooks.
- **Better alignment between the course contents and outcomes:** Designing slides, lecture notes, assignments, labs, exams, quizzes, and projects help us to refine the learning materials so that the course contents are better aligned with student outcomes of our Computer Science program. Consequently, better retention, progression, and graduation rates will be expected.
- **Broader impact:** Our cost-free learning materials will be made available to the public and thus benefit more institutions and more students in the future.
- **Investigators’ capability:** Both team members of this project have rich teaching experience of CSCI 3230 and CSCI 3236 and are well-prepared for the proposed transformation. Dr. Tong’s Ph.D. research topics were in Theoretical Computer Science. He has taught both courses since Spring 2016. Dr. Li has taught CSCI 3236 numerous times since Fall 2003 at Georgia Southern University. Through this project, cost-free learning resources will be either developed by team members or carefully selected from the multifarious open-source and free-of-charge online resources. As a pioneer from the Department of Computer Science at the Georgia Southern University, our team is fully committed to the development of no-cost-to-students learning materials for the proposed courses.

**Table 1. Summary & Projection of Student Enrollment**

Course	Fall 2018	Spring 2019	Summer 2019	Total	Projected enrollment in the future	
					# of Sections	# of Students
<b>CSCI 3230</b>	62	50	25	137	5	110
<b>CSCI 3236</b>	37	58	0	95	4	90
<b>Total</b>	<b>99</b>	<b>108</b>	<b>25</b>	<b>232</b>	<b>9</b>	<b>200</b>

**Note:** The enrollment summary of CSCI 3236 in Fall 2018 only considers one section. Due to the consolidation of Georgia Southern University and Armstrong State University in 2018, CSCI 3236 will be offered two sections each semester starting Spring 2019, with one on Statesboro campus and one on Armstrong campus.

**Table 2. Summary of Savings with Cost-free Learning Materials**

<b>C o u r s e</b>	<b>Textbook Used</b>	<b>Cost per Student</b>	<b>Projected Enrollment</b>	<b>Projected Costs</b>
<b>C S C I 3230</b>	M. T. Goodrich, R. Tamassia, and M. Goldwasser. Data Structures and Algorithms in Java, Sixth edition. Wiley, 2014. ISBN: 978-1-118-77133-4	\$ 168	110	\$18,480
<b>C S C I 3236</b>	1. John C. Martin. Introduction to Languages and the Theory of Computation, Fourth Edition, McGraw-Hill. ISBN-10: 0073191469; ISBN-13: 978-0073191461. Or 2. Thomas Sudkamp, Languages and Machines, Third Edition, Pearson. ISBN-10: 0321322215; ISBN-13: 978-0321322210	\$ 138 or \$ 118 In average \$ 128	90	\$11,520
<b>Total:</b>			<b>200</b>	<b>\$30,000</b>

**Transformation Action Plan**

The goal of this project is to develop cost-free, interactive, up-to-date learning materials for CSCI 3230 and CSCI 3236. Both investigators are the coordinators of their corresponding course(s). Dr. Weitian Tong will serve as the project lead and two team members will work together for the project implementation. The detailed responsibilities of investigators are described in the following Table 3.

**Table 3. PIs' Roles and Responsibilities**

Primary Investigator	Course	Responsibilities
Dr. Weitian Tong	CSCI 3230, CSCI 3236	Project lead. Subject matter expert and developer; course coordinator; instructor of record
Dr. Lixin Li	CSCI 3236, CSCI 3230	Subject matter expert and developer; course coordinator; instructor of record

With a coordinated effort, our team of investigators plans the following activities for the transformation of the cost-free learning materials. The whole transformation process will go through three stages.

**Stage 1: Preparation**

- Analyze and identify the weakness of the current course syllabus.
- Analyze the consistency between the learning modules and the course learning outcomes as well as our undergraduate program outcomes.
- Research and identify cost-free materials for each learning module. Note that all these materials will be publicly accessible, free to use, or openly licensed.

**Stage 2: Implementation**

- Screen and organize high-quality learning materials so that they are mapped appropriately to each learning module.
- Develop lecture notes by using interactive no-cost-to-students learning materials.
- Design cost-free course projects, assignments, quizzes, test banks, and hands-on exercises based on the cost-free high-quality learning materials.
- Develop cost-free study guidelines to help students review course contents and key learning points.
- Update the syllabus to include the refined no-cost-to-students learning materials.
- Disseminate the transformed course materials in our learning management system – Folio.

**Stage 3: Evaluation and further improvement**

- Assess the teaching and learning effectiveness of the new learning materials by comparing the evaluation measures (refer to Table 4) between sections using the developed cost-free learning materials versus sections using traditional textbooks.
- Fine-tune the learning modules using cost-free materials based on the evaluation data and students' feedback.

**Quantitative & Qualitative Measures**

Both quantitative and qualitative measures will be designed to assess the effectiveness of this project. Please refer to Table 4 for more details. Comparisons will be made between sections using the developed cost-free learning materials versus sections using traditional textbooks.

**Table 4. Quantitative and qualitative measures**

Source	Description
<p>Student performance measures (Quantitative)</p>	<p>The overall class performance can be measured from the students' grades of assignments, quizzes, exams, projects, presentations, and labs.</p> <p>The measurement metrics include class average, numerical grades distribution, letter grades distribution, and pass rate for each grading item.</p>
<p>Retention (Quantitative)</p>	<p>The retention can be measured by the drop rate, fail rate, and withdrawal rate.</p>
<p>Survey on cost-free learning materials (Qualitative)</p>	<p>Two anonymous survey questionnaires will be designed to allow students to share their learning experiences and discuss the effectiveness of the learning materials. These two surveys will be conducted in the middle and at the end of each semester, respectively.</p> <p>The surveys are both quantitative and qualitative. 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.</p> <p>The sample questions involved in the surveys will include but not be limited to:</p> <ol style="list-style-type: none"> <li>1. Please rate (from 1 to 10) the quality of the new cost-free learning materials.</li> <li>2. Please indicate your preference (from 1 to 10) for the adoption of the new cost-free learning materials.</li> <li>3. What improvements would you suggest we can make regarding our cost-free learning material delivery?</li> </ol>
<p>Official teaching evaluation (Quantitative and Qualitative Measures)</p>	<p>The official teaching evaluation is usually conducted at the end of each semester. The questions in the standardized evaluation form can be used to evaluate and compare the teaching effectiveness of using the new cost-free learning materials and using traditional textbooks.</p>

The major milestones of the proposed project are illustrated in Table 5.

**Table 5. Timelines and milestones**

Dates	Milestone
02/25/2019	<ul style="list-style-type: none"> <li>- Kickoff Meeting, Middle Georgia State University Hatcher Conference Center.</li> <li>- <b>Complete Stage 1 – Preparation.</b></li> <li>- Progress Report 1.</li> </ul>
05/10/2019	<ul style="list-style-type: none"> <li>- Complete the delivery of CSCI 3230 and CSCI 3236 with traditional textbooks.</li> <li>- Complete the official teaching evaluation.</li> <li>- Complete the collection of all evaluation measures.</li> <li>- Progress Report 2.</li> </ul>
08/01/2019	<ul style="list-style-type: none"> <li>- <b>Complete Stage 2 – Implementation.</b></li> <li>- Complete the design of surveys for students' feedback.</li> <li>- Progress Report 3.</li> </ul>
12/12/2019	<ul style="list-style-type: none"> <li>- Complete the <b>first delivery</b> of CSCI 3230 and CSCI 3236 with the new <b>cost-free learning materials.</b></li> <li>- Complete the two surveys.</li> <li>- Complete the official teaching evaluation.</li> <li>- Complete the collection of all evaluation measures.</li> <li>- Refine the learning materials according to the students' feedback.</li> <li>- Progress Report 4.</li> </ul>
05/07/2020	<ul style="list-style-type: none"> <li>- Complete the <b>second delivery</b> of CSCI 3230 and CSCI 3236 with the <b>refined cost-free learning materials.</b></li> <li>- Complete the two surveys.</li> <li>- Complete the official teaching evaluation.</li> <li>- Complete the collection of all evaluation measures.</li> <li>- Further refine the learning materials according to the students' feedback.</li> <li>- Progress Report 5.</li> </ul>
05/10/2020	<ul style="list-style-type: none"> <li>- <b>Complete Stage 3 – Evaluation and further improvement.</b></li> <li>- Analyze the whole project based on the collected data.</li> <li>- Complete and deliver the Final Report.</li> </ul>

**Budget**

The total budget for the project is \$10,800, which is used to compensate the team member's work and activities. The budget details and justifications are as follows.

**Personnel: \$10,000**

For each proposed course, the course developer will spend at least 100 hours to design the cost-free learning materials, conduct assessment surveys, collect evaluation data and develop the reports.

<b>Team Member</b>	<b>Role</b>	<b>Investigator's compensation</b>
Dr. Weitian Tong	Developer and instructor for CSCI 3230 / CSCI 3236	\$ 5,000
Dr. Lixin Li	Developer and instructor for CSCI 3236 / CSCI 3230	\$ 5,000

**Travel: \$800**

\$800 is budgeted for two team members to attend the kickoff meeting at Middle Georgia State University.

**Sustainability Plan**

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.

**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.



January 7, 2019

Dear Affordable Learning Georgia (ALG) Grant Reviewers,

I am writing this letter to support the project, "Interactive and cost-free course materials for two theoretical fundamental courses in Computer Science", submitted by Dr. Weitian Tong and Dr. Lixin Li from the Department of Computer Science in College of Engineering and Computing at Georgia Southern University.

In this project, two primary investigators will transform costly textbooks for two required Computer Science courses to no-cost-to-students learning materials. This transformation will directly impact about 200 CS major students from three Georgia Southern campuses in an academic year as well as the students enrolled in CS minor program.

Since the transformed courses are required courses in our degree program, I believe the effort of this project will be sustainable over the long term and contribute to better retention, progression, and graduation of students in our high-demand major.

I strongly support this grant proposal. If you need any additional information related to this proposal, please do not hesitate to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to read "Murali Medidi".

Murali Medidi

Professor & Chair



Textbook Transformation Grants, Round Thirteen  
(Spring 2019 –Spring 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 13 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)	Georgia Southern University
Applicant Name	Weitian Tong
Applicant Email	wtong@georgiasouthern.edu
Applicant Phone #	(912) 478-7251
Applicant Position/Title	Assistant Professor
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	Weitian Tong (Project Lead)	wtong@georgiasouthern.edu
Team Member 2	Lixin Li	lli@georgiasouthern.edu

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

N/A

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

Dr. Muralidhar Medidi, Professor and Department Chair, Department of Computer Science, Georgia Southern University

### Project Information and Impact Data

<b>Title of Grant Project</b>	Interactive and cost-free course materials for two theoretical fundamental courses in Computer Science
<b>Type of Grant</b>	No-or-Low-Cost-to-Students Learning Materials
<b>Requested Amount of Funding</b>	\$10,800
<b>Course Names and Course Numbers</b>	CSCI 3230 Data Structure CSCI 3236 Theoretical Foundations
<b>Final Semester of Project</b>	Spring 2020
<b>Average Number of Students Per Course Section Affected by Project</b>	23
<b>Average Number of Sections Affected by Project in One Academic Year</b>	9
<b>Total Number of Students Affected by Project in One Academic Year</b>	200
<b>Average Number of Students Affected per Summer Semester</b>	25
<b>Average Number of Students Affected per Fall Semester</b>	33
<b>Average Number of Students Affected per Spring Semester</b>	27
<b>Title/Author of Original Required Materials</b>	Table 2

<b>Original Total Cost Per Student</b>	Table 2
<b>Post-Project Cost Per Student</b>	\$0
<b>Post-Project Savings Per Student</b>	\$168/student for CSCI 3230 and \$128/student for CSCI 3236
<b>Projected Total Annual Student Savings Per Academic Year</b>	\$ 30,000
<b>Using OpenStax Textbook?</b>	No

**Table 1. Summary & Projection of Student Enrollment**

Course	Fall 2018	Spring 2019	Summer 2019	Total	Projected enrollment in the future	
					# of Sections	# of Students
<b>CSCI 3230</b>	62	50	25	137	5	110
<b>CSCI 3236</b>	37	58	0	95	4	90
<b>Total</b>	<b>99</b>	<b>108</b>	<b>25</b>	<b>232</b>	<b>9</b>	<b>200</b>

**Note:** The enrollment summary of CSCI 3236 in Fall 2018 only considers one section. Due to the consolidation of Georgia Southern University and Armstrong State University in 2018, CSCI 3236 will be offered two sections each semester starting Spring 2019, with one on Statesboro campus and one on Armstrong campus.

**Table 2. Summary of Savings with Cost-free Learning Materials**

Course	Textbook Used	Cost per Student	Projected Enrollment	Projected Costs
<b>CSCI 3230</b>	M. T. Goodrich, R. Tamassia, and M. Goldwasser. Data Structures and Algorithms in Java, Sixth edition. Wiley, 2014. ISBN: 978-1-118-77133-4	\$ 168	110	\$18,480
<b>CSCI 3236</b>	1. John C. Martin. Introduction to Languages and the Theory of Computation, Fourth Edition, McGraw-Hill. ISBN-10: 0073191469; ISBN-13: 978-0073191461. Or 2. Thomas Sudkamp, Languages and Machines, Third Edition, Pearson. ISBN-10: 0321322215; ISBN-13: 978-0321322210	\$ 138 or \$ 118 In average \$ 128	90	\$11,520
<b>Total:</b>			<b>200</b>	<b>\$30,000</b>

## Narrative Section

### 1. Project Goals

This project aims at transforming two core Computer Science courses into content-rich and easy-to-learn classes by not only providing better teaching effectiveness but also allowing students to access learning resources without any cost. In addition, the learning resources will be made sustainable by capturing up-to-date information and research findings. Hands-on exercises and examples will be developed to motivate students' interest by applying theoretical concepts and practical techniques to solve real-life problems.

### 2. Statement of Transformation

Both CSCI 3230 Data Structure and CSCI 3236 Theoretical Foundations are core Computer Science courses. CSCI 3230 introduces abstract data types such as lists, stacks, queues, and trees, and algorithm analysis, and CSCI 3236 is a study of languages, formal grammars, and abstract representations of computation. After the consolidation of Georgia Southern University and Armstrong State University, each course will be offered two sections each semester starting Spring 2019, with one on Statesboro campus and the other one on Armstrong campus.

The feasibility and impact of the proposed textbook transformation project are reflected in the following aspects.

- **No-cost-to-students:** As shown in Table 2 "Summary of Savings with Cost-free Learning Materials", the textbooks used in the two proposed fundamental CS courses are relatively expensive and thus most of our students cannot afford the textbooks. Although there are plenty of free and open-source online resources, they are often disorganized and may even contain inaccurate information. The proposed project will release the burden of costly textbooks by offering completely free yet high-quality learning materials, which will potentially help students graduate sooner as students can afford more courses. The more affordable program will increase the recruitment rate and train more qualified CS professionals in the State of Georgia.
- **More interactive learning materials:** Both courses are quite abstruse as most students reported to have a hard time according to historical teaching evaluations. In particular, students long for more interactive learning materials instead of tedious theoretical deduction in the current textbooks. Indeed, interactive contents would help students by involving them in the learning process and therefore improve their learning experience. For example, a student can better learn how an *abstract machine* works through animation or a video than a printed diagram in a textbook. This project will develop and collect high-quality and cost-free learning resources such as interactive materials in order to engage students in learning difficult concepts in these courses.
- **Up-to-date learning materials:** Nowadays, 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, textbooks easily get outdated only a few years after they are published. Up-to-date, open-source and cost-free online resources are more advantageous compared with the traditional textbooks.

- **Better alignment between the course contents and outcomes:** Designing slides, lecture notes, assignments, labs, exams, quizzes, and projects help us to refine the learning materials so that the course contents are better aligned with student outcomes of our Computer Science program. Consequently, better retention, progression, and graduation rates will be expected.
- **Broader impact:** Our cost-free learning materials will be made available to the public and thus benefit more institutions and more students in the future.
- **Investigators' capability:** Both team members of this project have rich teaching experience of CSCI 3230 and CSCI 3236 and are well-prepared for the proposed transformation. Dr. Tong's Ph.D. research topics were in Theoretical Computer Science. He has taught both courses since Spring 2016. Dr. Li has taught CSCI 3236 numerous times since Fall 2003 at Georgia Southern University. Through this project, cost-free learning resources will be either developed by team members or carefully selected from the multifarious open-source and free-of-charge online resources. As a **pioneer** from the Department of Computer Science at the Georgia Southern University, our team is fully committed to the development of no-cost-to-students learning materials for the proposed courses.

### 3. Transformation Action Plan

The goal of this project is to develop cost-free, interactive, up-to-date learning materials for CSCI 3230 and CSCI 3236. Both investigators are the coordinators of their corresponding course(s). Dr. Weitian Tong will serve as the project lead and two team members will work together for the project implementation. The detailed responsibilities of investigators are described in the following Table 3.

**Table 3. PIs' Roles and Responsibilities**

Primary Investigator	Course	Responsibilities
Dr. Weitian Tong	CSCI 3230, CSCI 3236	Project lead. Subject matter expert and developer; course coordinator; instructor of record
Dr. Lixin Li	CSCI 3236, CSCI 3230	Subject matter expert and developer; course coordinator; instructor of record

With a coordinated effort, our team of investigators plans the following activities for the transformation of the cost-free learning materials. The whole transformation process will go through three stages.

#### **Stage 1: Preparation**

- Analyze and identify the weakness of the current course syllabus.

- Analyze the consistency between the learning modules and the course learning outcomes as well as our undergraduate program outcomes.
- Research and identify cost-free materials for each learning module. Note that all these materials will be publicly accessible, free to use, or openly licensed.

**Stage 2: Implementation**

- Screen and organize high-quality learning materials so that they are mapped appropriately to each learning module.
- Develop lecture notes by using interactive no-cost-to-students learning materials.
- Design cost-free course projects, assignments, quizzes, test banks, and hands-on exercises based on the cost-free high-quality learning materials.
- Develop cost-free study guidelines to help students review course contents and key learning points.
- Update the syllabus to include the refined no-cost-to-students learning materials.
- Disseminate the transformed course materials in our learning management system – Folio.

**Stage 3: Evaluation and further improvement**

- Assess the teaching and learning effectiveness of the new learning materials by comparing the evaluation measures (refer to Table 4) between sections using the developed cost-free learning materials versus sections using traditional textbooks.
- Fine-tune the learning modules using cost-free materials based on the evaluation data and students’ feedback.

4. Quantitative and Qualitative Measures

Both quantitative and qualitative measures will be designed to assess the effectiveness of this project. Please refer to Table 4 for more details. Comparisons will be made between course sections using the developed cost-free learning materials versus sections using traditional textbooks.

**Table 4. Quantitative and qualitative measures**

Source	Description
Student performance measures (Quantitative)	The overall class performance can be measured from the students’ grades of assignments, quizzes, exams, projects, presentations, and labs.  The measurement metrics include class average, numerical grades distribution, letter grades distribution, and pass rate for each grading item.
Retention (Quantitative)	The retention can be measured by the drop rate, fail rate, and withdrawal rate.
Survey on cost-free learning materials (Qualitative)	Two anonymous survey questionnaires will be designed to allow students to share their learning experiences and discuss the effectiveness of the learning materials. These

	<p>two surveys will be conducted in the middle and at the end of each semester, respectively.</p> <p>The surveys are both quantitative and qualitative. 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.</p> <p>The sample questions involved in the surveys will include but not be limited to:</p> <ol style="list-style-type: none"> <li>1. Please rate (from 1 to 10) the quality of the new cost-free learning materials.</li> <li>2. Please indicate your preference (from 1 to 10) for the adoption of the new cost-free learning materials.</li> <li>3. What improvements would you suggest we can make regarding our cost-free learning material delivery?</li> </ol>
Official teaching evaluation (Quantitative and Qualitative Measures)	The official teaching evaluation is usually conducted at the end of each semester. The questions in the standardized evaluation form can be used to evaluate and compare the teaching effectiveness of using the new cost-free learning materials and using traditional textbooks.

## 5. Timeline

The major milestones of the proposed project are illustrated in Table 5.

**Table 5. Timelines and milestones**

Dates	Milestone
02/25/2019	<ul style="list-style-type: none"> <li>• Kickoff Meeting, Middle Georgia State University Hatcher Conference Center.</li> <li>• <b>Complete Stage 1 – Preparation.</b></li> <li>• Progress Report 1.</li> </ul>
05/10/2019	<ul style="list-style-type: none"> <li>• Complete the delivery of CSCI 3230 and CSCI 3236 with traditional textbooks.</li> <li>• Complete the official teaching evaluation.</li> <li>• Complete the collection of all evaluation measures.</li> <li>• Progress Report 2.</li> </ul>
08/01/2019	<ul style="list-style-type: none"> <li>• <b>Complete Stage 2 – Implementation.</b></li> <li>• Complete the design of surveys for students' feedback.</li> <li>• Progress Report 3.</li> </ul>

12/12/2019	<ul style="list-style-type: none"> <li>• Complete the <b>first delivery</b> of CSCI 3230 and CSCI 3236 with the new <b>cost-free learning materials</b>.</li> <li>• Complete the two surveys.</li> <li>• Complete the official teaching evaluation.</li> <li>• Complete the collection of all evaluation measures.</li> <li>• Refine the learning materials according to the students' feedback.</li> <li>• Progress Report 4.</li> </ul>
05/07/2020	<ul style="list-style-type: none"> <li>• Complete the <b>second delivery</b> of CSCI 3230 and CSCI 3236 with the <b>refined cost-free learning materials</b>.</li> <li>• Complete the two surveys.</li> <li>• Complete the official teaching evaluation.</li> <li>• Complete the collection of all evaluation measures.</li> <li>• Further refine the learning materials according to the students' feedback.</li> <li>• Progress Report 5.</li> </ul>
05/10/2020	<ul style="list-style-type: none"> <li>• <b>Complete Stage 3 – Evaluation and further improvement.</b></li> <li>• Analyze the whole project based on the collected data.</li> <li>• Complete and deliver the Final Report.</li> </ul>

## 6. Budget

The total budget for the project is \$10,800, which is used to compensate the team member's work and activities. The budget details and justifications are as follows.

- **Personnel: \$10,000**

For each proposed course, the course developer will spend at least 100 hours to design the cost-free learning materials, conduct assessment surveys, collect evaluation data and develop the reports.

Team Member	Role	Investigator's compensation
Dr. Weitian Tong	Developer and instructor for CSCI 3230 / CSCI 3236	\$ 5,000
Dr. Lixin Li	Developer and instructor for CSCI 3236 / CSCI 3230	\$ 5,000

- **Travel: \$800**

\$800 is budgeted for two team members to attend the kickoff meeting at Middle Georgia State University.

## 7. Sustainability Plan

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.

Note: [Letter of Support](#)

A supporting letter from Dr. Muralidhar Medidi, Chair of Department of Computer Science, College of Engineering and Computing, Georgia Southern University