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Application Summary

Competition Details

Competition Title:	Textbook Transformation Grants, Round Fifteen (Fall 2019 - Fall 2020)
Category:	University System of Georgia
Award Cycle:	Round 15
Submission Deadline:	09/16/2019 at 11:59 PM

Application Information

Submitted By:	Cathy Hakes
Appplication ID:	3543
Application Title:	476
Date Submitted:	09/17/2019 at 8:27 AM

Personal Details

Institution Name(s):	Georgia Gwinnett College
Applicant First Name:	Shuhua
Applicant Last Name:	Lai
Applicant Email Address:	slai@ggc.edu
Applicant Phone Number:	678-471-0788
Primary Appointment Title:	Professor, Information Technology
Submitter First Name:	Cathy
Submitter Last Name:	Hakes
Submitter Email Address:	chakes@ggc.edu
Submitter Phone Number:	678-407-5875
Submitter Title:	Executive Director of the Office of Research, Sponsored Programs & Accreditation

Application Details

Proposal Title
476

Requested Amount of Funding
$10,800

Priority Category (if applicable)
Upper-Level Courses (3000+)

Final Semester:

Fall 2020

Course Title(s)
Web Development

Course Number(s)
ITEC 4450

Team Member 1 Name
Shuhua Lai

Team Member 1 Email
slai@ggc.edu

Team Member 2 Name
Shuting Xu

Team Member 2 Email
sxu@ggc.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
Joseph Sloop

Sponsor Title
Interim Dean

Sponsor Department
School of Science and Technology

Average Number of Students per Course Section Affected by Project in One Academic Year
28

Average Number of Sections Affected by Project in One Academic Year
5

Total Number of Students Affected by Project in One Academic Year
140

Average Number of Students Affected per Summer Semester
28

Average Number of Students Affected per Fall Semester
56

Average Number of Students Affected per Spring Semester
56

Original Required Commercial Materials (title, author, price, and bookstore or retailer URL showing price)
Book Title: Programming the World Wide Web, 8th Edition

Author: Robert W. Sebesta [1]

Price: $131.77

URL: http://www.mypearsonstore.com/bookstore/programming-the-world-wide-web-9780133775983?xid=PSED

Original Total Cost per Student
$131.77

Post-Project Cost per Student
$0

Post-Project Savings per Student
$131.77

Projected Total Annual Student Savings per Academic Year
$18,447.80

Using OpenStax Textbook?
No

Project Goals

The goals of the project are:

1. Create more focused course materials.

The course ITEC 4450 Web Development is a required ITEC major course at GGC. It is a course that focuses on fundamental programming concepts and techniques in web development. At the completion of the course, students are expected to:

1. Understand the basic concepts of web clients and servers, as well as how they enable the operation of web-based applications;
2. Choose appropriate technologies and development tools to address a given web development task;
3. Develop web site front-ends using client side programming;
4. Develop web site back-ends using server side programming;
5. Develop web sites that integrate with local or remote databases; and
6. Understand the development life cycle for web-based applications and services.

While students are expected to have a balanced knowledge of the front ends of web development, the ITEC 4450 learning outcomes (d) through (f) aspire to particularly ensure the proficiency of students in the back end. This is because the course relies on the pre-requisite courses, ITEC 2130 Web Technologies and ITEC 2110 Digital Media, to provide the comprehensive training on the coding languages used to build websites and web applications. For example, HTML, CSS, and JavaScript, which are coding languages used to build websites and web applications, are taught in ITEC 2130 Web Technologies, while Flash is taught in ITEC 2110 Digital Media. Moreover, the book was chosen because the three ITEC 4450 course faculty (two full-time faculty and one part-time faculty) felt that this was the better option among those other textbooks on the market. The teaching faculty, however, find that the current textbook does not offer the sufficient server side programming training they felt students needed in today's competitive job market. Through the ALG Textbook Transformation grant, the project team who are the two ITEC 4450 full-time course faculty will have an opportunity to create an ITEC 4450 textbook that is aligned with the six learning outcomes, allows students to be technically proficient based on the learning outcomes, and is absolutely free to students.

2. Improve student success and retention by designing project-based course materials.

The exercises from the current textbook are focused only on the skills covered in each chapter and do not provide students with a systematic view of how web sites are designed and implemented from scratch. By using the project-based course materials, students will have the opportunity to design and implement a web site on their own systematically. We aspire that this pedagogical transformation will fill the gap of textbook knowledge and real-world application and in return improve student success rate.

3. Reduce student expenses in textbook purchases to zero dollars.

Upper level courses are often overlooked when efforts are made to reduce or eliminate the cost of textbooks. Yet, the prices of textbooks are often the costliest at this time of a student's academic career. The reduction of cost from $131.77 to $0 to 140 potential IT graduates is a tremendous help. Some of these students are going to graduate with large amount of student loan, so lifting the burden of textbook costs during their junior or senior year (some 140 students each year) would be a benefit to them and to the University System of Georgia.

4. Share the learning materials with other USG universities and colleges to benefit more students.

The project team will make the created learning materials freely available to the entire USG faculty through GALILEO. They can be used as replacement to their current textbooks or supplement teaching materials.

Statement of Transformation

Overview of the Transformation

Mark J. Perry in his article for Carpe Diem (July 26, 2015) stated that, “A new milestone must have been established recently – we’re now officially in a new era of the $400 new college textbook and the $300 used college textbook.” [2] But as Carl Straumsheim [4] noted, the offender in this list was a 400 level textbook. In fact, of the 15 most expensive textbooks at the University of Michigan-Flint textbook list that Perry featured in his article, 86% (13) were upper level 300 and higher courses and the top two costliest books were for 400 level courses. Straumsheim [3] went on to say that 400 level courses do not provide a good deal of alternatives for students to cut costs since efforts to lower or eliminate textbook costs seldom target upper level courses and, because fewer students take these classes, there are fewer used textbooks in the market. Yet, providing low-cost or no-cost textbooks to students at those periods of their academic career is even more critical since the costs of textbooks are at their most expensive and students are now at the cusp of completing their studies. Through this project, the team aspires to help ease the financial burden on students who are taking their final web development course and those who are potentially graduating from college.

In GGC, the costliest course and the course that required the most number of books is a 4000 level course. The textbook for ITEC 4450 Web Development is no different, being priced at $132. In addition, due to the fast evolving nature of the web design field, the technologies illustrated in the textbooks are updated frequently, which negatively impact their resale value. [4] With the advent of digital access codes or book keys (which are necessary to access study guides, assignments, quizzes, and tests materials) that expire after a certain time, students do not even have the ability to recoup their costs by reselling books. [5, 6] Such practices and the mounting costs of tuition, fees, and textbooks have led to protests all over the U.S., and news stories of student protests on rising college costs have rocked other parts of the world also. [7,8,9]

Through the ALG Textbook Transformation grant, GGC has the unique opportunity for its students in the upper level course of ITEC 4450 to cut cost. The course lends itself well to the grant since learning resources for web technologies are abundant on the World Wide Web today. Many of these resources are publicly accessible, free, or with an open license to use. The investigators of this proposal will identify, select and adopt/create no-cost materials to replace the costly textbook and achieve the same learning outcomes.

The teaching and learning course materials the team proposes to create will be project-based. All the knowledge covered by the learning materials will be focused on building students’ web site project. Project-based learning (PBL) is a student-centered pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems [10]. It is a style of active learning and inquiry-based learning. A meta-analysis conducted by Purdue University found that when implemented well, PBL can increase long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning [11]. We have successfully applied project-based learning materials in the course ITEC 2130 Web Technologies. By using the proposed project-based course materials, we hope students will improve class engagement and learning satisfaction, gain experience in working on real-world applications and improve student success rate.

Project’s transformative impact on course and department

The direct stakeholders affected by the transformation will be approximately 140 traditional and non-traditional undergraduate students annually who are enrolled in the Web Development course at GGC. The transformation process will help eliminate the cost of expensive textbooks for students and provide students with access to course learning materials on the first day of class. In addition, the project-based pedagogical transformation will engage students in classes better as they know every skill they learn in class will be used to build their designed web sites. This will help to improve course’s attendance and retention, and the experience of working on a real-world application will benefit their future career success.

Aside from the students, the transformation will impact the School of Science and Technology. ITEC 4450 Web Development is a required course for Information Technology major with Digital Media concentration. The successful transformation with zero textbook cost and better course engagement and satisfaction may help attract more IT students to enroll in the course, because some IT majors are not required to take this course.

Finally, GGC and other ITEC faculty in Georgia and across the country who teach a web development course may have free access to the course materials. The transformed textbook/materials will offer faculty an alternative instructional tool and will allow them to explore other materials that they could freely use in the class through the web. The free textbook will benefit IT faculty in that they have a comprehensive packet of teaching tools that is a viable solution to lowering textbook cost, improving student engagement, and increasing success rate.

Project’s transformative impact on institution

The proposed project-based course materials will strongly support the mission of GGC: “It emphasizes the innovative use of technology and active-learning environments to provide students enhanced learning experiences, practical

opportunities to apply knowledge...” The idea of zero textbook cost and project-based learning may inspire more successful course transformation in other areas and disciplines at GGC and USG at large also. While the effect of a $132 textbook or total $18,447.80 savings in this upper level course may appear to institutions or to digital publishers to be an insignificant amount compared to savings or revenues in lower-level courses, the eventual effects on institutional retention, graduation rates, students’ financial health, and graduates’ eventual high earnings are just as noteworthy.

To date, the project team has received ALG funding and continues to use their created online textbook in ITEC 2130, which is a pre-requisite to ITEC 4450. With a funded ITEC 4450, the team will be able to help students in this discipline to progress through their studies with no textbook costs. As Christopher Ettese, CEO of Flat World Knowledge, said regarding their expansion into online textbooks for upper level courses, “Instead of tackling one upper-level course at a time, OER and affordable textbook providers may over time focus more on degree programs with zero textbook cost. The ability to measure learning across an entire degree program is really where we’re headed in the future rather than just on a course-by-course basis.” [3]

Finally, the transformation may affect other faculty members’ attitude toward digitizing their textbooks. The project team has presented on their ALG ITEC 2130 textbook transformation experience at the Information Systems Education Conference 2019 where colleagues who attended their session received the idea of digitizing textbook warmly. The team plans to present again on this transformation in the hope that others will follow suit and provide no-cost textbooks to their students.

Transformation Action Plan

The new course materials will be identified and gathered/created based on course objectives and student learning outcomes of the ITEC 4450 Web Development course. The transformed textbook and materials will be produced by using publicly available resources since most of the content taught in this course do nonprofit organizations and open source foundations maintain standard web development applications.

The course syllabus will be modified accordingly for the transformation, including the course material information, grade distribution, tentative course schedule, etc. The course syllabus will be made available on GGC Brightspace (D2L). Since the new course materials will be provided on D2L, each topic covered in the course will have a web link in D2L, which contains all the materials relevant to the topic. In addition, each course topic will be designed based on learning-by-doing approach to include many examples, tutorials, and handson exercises that allow students to practice and improve their own web design skills.

The transformed textbook will also be a departure from the current textbook, which provides only a broad introduction of server side programming, without in-depth understanding and implementation as required in a senior-level course. As an example, the current textbook covers different methods of server side programming, such as using PHP, Java, ASP.NET, Ruby, etc. in one chapter. The PIs propose creating project-based teaching and learning course materials for this course with only needed contents. The team will **only focus on PHP and MySQL programming**, but will explore all the major applications of using PHP such as handling forms, file processing, manipulating databases with MySQL, creating sessions, web security, E-commerce, etc. After taking this course, students will be able to handle all the major tasks of server side programming using PHP. With this solid foundation, students can easily pick up server side programming using other languages if needed in future career.

The PIs will not neglect learning outcome (c) Develop web site front-ends using client side programming. There will be times to review these coding languages. Aside from this, the students will need to apply the front- and back-end programming when completing the course assignments because every time when they are asked to develop a website, front-end design is always part of the assignments. All the front-end techniques the students learned in the pre-requisite course (ITEC 2130) are needed to complete course project assignments, even though most assignments of this course (ITEC 4450) focus more on back-end programming and database applications.

Team members' roles

Team member: Shuhua Lai, Professor of Information Technology, as a subject matter expert and instructional designer, will create new course materials including developing lecture notes/course PPT slides; identify online free complementary reading materials/tutorials/video clips for each course topic; and set up and maintain the D2L course material for this project. Dr. Lai will also oversee the entire transformation process and prepare the reports.

Team member: Shuting Xu, Associate Professor of Information Technology, as a subject matter expert and instructional designer, will identify and create new course materials. She will select and determine study material for all quizzes, exams and homework assignments/projects; develop handson activities, lab activities; and complete and analyze all grade/survey related data for the course.

TABLE 1. Comparison in contents between current textbook and proposed transformed textbook

CURRENT TEXTBOOK

The book is organized into three parts:

1. The introduction (Chapter 1),
2. Client-side technologies (Chapters 2–8), and
3. Server-side technologies (Chapters 9–15).

PROPOSED TRANSFORMED TEXTBOOK

Our proposed book is organized into six parts:

1. Introduction to PHP programming (Dr. Lai)
2. Project based learning with focus on PHP loops, functions, strings, dates and arrays by implementing an online survey system (Dr. Xu)
3. Project based learning with focus on PHP sessions by implementing an online test system (Dr. Lai)
4. Project based learning with focus on Database MySQL by implementing an online inventory system (Dr. Xu)
5. Project based learning with focus on web security by implementing an online student information management system (Dr. Lai)

6. Project based learning with focus on e-commerce by implementing an online shopping system (Dr. Xu)

Plan for providing access

The new course materials will be hosted on Georgia Gwinnett College Brightspace (D2L) (https://ggc.view.usg.edu/d2l/home) and all students who take this course will have free access to the materials on the first day of class. This website will be used to post all the course materials, announcements, assignments, and for students to submit homework and take tests and quizzes.

The team will also use free web hosting service provided by Altervista (https://en.altervista.org/). Students can register free accounts on this web site. This web site will be used for students to post their web pages created for homework and projects and host their client-side and server-side programs (D2L does not provide this function).

Quantitative & Qualitative Measures

The project team will submit a request for IRB approval once the project starts. The survey will be conducted at the end of the semester and the data collected will help the PIs to modify and improve the learning materials to be used in the following semesters.

A. Quantitative Measures:

Textbook Completion (Goal 1)

The PI will track the deliverables as they are completed. It is expected that the textbook and the accompanying resources in the textbook (e.g., assignments, quizzes, projects) will be completed by the pilot date.

Student Success, Retention, and Performance (Goal 2)

The PIs will collect data from all students who take this course using the developed no-cost-to-student course materials. These data include but are not limited to:

- Demographic data
- Major area of study
- Retention rate in the course
- Passing and failing rate
- Drop and withdraw rate
- Percentage of students getting As, Bs, Cs, Ds, Fs
- Percentage of students achieving student learning outcomes

The above data will be collected at the end of the semester and:

- Compared with the sections of the ITEC 4450 without using the proposed course materials;
- Compared with the results from previous semesters; and
- Used to evaluate the efficacy of the course materials in improving student success.

Student Satisfaction (Goal 3)

The PIs will track the number of courses that utilized the materials, as well as the number of students in each class. Through a questionnaire, students will be asked the following sample questions to determine their satisfaction with several aspects of the course using the Likert scale of 1-5 (strongly disagree/agree):

- Teaching. The instructor communicated the subject content of the new online materials effectively.The instructor made the subject as interesting as possible.
- Assessment. The way I was assessed using the new online materials was a fair test of my skills.I received useful feedback on my assessment.
- Transformed Course materials. The project-based course materials were engaging.I like the class activities designed for this course.I like the homework designed for this course.I learned all the knowledge and skills needed to build my web site project.The course materials helped me develop my ability as a web developer.The course materials helped me develop the ability to plan my own work.The course materials have made me more confident about my ability to learn.As a result of the course materials, I developed my problem-solving skills.

- Overall satisfaction with the course materials

How would you rate, on average, your satisfaction with the overall delivery of the course that used only online materials?

- Overall, I was satisfied with the quality of the course delivery that used only online materials.

Dissemination Activities (Goal 4)

The project team will track the number of conferences and presentations conducted by the team.

B. Qualitative Measures:

Textbook Completion (Goal 1)

The project team will meet to discuss the following areas to evaluate the efficacy of the textbook and materials:

- Content: Did we clearly present the skills that students need to learn?Did we effectively present the concepts and techniques?Were the materials well organized?
- Helpfulness and Availability: Did we achieve the learning outcomes?Did we identify the appropriate resources that students needed to carry out their projects, assignments, or class work?Were we able to assist the students when they had difficulties?
- Knowledge: Did we provide enough opportunity for the students to practice the skills required in the course? (Follow-up questions:)Were the materials able to synthesize fundamental knowledge and skills?Did the materials help them get a deeper insight of web development?
- Project challenges and accomplishment of learning outcomes: What were the challenges and accomplishments of each of our goals?

Student Success, Retention, and Performance (Goal 2)

The PIs will utilize open-ended questions to assess this category. Questions may include:

- What additional materials do you wish to be included to improve your class performance?
- Do you wish to see more advanced class work, assignments, or class projects? If so, what specific web development skills do you want to improve?
- How satisfied are you with your effort on the course? How can we help further improve your skills/knowledge?
- What advice would you give another student who will be using these course's online resources?
- How can we improve the course?

Student Satisfaction (Goal 3)

The students will also be asked the following short answer questions:

- What were the best aspects of using the No-Cost-to-Students Learning Materials?
- What were the challenges of using the No-Cost-to-Students Learning Materials?
- Other comments or suggestions about this course?

Dissemination Activities (Goal 4)

The project team will track the comments, suggestions, and recommendations made by GGC colleagues (one part-time instructor) and colleagues they meet in conferences/presentations. These may be helping in assisting them as they work on revising or updating materials.

Timeline

For implementation in Fall 2019 Semester, which will be in November 2019 after the kickoff event.

Fall 2019 (Starting November 2019)

Complete course modules redesign. These include all reading materials, lecture notes, video clips, exercises, labs, and assignments.

Spring 2020

Complete course level materials redesign. This includes quizzes, tests, and syllabus.

Develop the survey questionnaire used to evaluate the course materials, and deliver the first report.

Fall 2020

Teach the course using the developed course materials. Conduct survey at the end of the semester.

Analyze data collected. Finish quantitative and qualitative data analysis. Compile final report.

Budget

Type of Grant: Standard-Scale Transformation

Request: $10, 800

Justification:

The funding mainly compensates the investigators' work and activities beyond normal teaching load in order to successfully complete the project. The workload for each person requires at least about 80 hours of development time and 20 hours of assessment.

Funds are requested for:

A. Personnel: $10,000, with each PI $5,000

Dr. Lai requests $5,000. As PI, he will manage the grant and prepare all reports. He will also be responsible for Chapters 1, 3 and 5 of the proposed textbook, along with the resources required for these chapters. The resources include examples, tutorials, quizzes, assignments and handson exercises.

Dr. Xu requests $5,000. She will assist be responsible for developing the OER materials for Chapters 2, 4 and 6 of the text. Like Dr. Lai, she will develop the other resources that accompany the chapters.

B. Travel: $800

Only open source software will be used in this project thus there is no additional spending on software or equipment purchasing.

C. Total: $10,800

Sustainability Plan

Web Development is a required course for IT major with Digital Media concentration at GGC. There are about five sections taught each academic year. The team plans to test the no-cost-to-student materials in three sections the two PIs teach. It is reasonable to expect that the success of this project will greatly reduce students cost, better prepare and engage students, improve academic performance, and in turn improve retention and success rates in this course. The team will then propose to have all sections adopt the no-cost-to-student material approach.

For GGC faculty, all no-cost materials and resources will be made available on D2L and will be shared among all faculty teaching this course. For non-GGC faculty, the materials will be provided freely via the GALILEO portal or upon request. In addition, the course materials will be updated periodically by faculty in the Information Technology program reflecting feedback from various sources and newly emerged web development technologies in the industry.

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.

Georgia Gwinnett
COLLEGE

School of Science & Technology

1000 University Center Lane
Lawrenceville, GA 30043
Phone: 678-407-5602
www.ggc.edu

To: Grant Review Committee

Affordable Learning Georgia

Re: Textbook Transformation Grant

Dear Committee,

I am pleased to write this letter to support Dr. Shuting Xu and Dr. Shuhua Lai's application for the ALG Textbook Transformation Grant.

The proposal focuses on the creation of no-cost-to-students learning materials to replace current textbook for our IT required course Web Development (ITEC 4450). This will lower costs of students taking this course and will most likely increase our retention and success rates in the course.

Drs. Xu and Lai have been teaching ITEC 4450 in the past few years at GGC. They have the knowledge, skills and experiences needed to successfully perform the action plan and meet the obligations of the grant. If awarded the grant, the school will work with them to coordinate the distribution of their award and provide necessary resources to facilitate their activities in developing the proposed learning materials.

Please let me know if you have any questions or need additional information.

Sincerely,

Joseph C. Sloop

Joseph Sloop, Ph.D.

Interim Dean, School of Science and Technology

Georgia Gwinnett College

Affordable Learning Georgia

Textbook Transformation Grants, Round Fifteen
(Fall 2019 – Fall 2020)

Proposal Form and Narrative

Applicant, Team, and Sponsor Information

Institution(s)	Georgia Gwinnett College
Applicant Name	Shuhua Lai
Applicant Email	slai@ggc.edu
Applicant Phone #	678-471-0788
Applicant Position/Title	Full Professor
Submitter Name	Cathy Hakes
Submitter Email	chakes@ggc.edu
Submitter Phone #	678-407-5875
Submitter Position	Executive Director, Office of Research and Sponsored Programs

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	Shuhua Lai	slai@ggc.edu
Team Member 2	Shuting Xu	sxu@ggc.edu

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.

Joseph Sloop, Interim Dean of School of Science and Technology, Georgia Gwinnett College.

Project Information and Impact Data

Priority Category / Categories	Upper-level undergraduate courses
Requested Amount of Funding	$10,800
Course Names and Course Numbers	Web Development, ITEC 4450
Final Semester of Project	Fall 2020
Average Number of Students Per Course Section Affected by Project	28
Average Number of Sections Affected by Project in One Academic Year	5
Total Number of Students Affected by Project in One Academic Year	140
Average Number of Students Affected per Summer Semester	28
Average Number of Students Affected per Fall Semester	56
Average Number of Students Affected per Spring Semester	56
Original Required Commercial Materials	Book Title: Programming the World Wide Web, 8th Edition Author: Robert W. Sebesta [1] Price: $131.77 URL: http://www.mypearsonstore.com/bookstore/programming-the-world-wide-web-9780133775983?xid=PSED
Total Price of Original Required Materials Per Student	$131.77
Post-Project Cost Per Student	$0
Post-Project Savings Per Student	$131.77
Projected Total Annual Student Savings Per Academic Year	$18,447.80
Using OpenStax Textbook?	No

NARRATIVE SECTION

1. PROJECT GOALS

The goals of the project are:

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a) Understand the basic concepts of web clients and servers, as well as how they enable the operation of web-based applications;
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4) **Share the learning materials with other USG universities and colleges to benefit more students.**

The project team will make the created learning materials freely available to the entire USG faculty through GALILEO. They can be used as replacement to their current textbooks or supplement teaching materials.

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Mark J. Perry in his article for Carpe Diem (July 26, 2015) stated that, "A new milestone must have been established recently – we're now officially in a new era of the $400 new college textbook and the $300 used college textbook." [2] But as Carl Straumsheim [4] noted, the offender in this list was a 400 level textbook. In fact, of the 15 most expensive textbooks at the University of Michigan-Flint textbook list that Perry featured in his article, 86% (13) were upper level 300 and higher courses and the top two costliest books were for 400 level courses. Straumsheim [3] went on to say that 400 level courses do not provide a good deal of alternatives for students to cut costs since efforts to lower or eliminate textbook costs seldom target upper level courses and, because fewer students take these classes, there are fewer used textbooks in the market. Yet, providing low-cost or no-cost textbooks to students at those periods of their academic career is even more critical since the costs of textbooks are at their most expensive and students are now at the cusp of completing their studies. Through this project, the team aspires to help ease the financial burden on students who are taking their final web development course and those who are potentially graduating from college.

In GGC, the costliest course and the course that required the most number of books is a 4000 level course. The textbook for ITEC 4450 Web Development is no different, being priced at $132. In addition, due to the fast evolving nature of the web design field, the technologies illustrated in the textbooks are updated frequently, which negatively impact their resale value. [4] With the advent of digital access codes or book keys (which are necessary to access study guides, assignments, quizzes, and tests materials) that expire after a certain time, students do not even have the ability to recoup their costs by reselling books. [5, 6] Such practices and the mounting costs of tuition, fees, and textbooks have led to protests all over the U.S., and news stories of student protests on rising college costs have rocked other parts of the world also. [7,8,9]

Through the ALG Textbook Transformation grant, GGC has the unique opportunity for its students in the upper level course of ITEC 4450 to cut cost. The course lends itself well to the grant since learning resources for web technologies are abundant on the World Wide Web today. Many of these resources are publicly accessible, free, or with an open license to use. The investigators of this proposal will identify, select and adopt/create no-cost materials to replace the costly textbook and achieve the same learning outcomes.

The teaching and learning course materials the team proposes to create will be project-based. All the knowledge covered by the learning materials will be focused on building students' web site project. Project-based learning (PBL) is a student-centered pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems [10]. It is a style of active learning and inquiry-based learning. A meta-analysis conducted by Purdue University found that when implemented well, PBL can increase long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning [11]. We have successfully applied project-based learning materials in the course ITEC 2130 Web Technologies. By using the proposed project-based course materials, we hope students will improve class engagement and learning satisfaction, gain experience in working on real-world applications and improve student success rate.

Project's transformative impact on course and department

The direct stakeholders affected by the transformation will be approximately 140 traditional and non-traditional undergraduate students annually who are enrolled in the Web Development course at GGC. The transformation process will help eliminate the cost of expensive textbooks for students and provide students with access to course learning materials on the first day of class. In addition, the project-based pedagogical transformation will engage students in classes better as they know every skill they learn in class will be used to build their designed web sites. This will help to improve course's attendance and retention, and the experience of working on a real-world application will benefit their future career success.

Aside from the students, the transformation will impact the School of Science and Technology. ITEC 4450 Web Development is a required course for Information Technology major with Digital Media concentration. The successful transformation with zero textbook cost and better course engagement and satisfaction may help attract more IT students to enroll in the course, because some IT majors are not required to take this course.

Finally, GGC and other ITEC faculty in Georgia and across the country who teach a web development course may have free access to the course materials. The transformed textbook/materials will offer faculty an alternative instructional tool and will allow them to explore other materials that they could freely use in the class through the web. The free textbook will benefit IT faculty in that they have a comprehensive packet of teaching tools that is a viable solution to lowering textbook cost, improving student engagement, and increasing success rate.

Project's transformative impact on institution

The proposed project-based course materials will strongly support the mission of GGC: "It emphasizes the innovative use of technology and active-learning environments to provide students enhanced learning experiences, practical opportunities to apply knowledge..." The idea of zero textbook cost and project-based learning may inspire more successful course transformation in other areas and disciplines at GGC and USG at large also. While the effect of a $132 textbook or total $18,447.80 savings in this upper level course may appear to institutions or to digital publishers to be an insignificant amount compared to savings or revenues in lower-level courses, the eventual effects on institutional retention, graduation rates, students' financial health, and graduates' eventual high earnings are just as noteworthy.

To date, the project team has received ALG funding and continues to use their created online textbook in ITEC 2130, which is a pre-requisite to ITEC 4450. With a funded ITEC 4450, the team will be able to help students in this discipline to progress through their studies with no textbook costs. As Christopher Ettese, CEO of Flat World Knowledge, said regarding their expansion into online textbooks for upper level courses, "Instead of tackling one upper-level course at a time, OER and affordable textbook providers may over time focus more on degree programs with zero textbook cost. The ability to measure learning across an entire degree program is really where we're headed in the future rather than just on a course-by-course basis." [3]

Finally, the transformation may affect other faculty members' attitude toward digitizing their textbooks. The project team has presented on their ALG ITEC 2130 textbook transformation experience at the Information Systems Education Conference 2019 where colleagues who attended their session received the idea of digitizing textbook warmly. The team plans to present again on this transformation in the hope that others will follow suit and provide no-cost textbooks to their students.

3. TRANSFORMATION ACTION PLAN

The new course materials will be identified and gathered/created based on course objectives and student learning outcomes of the ITEC 4450 Web Development course. The transformed textbook and materials will be produced by using publicly available resources since most of the content taught in this course do non-profit organizations and open source foundations maintain standard web development applications.

The course syllabus will be modified accordingly for the transformation, including the course material information, grade distribution, tentative course schedule, etc. The course syllabus will be made available on GGC Brightspace (D2L). Since the new course materials will be provided on D2L, each topic covered in the course will have a web link in D2L, which contains all the materials relevant to the topic. In addition, each course topic will be designed based on learning-by-doing approach to include many examples, tutorials, and hands-on exercises that allow students to practice and improve their own web design skills.

The transformed textbook will also be a departure from the current textbook, which provides only a broad introduction of server side programming, without in-depth understanding and implementation as required in a senior-level course. As an example, the current textbook covers

different methods of server side programming, such as using PHP, Java, ASP.NET, Ruby, etc. in one chapter. The PIs propose creating project-based teaching and learning course materials for this course with only needed contents. The team will **only focus on PHP and MySQL programming**, but will explore all the major applications of using PHP such as handling forms, file processing, manipulating databases with MySQL, creating sessions, web security, E-commerce, etc. After taking this course, students will be able to handle all the major tasks of server side programming using PHP. With this solid foundation, students can easily pick up server side programming using other languages if needed in future career.

The PIs will not neglect learning outcome (c) Develop web site front-ends using client side programming. There will be times to review these coding languages. Aside from this, the students will need to apply the front- and back-end programming when completing the course assignments because every time when they are asked to develop a website, front-end design is always part of the assignments. All the front-end techniques the students learned in the pre-requisite course (ITEC 2130) are needed to complete course project assignments, even though most assignments of this course (ITEC 4450) focus more on back-end programming and database applications.

Team members' roles

Team member: Shuhua Lai, Professor of Information Technology, as a subject matter expert and instructional designer, will create new course materials including developing lecture notes/course PPT slides; identify online free complementary reading materials/tutorials/video clips for each course topic; and set up and maintain the D2L course material for this project. Dr. Lai will also oversee the entire transformation process and prepare the reports.

Team member: Shuting Xu, Associate Professor of Information Technology, as a subject matter expert and instructional designer, will identify and create new course materials. She will select and determine study material for all quizzes, exams and homework assignments/projects; develop hands-on activities, lab activities; and complete and analyze all grade/survey related data for the course.

TABLE 1. Comparison in contents between current textbook and proposed transformed textbook

CURRENT TEXTBOOK	PROPOSED TRANSFORMED TEXTBOOK
The book is organized into three parts: 1. The introduction (Chapter 1), 2. Client-side technologies (Chapters 2–8), and 3. Server-side technologies (Chapters 9–15).	Our proposed book is organized into six parts: 1. Introduction to PHP programming (Dr. Lai) 2. Project based learning with focus on PHP loops, functions, strings, dates and arrays by implementing an online survey system (Dr. Xu) 3. Project based learning with focus on PHP sessions by implementing an online test system (Dr. Lai) 4. Project based learning with focus on Database MySQL by implementing an online inventory system (Dr. Xu)

	5. Project based learning with focus on web security by implementing an online student information management system (Dr. Lai) 6. Project based learning with focus on e-commerce by implementing an online shopping system (Dr. Xu)

Plan for providing access

The new course materials will be hosted on Georgia Gwinnett College Brightspace (D2L) (https://ggc.view.usg.edu/d2l/home) and all students who take this course will have free access to the materials on the first day of class. This website will be used to post all the course materials, announcements, assignments, and for students to submit homework and take tests and quizzes.

The team will also use free web hosting service provided by Altervista (https://en.altervista.org/). Students can register free accounts on this web site. This web site will be used for students to post their web pages created for homework and projects and host their client-side and server-side programs (D2L does not provide this function).

4. QUANTITATIVE AND QUALITATIVE MEASURES

The project team will submit a request for IRB approval once the project starts. The survey will be conducted at the end of the semester and the data collected will help the PIs to modify and improve the learning materials to be used in the following semesters.

A. Quantitative Measures:

Textbook Completion (Goal 1)

The PI will track the deliverables as they are completed. It is expected that the textbook and the accompanying resources in the textbook (e.g., assignments, quizzes, projects) will be completed by the pilot date.

Student Success, Retention, and Performance (Goal 2)

The PIs will collect data from all students who take this course using the developed no-cost-to-student course materials. These data include but are not limited to:

- Demographic data
- Major area of study
- Retention rate in the course
- Passing and failing rate
- Drop and withdraw rate
- Percentage of students getting As, Bs, Cs, Ds, Fs
- Percentage of students achieving student learning outcomes

The above data will be collected at the end of the semester and:

- Compared with the sections of the ITEC 4450 without using the proposed course materials;
- Compared with the results from previous semesters; and
- Used to evaluate the efficacy of the course materials in improving student success.

Student Satisfaction (Goal 3)

The PIs will track the number of courses that utilized the materials, as well as the number of students in each class. Through a questionnaire, students will be asked the following sample questions to determine their satisfaction with several aspects of the course using the Likert scale of 1-5 (strongly disagree/agree):

- Teaching.
    - The instructor communicated the subject content of the new online materials effectively.
    - The instructor made the subject as interesting as possible.
- Assessment.
    - The way I was assessed using the new online materials was a fair test of my skills.
    - I received useful feedback on my assessment.
- Transformed Course materials.
    - The project-based course materials were engaging.
    - I like the class activities designed for this course.
    - I like the homework designed for this course.
    - I learned all the knowledge and skills needed to build my web site project.
    - The course materials helped me develop my ability as a web developer.
    - The course materials helped me develop the ability to plan my own work.
    - The course materials have made me more confident about my ability to learn.
    - As a result of the course materials, I developed my problem-solving skills.

- Overall satisfaction with the course materials
  How would you rate, on average, your satisfaction with the overall delivery of the course that used only online materials?
    - Overall, I was satisfied with the quality of the course delivery that used only online materials.

Dissemination Activities (Goal 4)

The project team will track the number of conferences and presentations conducted by the team.

B. Qualitative Measures:

Textbook Completion (Goal 1)

The project team will meet to discuss the following areas to evaluate the efficacy of the textbook and materials:

- Content:
    - Did we clearly present the skills that students need to learn?

    - Did we effectively present the concepts and techniques?
    - Were the materials well organized?
- Helpfulness and Availability:
    - Did we achieve the learning outcomes?
    - Did we identify the appropriate resources that students needed to carry out their projects, assignments, or class work?
    - Were we able to assist the students when they had difficulties?
- Knowledge:
    - Did we provide enough opportunity for the students to practice the skills required in the course? (Follow up questions:)
    - Were the materials able to synthesize fundamental knowledge and skills?
    - Did the materials help them get a deeper insight of web development?
- Project challenges and accomplishment of learning outcomes:
    - What were the challenges and accomplishments of each of our goals?

Student Success, Retention, and Performance (Goal 2)

The PIs will utilize open-ended questions to assess this category. Questions may include:

- What additional materials do you wish to be included to improve your class performance?
- Do you wish to see more advanced class work, assignments, or class projects? If so, what specific web development skills do you want to improve?
- How satisfied are you with your effort on the course? How can we help further improve your skills/knowledge?
- What advice would you give another student who will be using these course's online resources?
- How can we improve the course?

Student Satisfaction (Goal 3)

The students will also be asked the following short answer questions:

- What were the best aspects of using the No-Cost-to-Students Learning Materials?
- What were the challenges of using the No-Cost-to-Students Learning Materials?
- Other comments or suggestions about this course?

Dissemination Activities (Goal 4)

The project team will track the comments, suggestions, and recommendations made by GGC colleagues (one part-time instructor) and colleagues they meet in conferences/presentations. These may be helping in assisting them as they work on revising or updating materials.

5. TIMELINE

For implementation in Fall 2019 Semester, which will be in November 2019 after the kickoff event.

Fall 2019 (Starting November 2019)

Complete course modules redesign. These include all reading materials, lecture notes, video clips, exercises, labs, and assignments.

Spring 2020

Complete course level materials redesign. This includes quizzes, tests, and syllabus.

Develop the survey questionnaire used to evaluate the course materials, and deliver the first report.

Fall 2020

Teach the course using the developed course materials. Conduct survey at the end of the semester.

Analyze data collected. Finish quantitative and qualitative data analysis. Compile final report.

6. BUDGET

Type of Grant: Standard-Scale Transformation

Request: $10, 800

Justification:

The funding mainly compensates the investigators' work and activities beyond normal teaching load in order to successfully complete the project. The workload for each person requires at least about 80 hours of development time and 20 hours of assessment.

Funds are requested for:

A. Personnel: $10,000, with each PI $5,000

Dr. Lai requests $5,000. As PI, he will manage the grant and prepare all reports. He will also be responsible for Chapters 1, 3 and 5 of the proposed textbook, along with the resources required for these chapters. The resources include examples, tutorials, quizzes, assignments and hands-on exercises.

Dr. Xu requests $5,000. She will assist be responsible for developing the OER materials for Chapters 2, 4 and 6 of the text. Like Dr. Lai, she will develop the other resources that accompany the chapters.

B. Travel: $800

Only open source software will be used in this project thus there is no additional spending on software or equipment purchasing.

C. Total: $10,800

7. SUSTAINABILITY PLAN

Web Development is a required course for IT major with Digital Media concentration at GGC. There are about five sections taught each academic year. The team plans to test the no-cost-to-student materials in three sections the two PIs teach. It is reasonable to expect that the success of this project will greatly reduce students cost, better prepare and engage students, improve academic performance, and in turn improve retention and success rates in this course. The team will then propose to have all sections adopt the no-cost-to-student material approach.

For GGC faculty, all no-cost materials and resources will be made available on D2L and will be shared among all faculty teaching this course. For non-GGC faculty, the materials will be provided freely via the GALILEO portal or upon request. In addition, the course materials will be updated periodically by faculty in the Information Technology program reflecting feedback from various sources and newly emerged web development technologies in the industry.

8. REFERENCES

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