Affordable Learning Georgia Textbook Transformation Grants

Final Report

To submit your Final Report, go to the [Final Report submission page](http://affordablelearninggeorgia.org/site/final_report_submission) on the ALG website: http://affordablelearninggeorgia.org/site/final\_report\_submission

The final report submission form allows up to five files:

* This completed narrative document (required)
* Syllabus or syllabi (required)

*If multiple files, compress into one .zip folder*

* Qualitative/Quantitative Measures data files (required)

*If multiple files, compress into one .zip folder*

* Photo of your team or a class of your students for future ALG promotions (optional)
* Invoice for the second half of the grant’s award amount (optional)

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

# General Information

**Date: 5/17/2021**

**Grant Round: 16**

**Grant Number: #508**

**Institution Name(s): Kennesaw State University**

**Project Lead: Lin Li**

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

* Lin Li, Assistant Professor of Industrial and Systems Engineering, [lli19@kennesaw.edu](mailto:lli19@kennesaw.edu)
* Robert Keyser, Associate Professor of Industrial and Systems Engineering. [rkeyser@kennesaw.edu](mailto:rkeyser@kennesaw.edu)
* Meng Han, Assistant Professor of Information Technology, [mhan9@kennessaw.edu](mailto:mhan9@kennessaw.edu)

**Course Name(s) and Course Numbers:**

* ENGR 1100: Survey of Engineering Applications from Mathematics
* IET 4451: Systems Simulation

**Semester Project Began: Spring 2020**

**Final Semester of Implementation: Spring 2021**

**Total Number of Students Affected During Project: Course Enrollment**

|  |  |  |
| --- | --- | --- |
| Enrollment | Fall 2020 | Spring 2021 |
| **ENGR 1100** | 49 | NA |
| **IET 4451** | 38 | 35 |

Note: The no-cost learning for ENGR1100 was taught in Fall 2020 as it is not currently offered in Spring 2021. The no-cost learning for IET 4451 was taught in both Fall 2020 and Spring 2021.

# Narrative

* 1. *Describe the key outcomes, whether positive, negative, or interesting, of your project. Include:*
* *Summary of your transformation experience, including challenges and accomplishments*
* *Transformative impacts on your instruction*
* *Transformative impacts on your students and their performance*

We have developed and implemented no-cost-to-student learning material for the two proposed courses (ENGR 1100 and IET 4451). The learning material will be hosted on OpenALG (<https://alg.manifoldapp.org/> ). Total of 122 students have been impacted by our efforts. Class surveys are conducted in Dec, 2020 in each course using a 5-point Likert scale (1=Strongly disagree, 5=strongly agree) on students’ opinion on the no-cost learning material. The results summarized in the table 1 below indicate students’ feedback are overwhelmingly positive. Based on our assessment data, the no-cost learning materials we developed are as effective as the textbooks used previously in the corresponding courses

Table 1: Students’ feedback on no-cost learning material

|  |  |  |  |
| --- | --- | --- | --- |
| Statement | ENGR 1100 | IET 4451 | Average |
| I was satisfied with the quality of the no-cost materials provided in this course. | 4.91 | 4.77 | 4.83 |
| The no-cost materials in this course helped ease my financial burden as I pursue my college degree. | 4.91 | 4.77 | 4.84 |
| I would recommend to other students that taking a course with low cost, no cost materials provide the same or better quality of education versus taking a course with traditional textbook materials. | 5.00 | 4.69 | 4.83 |
| The content, links and other learning module materials were sufficient to help me learn. | 4.82 | 4.84 | 4.84 |
| I feel that learned more in this course using the instructor’s low-cost, no-cost materials included in this course versus using traditional textbook materials. | 4.36 | 4.00 | 4.17 |

Both ENGR 1100 and IET 4451 course material involves hands-on programming skills (MATLAB for ENGR 1100, and ARENA for IET 4451). From instructors’ perspective, developing learning materials by ourselves enables us to better adapt to the evolving and dynamic nature of programming field. At the same time, successful transformation activities require significant efforts from the instructors. We are thankful for the strong support from ALG to make it happen. The success of this project not only benefit students in both ISYE and IET program, but also increases the visibility of ALG in ISYE department.

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

Below are some of the lessons from the two courses covered in this grant.

|  |  |  |
| --- | --- | --- |
| Course | What worked well | What would do differently |
| **ENGR 1100** | The no-cost learning material eliminates the textbook that would have been used in the course. The resources from YouTube, online repository was well received by the students. | Provide more guidance to students during their term projects. |
| **IET 4451** | The hands-on simulation examples helped students understand the simulation techniques. Students have favorable evaluation of the no-cost learning material. | Make some of the HW assignments individual, rather than group, assignments. |

# Quotes

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

**Quotes for ENGR 1100:**

“I think this no-cost learning material is quite efficient and help to reduce the costs needed to purchase a textbook that can be allocated elsewhere. This teaching method also allows the instructor to understand and identify areas where students are having difficulty.”

**Quotes for IET 4451:**

“For this course, my instructor's lectures and course notes were much easier to understand than Arena textbook (which I rented virtually due to cost).”

“We appreciate this approach financially, but it also is a better way for us students to learn I believe as well.”

# Quantitative and Qualitative Measures

## Uniform Measurements Questions

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

**Student Opinion of Materials**

**Was the overall student opinion about the materials used in the course positive, neutral, or negative?**

Total number of students affected in this project: \_\_\_122\_\_\_

There are total of **25** students completed the survey.

* Positive: \_\_\_\_80\_\_\_ % of \_\_\_\_20\_\_\_\_ number of respondents
* Neutral: \_\_\_12\_\_\_\_ % of \_\_\_\_\_3\_\_\_ number of respondents
* Negative: \_\_\_\_8\_\_\_ % of \_\_\_\_\_2\_\_\_ number of respondents

**Student Learning Outcomes and Grades**

**Was the overall comparative impact on student performance in terms of learning outcomes and grades in the semester(s) of implementation over previous semesters positive, neutral, or negative?**

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

The overall comparative impact on student performance in term of learning outcomes and grades are positive. In both courses, sections using no-cost material have higher average GPA than the sections using traditional textbook.

|  |  |  |  |
| --- | --- | --- | --- |
| Course |  | Student average GPA | |
|  | **Enrollment** | **Semester with no-cost material** | **Semester with textbook** |
| ENGR 1100 | 49 | 3.45 | 3.28 |
| IET 4451 | 73 | 3.24 | 3.09 |

Choose One:

* \_X\_ Positive: Higher performance outcomes measured over previous semester(s)
* \_\_\_ Neutral: Same performance outcomes over previous semester(s)
* \_\_\_ Negative: Lower performance outcomes over previous semester(s)

**Student Drop/Fail/Withdraw (DFW) Rates**

**Was the overall comparative impact on Drop/Fail/Withdraw (DFW) rates in the semester(s) of implementation over previous semesters positive, neutral, or negative?**

**Drop/Fail/Withdraw Rate:**

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

For ENGR 1100, the DFW rate comparison is between Fall 2020 (semester with no-cost material) and Fall 2019 (semester with traditional textbook). There are two students who withdrew the course early on in Fall 2020. If we focus only on the failure rate for students who complete the entire semester, then the percentage is neutral (2.0% for the semester with no-cost material, and 2.8% for the semester with textbook).

For IET 4451, during Fall 2020, we had 38 students complete the course and 4 withdrawals. During Spring 2021, 35 students completed the course and 7 students withdrew. There were no Drop/Fail students in either the Fall 2020 or Spring 2021 semesters.

Please note that there is significant impact on the course modality due to Covid19 pandemic where Fall 2020 is completely virtual learning.

|  |  |  |  |
| --- | --- | --- | --- |
| Course |  | Drop/Fail/Withdraw Rate Comparison | |
|  | **Enrollment** | **Semester with no-cost material** | **Semester with textbook** |
| ENGR 1100 | 49 | 6.1% | 2.8% |
| IET 4451 | 73 | 13.1% | 0% |

\_\_\_\_8.1\_\_\_% of students, out of a total \_\_122\_\_\_ students affected, dropped/failed/withdrew from the course in the final semester of implementation.

Choose One:

* \_\_\_ Positive: This is a lower percentage of students with D/F/W than previous semester(s)
* \_X\_ Neutral: This is the same percentage of students with D/F/W than previous semester(s)
* \_\_\_ Negative: This is a higher percentage of students with D/F/W than previous semester(s)

## Measures Narrative

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

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

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

In this project, we measured the success of our transformative efforts based on both the quantitative data and qualitative data. In terms of quantitative analysis, we compared students’ DFW rates, grades, and success in learning objectives. The DFW rates are taken from student registration system. The student grades and success in learning objectives are assessed Faculty Course Assessment Report (FCAR) which includes students’ grade and success in achieving the learning outcomes. The qualitative analysis is based on a survey we developed to collect students’ feedback on the learning materials used in the courses. Students rated their experience using a 5-point Likert scale (1=strongly disagree, and 5= strongly agree). Students were also given the opportunity to enter any comments they may have. A copy of the survey results is attached separately.

Based on the assessment data we collected, the learning materials we created offered the same level of the learning effectiveness as the textbooks. Students’ performance outcomes and DFW in general stayed neutral. One factor that is potentially affecting the DFW rate is the course modality change due to COVID-19.

The student learning outcomes are listed as follows.

|  |  |
| --- | --- |
| Course | Student Learning Outcome |
| **ENGR 1100** | By the end of this course, students will be able to:   * Apply basic concepts of Linear Algebra for vector and matrix operations, * Input vectors and matrices in MATLAB, * Perform 2D and 3D plotting, * Formulate and solve systems of linear equations by Gaussian elimination, and matrix inversion, * Write conditional statements and loops, * Write Scripts and functions in MATLAB, * Solve some engineering problems using MATLAB, * Apply the fundamental knowledge of mathematics, science & engineering, to solve the real engineering problems (through case studies). |
| **IET 4451** | By the end of this course, students will be able to:   * Apply probability and statistics concepts to perform input data analysis, random variable generation, and output data analysis in simulation models. * Illustrate complex, real-life industrial systems using computer simulation methods. * Construct simulation models using advanced simulation software. * Discuss simulation results through written reports and oral presentations. |

# Sustainability Plan

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

To ensure that no-cost learning material resources developed for these courses are sustainable, Dr. Li and Dr. Keyser both remain as the course coordinator as well as the instructor-of-record. They will make continuous improvement on these courses as they teach, revise and update the course material each semester.

# Future Affordable Materials Plans

*Describe any impacts or influences this project has had on your thinking about or selection of learning materials in this and other courses that you will teach in the future.*

The ALG project provides a rewarding experience for both the instructors as well as students. The positive feedback from students inspire faculty to investigate more opportunities of incorporating no-cost material in ISYE curriculum to better support students’ success.

# Future Scholarship Plans

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

Dr. Li and Dr. Keyser are working on a paper “Investigating the effectiveness of no-cost learning material for ISYE courses” which will be submitted to an education journal soon.

# Description of Photograph (optional)

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