Affordable Learning Georgia Affordable Materials Grants  
Textbook Transformation Grants Final Report

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 events.

# General Information

**Date:** 12/23/2020

**Grant Round:** 14

**Grant Number:** 501

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

**Project Lead:** Paola Spoletini

**Team Members (Name, Title, Department, Institutions if different, and email address for each):** Paola Spoletini, Professor, Department of Software Engineering and Game Design, [pspoleti@kennesaw.edu](mailto:pspoleti@kennesaw.edu), and Reza Parizi, Assistant Professor, Department of Software Engineering and Game Design, [rparizi1@kennesaw.edu](mailto:rparizi1@kennesaw.edu)

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

SWE 6613 – Requirements engineering,

SWE 6673 – Software Testing and Verification

SWE 6883 – Formal Methods

**Semester Project Began:** Fall 2019

**Final Semester of Implementation:** The complete data per SWE 6673 will be collected in Spring 2020, while the data for SWE 6883 will be collected in Fall 2021. The course transformation has been finalized by Fall 2020.

**Total Number of Students Affected During Project:** 100 (for the previous instances of SWE 6613 and SWE 6673) and expected additional 20 students for SWE 6883.

# 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*

The courses considered in this grant are (a) 2 of the main pillars of our MS SWE (SWE 6613 - Requirements Engineering and SWE 6673 - Software Testing and Verification), and a popular elective (SWE 6883 – Formal methods).

Many traditional books to cover these fundamental disciplines exist, but, given the fast-evolving discipline, not only books represent a considerable expense for the students, but they also tend to become obsolete very soon, making the expense often not worth it.

Another issue with the existing textbook is that very rarely a textbook contains all the relevant content covered in the course and students might end up buying a textbook and just use a small percentage of it. A student as feedback for SWE 6613 reported “When I've had required texts, I've found that either they are exact duplicates of what the instructor has in their materials, or the text is largely irrelevant. In either case, I've found myself having to read 50-100+ pages per week without gaining much. It is more beneficial to make these texts optional so that students who want the additional resource can use it if they want to.”

For these reasons, in this project, we have developed free-cost materials for these three major courses to both make our program more affordable and also improve the quality of the students’ experience.

Because of the intrinsic nature of these disciplines, we have decided to produce, collect, and provide 3 different types of material: (1) Material for interactive, highly hands-on activities, (2) Slides, links to external reading, recorded lectures, and link to talks, and (3) research material.

Producing material for sustainable hands-on activities has been very challenging. To overcome the need for external support we made many of these activities as role-playing activities in which students either interact with each other or with the instructors. We also provided videos and material for students to reflect and learn from these experiences. This kind of material was particularly needed for SWE 6613 (for example to teach requirements elicitation interviews), but we have added such activities also in SWE 6673 (code inspection) and SWE 6883 (Formal specification analysis).

For the most traditional material, we relied on both online resources and in-house developed material.

Finally, we created activities around the most fundamental research papers in the disciplines covered in the course as well as a research project for the students to investigate the latest research discovery in the field.

While there were no significant improvements in the course grades, students' feedback for SWE 6673 and SWE 6613 was extremely positive. It is important to notice that both Spring and Fall 2020 have been affected by COVID-19 (and this could be the explanation for the higher number of W than in previous offerings).

In a previous grant, we converted SWE 6623 and SWE 6733 as no-cost courses, with these additional courses we are halfway to provide a no-cost path for our MS SWE.

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

During this experience, we have learned many things. On the positive side, we have noticed that the effort put into making the courses no-cost was well perceived by the students, not only because of the saving but also (and especially) because of the quality of the provided experience.

Preparing hands-on experiences that (1) can be replicated every year, (2) do not require special arrangements, and (3) provide a meaningful learning experience, is extremely difficult. We have learned that not all the topics can be taught using this tool and that sustainability needs to be kept in mind during the whole development process.

# Quotes

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

*“Books were not missed! The class (SWE 6613) was very interactive and practical assignments and exercises allowed me to learn more than from a book (and without spending a cent).”*

*“Good lecture materials (slides, recordings, etc.) have done my experience meaningful, enjoyable and inexpensive. Textbooks can beneficial as optional so that students who want the additional resource can use it if they want to.”*

*“The classwork on interviews and analysis of online reviews have been engaging and beneficial. The offered material was novel and not available in textbooks!”*

# 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: \_100\_\_\_\_\_\_\_\_\_

* Positive: \_100\_\_\_\_\_\_ % of \_\_100\_\_\_\_\_\_ number of respondents
* Neutral: \_\_\_\_0\_\_\_ % of \_\_\_\_0\_\_\_\_ number of respondents
* Negative: \_\_\_0\_\_\_\_ % of \_\_\_0\_\_\_\_\_ number of respondents

**Student Learning Outcomes and Grades**

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

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

Choose One:

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

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

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

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

\_\_\_\_10\_\_\_% of students, out of a total \_100\_\_\_ students affected, dropped/failed/withdrew from the course in the final semester of implementation.

Choose One:

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

The courses targeted in the project were developed to be in full effect in 2020. In particular, SWE 6673 has been offered in Spring 2020, and SWE 6613 has been offered in Fall 2020. Because of the changes connected to COVID-19, we did not offer SWE 6883 (it is now planned for Fall 2021), but the course has been completed and it is ready to be evaluated.

SWE 6613 and SWE 6673 in 2020 had in total of 100 students; two third took the course online (SWE 6673 was fully moved online in the middle of the semester). As in our previous project, to avoid that the modalities affected the impact of the modifications, we developed an online shelf for each course, and the on-campus sections use exactly the same shelf provided in D2L. Thanks to this choice, the modality in which the courses were taught did not affect the success rate, which was equivalent independently from the modality. This also helped the students registered in the on-campus section when the course was moved fully online.

Using as a baseline the success rate of the courses interested in the project in 2019, we noticed that the rate of positive grades ((#As + #Bs) / total number of students) decreased a little when Ws are included, but improved when excluded. This is because the number of withdrawals increased in 2020. we believe that this is connected to COVID-19 and how it affected everyone’s life.

With and without Ws, the percentage of A increased in both courses. This might be motivated by the more engaging nature of the developed material.

In Fall 2020, we had online meetings with students (almost once a week) and we use them to gather feedback about the material. During these conversations, students stated that they appreciated the course structure and the material. They also said that the engaging nature of the material helped them to keep working on the course in these difficult times.

As in our previous project, we collected students’ opinions also in a more systematic way both through a questionnaire and unstructured interviews. Some of the questions we covered are the following:

1. Would have you preferred to have a traditional textbook?

2. During the semester did you feel the need for additional material?

3. Was the course actual?

The majority of the students were fully satisfied with the courses and did not express the need of additional material

We have also equipped our courses with an evaluation survey per module so that the students could provide feedback in a more detailed way. The feedback we received was always positive. In the surveys, they pointed out their favorite activities and what they liked. This will be particularly useful in developing new courses.

# 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.*

Our programs follow a 3-year evaluation plan (i.e., each course is evaluated in a collegial way at least once every 3 years). In addition,

* Each course has a coordinator who collects the instructors and the students’ feedback;
* The course instructor has to prepare a course evaluation to analyze the student’s performance (in all the offered sections he/she teaches), which also include general consideration about the course, its goal, problems related to it, and possible improvement measures;
* Each course is evaluated by students through a course evaluation form that also evaluates the provided material.

These collective mechanisms provide the information needed to evaluate the courses’ content and update them in a continuous way. The course coordination is distributed fairly among faculty members, so this will not overload any faculty member that was already invested as responsible for a set of courses before the introduction of zero-cost courses.

To make the update process more sustainable, the courses have been equipped with both an instructor's manual and a course manual. The instructor manual explains to new instructors how to teach and personalize the courses, while the course manual clearly explains how to update certain activities when needed.

# 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.*

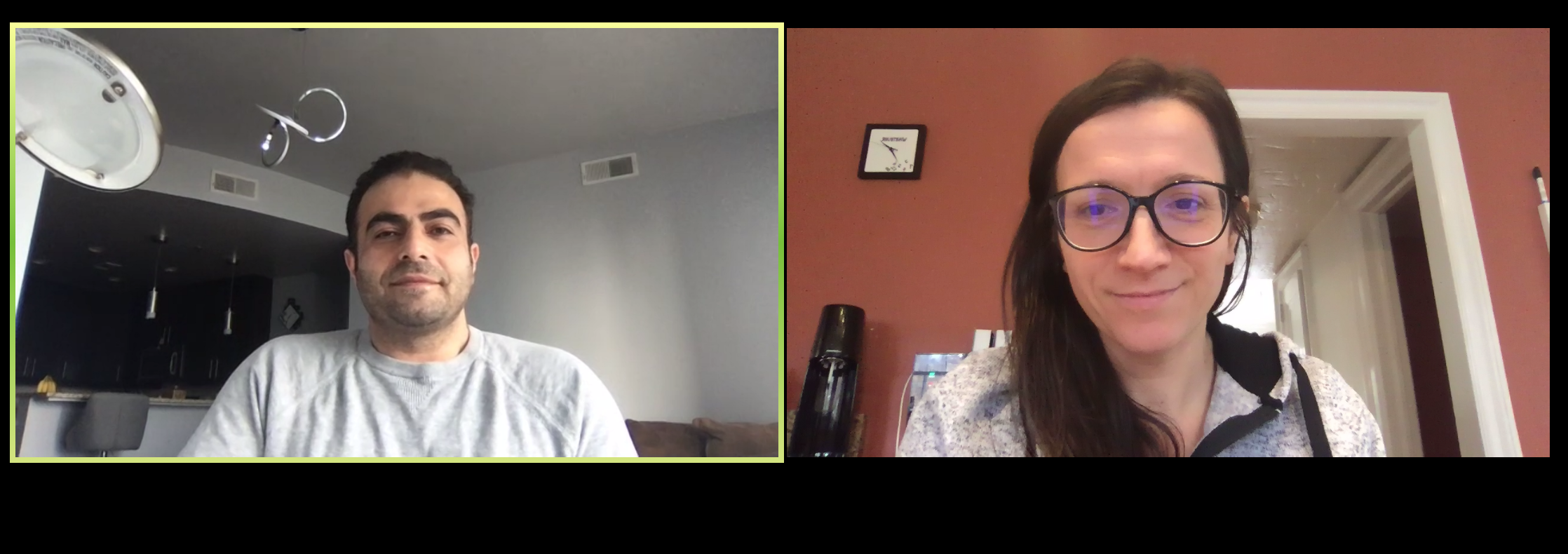
“Forcing us” to collect continuous feedback from the students helped us to monitor their engagement and what they “like” and what they don’t. Moreover, the planning of material that needs to be actual and needs to remain so helped us to adopt a strategic plan for developing course material. We believe that in course planning, we need to keep in mind (1) the foundational material to include - this rarely changes in terms of content, but can be taught with the addition of hands-on activities, and (2) the current technologies and topics that are relevant for the industry and make the course useful and interesting for the students, together with the “rules” needed to monitor this content and its need to updates. Moreover, after this experience, we will always develop a course manual with the guidelines to maintain the course.

# 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.*

The results of this research-led study are expected to be published in Education Conferences and those connected to SWE 6613 in Requirements Engineering Venue.

# Description of Photograph (optional)



PIs in a Zoom’s meeting