­­­­­Affordable Materials Grants, Round 19:

Continuous Improvement Grants

(Spring 2021 -Spring 2022)

Proposal Form and Narrative

# Applicant and Team Information

|  |  |
| --- | --- |
| Requested information | Answer |
| Institution | Georgia Gwinnett College |
| Applicant name | Sairam Tangirala |
| Applicant email | stangira@ggc.edu |
| Applicant position/title | Associate Professor |
| Submitter name | Cathy Hakes |
| Submitter email | chakes@ggc.edu |
| Submitter position/title | Executive Director of Research, Sponsored Programs & Accreditation |

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.

|  |  |  |
| --- | --- | --- |
| Team member | Name | Email address |
| Team member 1 | Skanda Vivek | svivek@ggc.edu |

**Project Title:** Instructor's Resources for An Existing "Science of Everyday Materials" OER

# Project Information

| Requested information | Answer |
| --- | --- |
| Type of Project | Creation of ancillaries for existing OER courses |
| Requested Amount of Funding  *$10,000 maximum total award per grant* | $5,238 |
| Course Titles and Course Numbers | Physical Science-Science of Everyday Materials, PSCI 1101K |
| Final Semester of Project | Spring 2022 |
| Currently Existing Resource(s) to be Revised/Ancillaries Created  *Please provide a title and web address (URL) to each of the currently existing resources that you are revising, creating new ancillary materials for, or replacing. If replacing, please include a title and web address (URL) to the new OER as well.* | Science of Everyday Materials  <https://alg.manifoldapp.org/projects/science-of-everyday-materials> |

Link to the ALG-Funded Course:

https://alg.manifoldapp.org/projects/science-of-everyday-materials

**1. Project Goals**

The project goal is to design and create instructional resources that may be made available to other instructors to reduce the barrier to adopting our existing OER. In particular, we plan to create the following instructor's resources to be used with existing “Science of Everyday Materials” ALG content:

1) Repository of power point lectures

2) Repository of Laboratory protocols

3) Repository of quizzes and tests

4) Repository of sample Homework

5) Sample course assessment tool

Creating and teaching science courses for non-science majors is a challenge (1). The non-science major's physical science course PSCI1101K-"Science of Everyday Materials" and its online ALG's OER text was designed and authored by us (applicants) for increasing an appreciation and respect towards science. We carefully designed the syllabus of this lab-based course by selecting instructional content to explain the fundamental science concepts that determine the properties of materials encountered in everyday life. This course covers a wide range of scientific concepts and methodologies encountered in everyday life that ranges from science fundamentals relevant in atomic-length scales to more frequently experienced length-scales of traffic jams.

At GGC, non-science major classes such as PSCI1101K draws students with diverse academic interests from Schools of Business, Education, Health Sciences, and Liberal Arts. Moreover, this course has very limited pre-requisites of “Quantitative Skills and Reasoning” and “English Composition-I” and students may not have any relevant science background at all. While science majors take multiple courses across scientific disciplines and obtain a solid scientific worldview through these exposures, non-science majors take a couple of science courses (2) during their entire undergraduate study. Additionally, instructors cannot assume student interest for granted in this course as its students are non-science majors. Consequently, instructors may need to prevail over these roadblocks to effectively achieve the course goals.

To engage its non-science student audience, by design, the course content is interdisciplinary and includes an interesting mix of material science, physics, and chemistry. David Hawthorne, director of education and outreach at the national socio-economic center at University of Maryland says one of the most important learning outcomes of his course on teaching non-science students about pollination is “detail distillation” (3) - Students learn that every complex problem has a simple solution (which could be right or wrong depending on the application). For college instructors whose focus is on teaching science courses to non-majors, there is no well-defined pedagogical path. We have learned from our combined experience of teaching 9 sections of this course, that there is an opportunity for us to support other instructors interested in adopting this course. With our guidance, we feel that other instructors can be successful in achieving the goals of the course. Research has found that learning science in the everyday context is more relevant to their out-of-school lives and students demonstrate increased motivation and interest in learning (4).

In Round 16 of the Affordable Learning Materials Grant, we published a textbook using OER content as an on-line alternative textbook (at [ALG's website](https://alg.manifoldapp.org/projects/science-of-everyday-materials)). We have had a tremendous participation and success in the engagement generated with our OER. Using our 5-point Likert scale based quantitative surveys, we present a couple of observations that motivated us to apply for this continuous improvement grant.

1. Would you recommend the online text resource to your peers?

**Yes:** 82.42 %

1. The content serves as a resource for learning about the science of everyday materials. **Yes:** 80.3 %

In fall 2020, from Table-1, we learned that our OER had a good reception from a total of 5 sections and 76 survey respondents. We have identified avenues of improving the effectiveness of our OER text by:

* increasing student recommendation of the OER material (# 1) and
* providing additional instructor’s resources to supplement OER content’s and thereby increasing its efficacy of serving as a go-to resource (# 2)

Our active participation in professional conferences and engagement with participants has also been helpful in planning for this grant. We presented our OER content at conferences below and gathered pointers about what would make it easier for its adoption by other instructors.

**Conference Name:**

* Open Education Conference- Nov 2020
* Joint North Carolina Section and Southern Atlantic Coast Section of American Association of Physics Teachers Virtual Fall Meeting – Nov 2020
* Georgia Gwinnett College Teaching, Learning, and Research Symposium – Jan 2021

**Feedback from Conference Attendees:**

* There is a need for creating instructor’s resources for easy and quick adoptions by other faculty
* It may be advantageous to create Learning Management System (LMS) based course modules containing instructor’s resources
* Creating multiple format LMS modules may increase the adoption across several LMS platforms
* Following modules may be created to supplement existing OER
  + Sample Quizzes
  + Sample Question Library
  + Sample Exams
  + Sample Homework
  + Sample Lab protocols
* Making above LMS components available as a part of OER at ALG’s website
* Creation of assessment tool for the course for future course development

In this proposal, **we plan to take a step further and to create and design instructional resources that are made available to other instructors to reduce the barrier to adopting our existing OER.** To create a wider adoption of OER content for any course, we believe that it is crucial that the instructors have open access to importing a set of LMS course modules into their respective courses at their respective academic institutions. This requires a creation of resources listed above in a format that is not specific to a LMS platform. While exploring Desire2Learn (D2L) LMS platform used at GGC, we learned that D2L provides a functionality of creating and exporting LMS content into components/modules that may be compatible with multiple LMS platforms that are supported by [IMS Global Learning Consortium](https://www.imsglobal.org/).

The collection of proposed (above) ancillary materials are intended to serve as an independent, self-contained resource that includes chapter/section references to our “Science of Everyday Materials” [ALG textbook](https://alg.manifoldapp.org/projects/science-of-everyday-materials). This will provide an easy way for the interested instructors to use our OER resource effectively and provide the flexibility to modify the content using their respective LMS platform.

**Deliverables:** The ancillary OER materials that are proposed above (#1 to #4) will be packaged in two formats noted below for easy instructor adoption. These materials will be added for download at the ALG’s website that hosts our “Science of Everyday Materials” [ALG textbook](https://alg.manifoldapp.org/projects/science-of-everyday-materials)

* + Microsoft Office Suite compatible files
* D2L (LMS) platform’s exported components which may be directly imported by instructors into their LMS. Exported course modules are compatible for direct import into Desire2Learn and other LMS platforms compatible with [IMS Global Learning Consortium](https://www.imsglobal.org/)

**2. Action Plan**

**Detailed Task Description**

We propose to complete the creation of ancillary materials for our existing OER by completing the following tasks:

1. To carefully go over the course goals and existing pedagogical research to identify and/or create a set of course assessment questions which may serve as a metric for evaluating the course goals.
2. Prepare a limited set of example conceptual questions, word problems, clicker-questions recommended for promoting active learning in-class.
3. To develop a set of lab protocols by keeping the course’s spirit of “everyday materials” in midst of all lab protocols.
4. Prepare a list of recommended demonstrations that may be performed in class.
5. Create a set of homework questions.
6. Create a set of exams.
7. Re-visit our past semester sections of this course and identify topics where students needed additional support and create a pool of homework and in-class examples to promote learning of identified topics.
8. Classify all assessment questions as multiple choice questions conceptual questions, word problems, True/False, and other type of questions.
9. Prepare and curate a course content-specific list of existing web-based instructional videos, simulations, etc. that may be directly used by other instructors.
10. Create a list of reference textbooks that may be used to supplement the instructor’s resources and the online OER.
11. Create two sets of instructor’s resources:
    1. Microsoft Office Suite compatible.
    2. D2L (LMS) platform’s exported components, which may be directly imported by instructors into their LMS.

**Role of Each Team Member**

Drs. Sairam Tangirala and Vivek are experts in the science of materials. Dr. Vivek conducted his PhD on experimental squishy materials. He has performed numerous demonstrations at the Atlanta science festival as well as for K-12 students on squishy materials like cornstarch in water, and making huge soap bubbles. In addition, Dr. Vivek’ s research on physics of traffic in the connected era has been featured across numerous popular outlets including Forbes, Ars Technica, Nature, etc. Dr. Tangirala is has experience with topics in condensed matter physics, and in particularly simulation aspects. Apart from this, Dr. Tangirala has been involved in scientific outreach and teaching non-technical audiences for more than a decade.

Drs. Vivek and Tangirala will draw from their technical experience in condensed matter, and teaching diverse non-technical students at GGC to create novel content on the science of everyday materials, which is readable and accessible to non-science majors. The roles for designing the ancillary content reflect on Dr. Vivek and Dr. Tangirala’ s expertise as well as their passion and experience in teaching and giving demonstrations to non-technical audiences. Both Drs. Vivek and Tangirala will work on writing materials. Dr. Tangirala will take the lead in accomplishing the project’s evaluation plan, including the creation of surveys and both plan to collect and analyze the collected survey data.

The goals of this proposal have been clearly defined and well within the technical, and pedagogical expertise of both the applicants. For this reason, the specific division of work is expected to be flexible and to take into account the subject-expertise, and workloads of the applicants in the next academic year. For example, Dr. Tangirala is the subject matter expert and instructional designer for the PSCI 1101 theme course. He will design materials for topics related to phases of matter, liquid crystals, DNA, and scientific visualization. Dr. Vivek is the subject matter expert and instructional designer for the PSCI 1101 theme course. He will design materials for chapters on viscoelastic materials, colloids, soap bubbles, and traffic.

**Plans for open licensing materials**

We plan to follow open licensing agreements encouraged by ALG.

**Plans for making materials accessible**

The final product will comprise of LMS compatible course modules that will be created by using Desire2Learn platform’s “export component” feature. According to Desire2Learn’s Import/Export/Copy Components tool, the exported modules are available in formats compatible with Desire2Learn and other LMS platforms compatible with [IMS Global Learning Consortium](https://www.imsglobal.org/). According to Desire2Learn’s Accessibility Compliance [webpage](https://www.d2l.com/accessibility/standards/), “Under the Accessibility for Ontarians with Disabilities Act (AODA) 2005, we also have a Multi-Year Accessibility Plan (2014 – 2021) for D2L’s public-facing websites.”

**3. Timeline**

*Provide a project timeline aligned with the action plan above. Include major milestones and deadlines, keeping in mind your selected Final Semester.*

This project is scheduled from Spring 2021 to Spring 2022. The proposed work is planned to begin in April 2021 (after the ALG kick-off date), continue during Fall 2021, and end on 05/16/2022

**April – May 03: Spring 2021**

*Action Plan:*

Applicants continue to teach PSCI1101K-Science of Everyday Materials course and collect student feedbacks, assess student learnings and identify topics of instructor’s resources

*Milestones:*

• Prepare schedule of periodic meetings during Summer 2021

• Identify topics, labs that need additional instructional support based on student feedback

*Deadline:* May 17, 2021

**June – July 2021: Summer 2021**

*Action Plan:*

• Applicants will work independently on the items (#1 – #4) listed under “Detailed Task Description”

• Applicants will update each other during periodic meetings

*Milestones:*

• Prepare drafts of course assessment metrics

• Prepare a draft of a set of active learning in-class questions

• Prepare a draft of in-class demonstrations

*Deadline:* July 28, 2021

**Fall 2021 semester**

*Action Plan:*

• Applicants will plan for Fall 2021 schedule

• Applicants will work independently on the items (#5 – #8) listed under “Detailed Task Description”

• Applicants will update each other during periodic meetings

• Identify and attend professional conference-1

• Submit ALG report

*Milestones:*

• Prepare schedule of periodic meetings during Fall 2021

• Finalize content from task#2 and upload at ALG website

• Prepare drafts for identified tasks#3

*Deadline:* Dec. 20, 2021

**Spring 2022 semester**

*Action Plan:*

• Applicants will plan for Spring 2022 schedule

• Applicants will work independently on the items (#9 – #11) listed under “Detailed Task Description”

• Applicants will update each other during periodic meetings

• Identify and attend professional conference-2

• Submit ALG report

*Milestones:*

• Prepare schedule of periodic meetings during Spring 2022

• Finalize content from task#3 and upload at ALG website

• Prepare drafts for identified action plans

• Finalize remaining tasks and upload content at ALG’s website

*Deadline:* May 16, 2022

**4. Budget**

Type of Grant: Continuous Improvement Grant

Amount Requested: $5,238

Justification: Materials needed for the creation of ancillaries for existing OER course and associated travel to professional conferences.

**A. INDIVIDUAL AWARD (Max allowed per person is $2,000): $5,238**

**1. Dr. Sairam Tangirala, Associate Professor of Physics,** will serve as a PI. He is the subject matter expert and instructional designer for the PSCI 1101 theme course. He will serve as project manager and also share the design, creation, evaluation, and hosting roles of ancillary materials He will design materials for topics related to phases of matter, liquid crystals, DNA, and scientific visualization. In addition, he will take the lead in accomplishing the project’s evaluation plan, including the creation of survey and both plan to collect and analyze the collected survey data.

* Summer Pay: $1,711.01
* Fringe Benefits: $288.99. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total: $2,000**

**2. Dr. Skanda Vivek, Assistant Professor of Physics,** will serve as co-PI. Dr. Vivek is the subject matter expert and instructional designer for the PSCI 1101 theme course. He will share the design, creation, evaluation, and hosting roles of ancillary materials. Content wise, he will design materials for chapters on viscoelastic materials, colloids, soap bubbles, and traffic.

* Summer Pay: $1,711.01
* Fringe Benefits: $288.99. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total: $2,000**

**3. Student Assistant:** One student will be interviewed and engaged in helping to create, edit, review, proof-read, and to perform work related to the proposed ancillary material’s creation.

* Pay: $1,238 based on rate $8.25/hr. for a total of 150 hours (5 hrs./week x 30 weeks)

**Total: $1,238**

**C. Total Budget Requested $ 5,238.00**

# **REFERENCES**

1. **Pain, Elisabeth.** Teaching Science to Nonscience Majors. *Science.* [Online] https://www.sciencemag.org/careers/2010/04/teaching-science-nonscience-majors.

2. *Implications of Learning Research for Teaching Science to Non-Science Majors.* **Eugenia Etkina, Jose P. Mestre.** 2004, SSI-2004.

3. **Hawthorne, David.** More than Honey: Teaching Science for Non-majors. [Online] https://www.sesync.org/blog/science-for-nonmajors.

4. *Learning Science Through Real-World Contexts.* **Donna King, Stephen Ritchie.** s.l. : Second International Handbook of Science Education, 2011.

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# Letter of Support

Dr. Sonal Dekhane

Interim Dean

School of Science and Technology

# Grants or Business Office Letter of Acknowledgment

Dr. Cathy Hakes

Executive Director

Office of Research, Sponsored Programs & Accreditation