



GETSI Phase 2 - IUSE 2019 Annual Report - UNAVCO

Collaborative Research: Implementing 21st century geodesy learning through faculty development and expanded applications of data to societal issues

Project Period: 08/01/2017-07/31/2020

Reporting Period: 08/01/2019-07/31/2019

Principal Investigators: Meghan Miller (PI), Donna Charlevoix (Co-PI), Beth Pratt-Sitaula (Co-PI)

Sponsor: NSF DUE-IUSE

Award ID: 1725347

Collaborators: Bruce Douglas (Indiana University), Rebecca Walker (Mt San Antonio College)

The screenshot shows a webpage for a GETSI module. At the top, it says "GETSI's Earth-focused Modules for Undergraduate Classroom and Field Courses" with a "Download" button. Below that is a "Learn More" button. The main title is "Measuring the Earth with GPS: Plate Motion and Changing Ice-Water". There is a progress indicator with numbers 100, 200, 300, and 400, and the text "Intro Level". A diagram shows a timeline from 100 to 400 with a bracket indicating "2-3 Weeks" and "4 Units". The authors listed are Karen M. Kortz (Community College of Rhode Island), Jessica J. Smay (San Jose City College), and Editor: Beth Pratt-Sitaula (UNAVCO). The background image shows a mountain landscape with a yellow dome and solar panels. A "Summary" box is visible at the bottom of the screenshot.

Summary

Although GPS's first widespread use by geoscientists was to track plate motions, geoscientists have found that GPS can also be used to measure local movement due to changes in the amount of water, snow, and ice. This module guides students to read GPS graphs as scientists do, and use their interpretations of that data to support recommendations that address societal issues related to earthquakes, water resources, and glacier melting. Its flexible use, as in-class group work, homework, and lab activities, provide approximately two weeks of instruction that can be used in sequence, scattered throughout the semester, or used as individual, stand-alone pieces.

On the GETSI Phase 2 modules about to be published – “Measuring the Earth with GPS”. It features applications of GPS data for plate tectonics, earthquake hazards, climate change, and water resources at a level appropriate for introductory undergraduate earth science courses.

Accomplishments

What are the major goals of the project?

GETSI (GEodetic Tools for Societal Issues) is a curriculum development and dissemination project to increase the use of geodetic data by both introductory and majors-level undergraduate students. This grant is for GETSI Phase 2, which continues the work started under a TUES Phase 1 “exploratory” grant.

Over the last two decades, technical advances in geodesy – the study of the size, shape, and mass of the Earth and their changes with time – have revolutionized our understanding of Earth processes and produced discoveries of major societal impact related to climate change, water resources, natural hazards, and environmental change. Overall, teaching resources and textbooks have simply not kept pace with advances in geodesy, both for introductory and upper division undergraduate courses.

Overarching Objectives

1. Improve geoscience (particularly geodetic) knowledge base of undergraduate students both for general science literacy (introductory) and future science workforce (majors-level).
2. Improve effectiveness of teaching resources and pedagogy employed by faculty members teaching geodesy, geoscience, and allied science and engineering fields.

GETSI Phase 2 Outputs

1. Development, testing, revision, and publication of six more curricular modules featuring geodesy data investigations applied to critical societal issues and supporting Earth science, climate, and quantitative literacy at both the introductory and upper division levels in diverse academic settings.
2. Extensive faculty professional development and module dissemination to ≥ 450 instructors through in-person and virtual short courses.
3. Educational research on the process of adaption and adoption of online undergraduate curricular materials to better serve students and instructors.
4. Educational research on the challenges and benefits of building curricular materials that serve both geoscience and allied engineering and science undergraduates.

GETSI Phase 2 Outcomes

1. Students:
 - a. Are able to apply authentic geodetic data and quantitative reasoning to scientific questions
 - b. Have improved understanding of nature, methods, and communication of science
 - c. Gain Earth and climate science literacy and the ability to apply them to critical resource, hazard, and environmental issues
2. Faculty
 - a. Adopt developed GETSI curricular modules
 - b. Have improved knowledge of geodetic methods
 - c. Include more connections between authentic data and addressing of critical societal issues
 - d. Increase use of promising pedagogical practices in STEM education (e.g.,

NRC, 2015)

3. Educational research:
 - a. Better knowledge of process by which instructors adapt and adopt online resources
 - b. Improved understanding of the relationship between teaching practices and materials adoption.
 - c. More capabilities to develop teaching resources that bridge between geodesy learning and other STEM disciplines

What was accomplished under these goals?

Major Activities

GETSI is partnered with the SERC (Science Education Resources Center) InTeGrate project (Interdisciplinary Teaching about Earth for a Sustainable Future) for curriculum design. SERC is providing assessment consulting, independent evaluation, and webhosting.

Progress towards the major project outcomes is:

- Output #1 Module Development - significant progress; only slightly behind schedule
- Output #2 Dissemination - underway and on schedule
- Output #3 Research on Use - feedback survey collection underway and on schedule
- Output #4 Research on Transfer - not started; scheduled to be done in Year 3

The report from SERC, the external evaluator, also provides information on the accomplishment of project outcomes (see attached file).

Output #1: All six curricular modules started in Year 1 made significant additional progress in Year 2.

These are:

- Monitoring Volcanoes and Communicating Risk (Introductory)
- Eyes on the Hydrosphere: Tracking Water Resources (Introductory)
- Measuring the Earth with GPS: Plate Tectonics and Changing Ice-Water (Introductory)
- Modeling Flood Hazards (Majors level)
- Planning for Failure: Landslide Analysis for a Safer Society (Majors level)
- Understanding Our Changing Climate: Data Behind Melting Ice and Changing Sea Level (Majors level)

The modules go through a rigorous review process including four checkpoints prior to classroom testing. Classroom testing is done in the classes of the two authors and a non-author pilot tester. After analysis of student data and tester reflections, there are another three checkpoints during the revision and publication process. Of the eighteen needed pilot tests (six modules with three people each), seventeen were completed on schedule during the 2018-19 academic year. The pilot testing will be done in the last class early in the fall 2019 semester. The other five modules have all started the revision process.

In addition to the new modules development, all thirteen GETSI modules (seven already published and six nearing completion) were aligned to the Next Generation Science Standards (NGSS) by a review panel held in association with the Earth Educators

Rendezvous in July 2019. This was funded through a supplemental IUSE award in order to bring the GETSI modules more fully into alignment with InTeGrate modules and facilitate the use of modules by undergraduate pre-service teacher STEM courses. The alignment was conducted by 11 community members and is in the final editing stages by panel facilitator, Anne Egger (Central Washington University).

Output #2: GETSI held two short courses and one review panel during Year 2, with a total of 72 participants. The GETSI website has had increased usage in association with the start of GETSI Phase 2. Details on short courses, webinar, and website use are included in the SERC Evaluation Report. In addition GETSI modules have been disseminated through posters presentations at 2019 Earth Educators Rendezvous and 2018 American Geophysical Union (AGU) Annual Meeting as well as through UNAVCO and partner listservs. GETSI has engaged in outreach from the UNAVCO and National Association of Geoscience Teachers (NAGT) booths at both GSA and AGU annual meetings.

Project PI, Pratt-Sitaula, also attended the Tectonics On-Ramp Writing Soiree (<https://serc.carleton.edu/onramps>) in April 2019. In addition to helping author and review these 2-page quick guides to support integration of active learning methods into tectonics courses, she helped to ensure that GETSI teaching resources were referenced in On-Ramps where appropriate to serve that project's goals.

Outcome #3: The "Share Your Experience" feedback surveys are available on the GETSI website (https://serc.carleton.edu/getsi/share_experience.html). A total of 25 more post-use feedback surveys were completed in Year 2 (see also SERC Evaluation Report). In addition more than 60 participants in short courses have given information on intended use. This information will be folded into the final analysis.

Opportunities for training and professional development?

GETSI materials authors receive professional development related to pedagogical best practices for geoscience teaching. Participants in short courses and webinars receive professional development related to both pedagogy and geodesy content.

How have results been disseminated to communities of interest?

As described above in Major Activities Output #2, modules have been disseminated via a short courses, conference booths, conference presentations, listservs, and websites. GETSI is also featured on the UNAVCO website as a major project (<http://www.unavco.org/projects/projects.html#Major>) giving it prominence beyond just the Educational section, which tends to be limited to a smaller subset of the UNAVCO community.

Plan for next reporting period?

We plan to continue the activities and schedule as outlined in the project proposal. Outcome #1 Module Development will be completed during the first couple months of Year 3. Outcome #2 Dissemination will efforts will be increased with at least three short courses and six webinars in Year 3. Additional emphasis will be places on the research elements Outcomes #3 and 4.

Products

Text Book Chapter

Title: Using Global Positioning System (GPS) Data in Structural Geology to Better Understand Tectonic Motions and Earthquake Hazards

1st pg: 43

Authors: Beth Pratt-Sitaula, Phillip Resor, Bruce Douglas, Donna Charlevoix

Book: Problems and Solutions in Structural Geology and Tectonics

Book authors: Andrea Billi, Ake Fagereng

Conference Papers and Presentations

Title: Improved physical model of instantaneous/infinitesimal strain for hands-on learning using a triangle of stretchy cloth

Conference: Geological Society of America Annual Meeting 2018

Authors: Ryley M. Collins, Vincent S. Cronin, Cynthia E. Cronin, Beth Pratt-Sitaula, and Shelley Olds

Title: Data-rich Societally-situated Undergraduate Teaching Resources and Instructor Professional Development for Geoscience Classrooms and Field Courses

Conference: American Geophysical Union Annual Meeting 2018

Authors: Beth Pratt-Sitaula, Bruce Douglas, Becca Walker, Benjamin Crosby, Donna Charlevoix, Meghan Miller

Title: Context matters: Designing data-rich geodesy teaching materials that get used

Conference: Earth Educators Rendezvous 2019

Authors: Kristin O'Connell, Beth Pratt-Sitaula, Becca Walker, Bruce James Douglas, Benjamin Crosby, Donna Charlevoix

Websites

GETSI Project Site: <http://serc.carleton.edu/getsi/index.html>

This is the GETSI project website. It gives background information on the project and is the primary publication site of the teaching modules when they are complete. Development workspaces allow for internal project notes and draft module text.

Other Products

What kind: Educational aids or Curriculum

Describe: Tectonic On-Ramp "Leading Compelling

Discussions" https://serc.carleton.edu/onramps/leading_compelling_discussions.html.

Being shared via website (<https://serc.carleton.edu/onramps/index.html>) and paper copies at conferences.

Participants

Individuals

Meghan Miller UNAVCO PI 0 Months
As the UNAVCO President Miller is responsible for coordination with the science community and the successful accomplishment of the work. She is paid entirely out of indirect as her work is for the proportional benefit of all awards; thus she does not draw salary on this grant.

Donna Charlevoix UNAVCO Co-PI 0 Months
As the Director of UNAVCO's Education and Community Engagement, Charlevoix is also responsible for coordination with the science community and the successful accomplishment of the work. Her salary is covered through the NSF GAGE Facility Cooperative Agreement.

Beth Pratt-Sitaula UNAVCO Co-PI 3 Months
A UNAVCO Educational Specialist, Pratt-Sitaula serves as the GETSI facilitator in charge of project logistics and communication. She coordinates between UNAVCO, the authors, technical experts, beta-testers, SERC, NAGT, and related organizations. She leads dissemination (meeting presentations, journal papers, articles, website content, webinars). Pratt-Sitaula's funding to work on GETSI is from this NSF IUSE grant.

Ian Armstrong Indiana University Graduate student 1 Months
Armstrong served as a research assistant and student intern for the project. He works on data processing, figure creation, procedural manuals, and other tasks to support the module development and instructor training. During the academic year he had an assistantship paid through the Indiana U part of the grant; during the summer he was paid through the UNAVCO port of the this NSF-IUSE grant. The time reported here are just for the UNAVCO portion.

Jonathan Harvey Fort Lewis College Faculty 0 Months
Harvey is serving as a module co-author on the adapted introductory-level module *Eyes on the Hydrosphere: Tracking Water Resources*. His full time job is as a faculty member at Fort Lewis College. GETSI will pay him a total of \$5000 stipend over the period of work on module development and revision.

Stephen Hughes University of Puerto Rico-Mayaguez Faculty 0 Months
Hughes is serving as a module co-author on the new majors-level module *Planning for Failure: Landslide Analysis for a Safer Society*. His full time job is as a faculty member at University of Puerto Rico-Mayaguez. GETSI will pay him a total of \$7500 stipend over the period of work on module development and revision.

Bobak Karimi Wilkes University Faculty 0 Months
Karimi is serving as a module co-author on the new majors-level module *Planning for Failure: Landslide Analysis for a Safer Society*. His full time job is as a faculty member at Wilkes University. GETSI will pay him a total of \$7500 stipend over the period of work on module development and revision.

Susan Kaspari Central Washington University Faculty 0 Months

Kaspari is serving as a module co-author on the adapted majors-level module *Our Changing Climate*. Her full time job is as a faculty member at Central Washington University. GETSI will pay her a total of \$5000 stipend over the period of work on module development and revision.

Kaatje Kraft Whatcom Community College Faculty 0 Months
Kraft is serving as a module co-author on the new introductory-level module *Monitoring Volcanoes and Communicating Risk*. Her full time job is as a faculty member at Whatcom Community College. GETSI will pay her a total of \$7500 stipend over the period of work on module development and revision.

Karen Kortz Community College of Rhode Island Faculty 0 Months
Kortz is serving as a module co-author on the adapted introductory-level module *Measuring the Earth with GPS*. Her full time job is as a faculty member at Community College of Rhode Island. GETSI will pay her a total of \$5000 stipend over the period of work on module development and revision.

James McNamara Boise State University Faculty 0 Months
McNamara is serving as a module co-author on the new majors-level module *Modeling Flood Hazards*. His full time job is as a faculty member at Boise State University. GETSI will pay him a total of \$7500 stipend over the period of work on module development and revision.

Venkatesh Merwade Purdue University Faculty 0 Months
Merwade is serving as a module co-author on the new majors-level module *Modeling Flood Hazards*. His full time job is as a faculty member at Boise State University. GETSI will pay him a total of \$7500 stipend over the period of work on module development and revision.

Jessica Smay San Jose City College Faculty 0 Months
Smay is serving as a module co-author on the adapted introductory-level module *Measuring the Earth with GPS*. Her full time job is as a faculty member at San Jose City College. GETSI will pay her a total of \$5000 stipend over the period of work on module development and revision.

Rachel Teasdale California State University-Chico Faculty 0 Months
Teasdale is serving as a module co-author on the new introductory-level module *Monitoring Volcanoes and Communicating Risk*. Her full time job is as a faculty member at California State University-Chico. GETSI will pay her a total of \$7500 stipend over the period of work on module development and revision.

Ellen Iverson SERC Other professional 0 Months
Iverson is the lead assessment consultant and independent evaluator for the GETSI project. She is paid by SERC (Science Education Resources Center) via a subaward from this NSF IUSE project.

Kristin O'Connell SERC Other professional 1 Month
O'Connell supports Iverson on assessment and evaluation for the GETSI project. She is paid by SERC (Science Education Resources Center) via a service agreement with this NSF IUSE project.

Stuart Birnbaum SERC Faculty 0 Months

Birnbaum is the assessment consultant for the majors-level modules. He is paid by SERC (Science Education Resources Center) via a subaward from this NSF IUSE project.

Monica Bruckner SERC Other professional 0 Months

Bruckner is the webmaster for the GETSI project. She supports any needs related to the SERC-hosted GETSI website. She is paid by SERC (Science Education Resources Center) via a subaward from this NSF IUSE project.

Kathryn Sheriff SERC Other professional 0 Months

Sheriff is an evaluation program analyst. She handles all issues related to submission and preparation of student data for assessment review. She is paid by SERC (Science Education Resources Center) via a subaward from this NSF IUSE project.

Anne Egger Central Washington University Faculty 0 Months

Egger served as the NGSS review panel facilitator. She is paid as a consultant from this NSF-IUSE grant.

Margarita M. Solares Colón University of Puerto Rico at Mayagüez Graduate student
0 months

Solares Colón does Spanish translations of the subtitles for project-related animations and videos. She is paid as a consultant from this NSF-IUSE grant.

Michael Stoffel Other professional 0 Months

Stoffel does copyediting of final module text. He is paid as a consultant from this NSF-IUSE grant.

Daniel Zietlow Other professional 0 Months

Zietlow did image design and video editing for the project. He is paid as a consultant from this NSF-IUSE grant.

Organizations

Type: Academic Institution

Name: SERC (Science Education Resource Center)

Location: Northfield, MN

Contribution: Assessment and evaluation; dissemination

Details: SERC is providing assessment design, independent evaluation, and project dissemination through a designated subaward. GETSI module design and assessment are following the model of SERC's InTeGrate project. Modules are being reviewed by a SERC-recruited expert assessment consultant and student data are collected using the InTeGrate collection system. SERC is also hosting the GETSI website and providing content management assistance for the site and webinars. As needed, GETSI announcements go out through SERC channels to the wider geoscience community. Ellen Iverson and Kristin O'Connell, SERC assessment specialists, are providing independent evaluation of the GETSI project (see attached report).

Type: Other Nonprofits

Name: National Association of Geoscience Teachers (NAGT)

Location: Northfield, MN

Contribution: Collaborative Research

Details: NAGT is collaborating with GETSI on dissemination. For example, as part of publicizing GETSI webinars, announcements went out on NAGT listservs. GETSI also contracted with NAGT for the running of the NGSS review panel in association with the 2019 Earth Educators Rendezvous.

Type: Other Nonprofit

Name: American Geophysical Union

Contribution: Collaborative Research

Details: AGU collaborated on the hosting and recruiting for the short course held during AGU annual meeting 2018.

Impacts

What is the impact on the principle discipline?

Geodesy encompasses an increasingly important set of geoscience methods for better understanding earth processes. Its scope has greatly increased from early applications of surveying and tectonic plate motions to include critical insights into natural hazards (ex. earthquake, volcanoes, landslides), climate change (ex. ice mass and sea level change), and water resources (ex. groundwater storage and change). However, the field remains fairly technical and access to some data sets is limited. Therefore undergraduate students are seldom given the chance to analyze geodesy data. This is a critical omission for a toolbox of techniques needed for the next generation of science literate citizens and geoscience workforce members. GETSI is working to address part of this gap through the development and dissemination of high quality teaching modules for both introductory and majors-level courses that feature geodesy data analysis and quantitative skills.

What is the impact on society beyond science and technology?

As our global population continues to increase, living in ever more marginal lands with ever-increasing temperatures and decreasing water resources, our ability to mitigate effectively for natural hazards, respond to climate changes, and manage our common resources becomes ever more critical. The GETSI project is rooting the study of earth science through the lens of societally important questions. The aim is to increase the ability of students to analyze and address these challenges.

Changes/Problems

Actual or Anticipated problems or delays and actions or plans to resolve them

One module author was not able to complete classroom pilot testing as planned during the 2018-19 academic year. He will complete pilot testing early in fall 2019. Although revisions are underway in the other five modules, final module publication will only be completed for two of the modules by the initially stated deadline of September 1. Three other modules should be complete by October 15 and the last one by the December 1, 2019.

Appendix – SERC Evaluation Report



GEodesy Tools for Societal Issues (GETSI): Phase II

YEAR 2 EVALUATION REPORT

July, 2019

SERC EVALUATION TEAM

Ellen Iverson, Ph.D., Evaluation Director

Ellen Altermatt, Ph.D.

Kristin O'Connell, M.S.

LEAD AUTHOR

Kristin O'Connell, M.S.

EXECUTIVE SUMMARY

The second phase of GEodesy Tools for Societal Issues (GETSI) continues with collaborative development of geodetic teaching materials coupled with an emphasis on materials adoption. During Year 2 of Phase II, significant progress was made on project outputs (see Figure 1 logic model). Adoption of materials is facilitated through professional development and dissemination. The instructor experience is characterized through feedback provided on surveys to understand the adaption /adoption of online curricular materials as well the challenges and benefits of the materials.

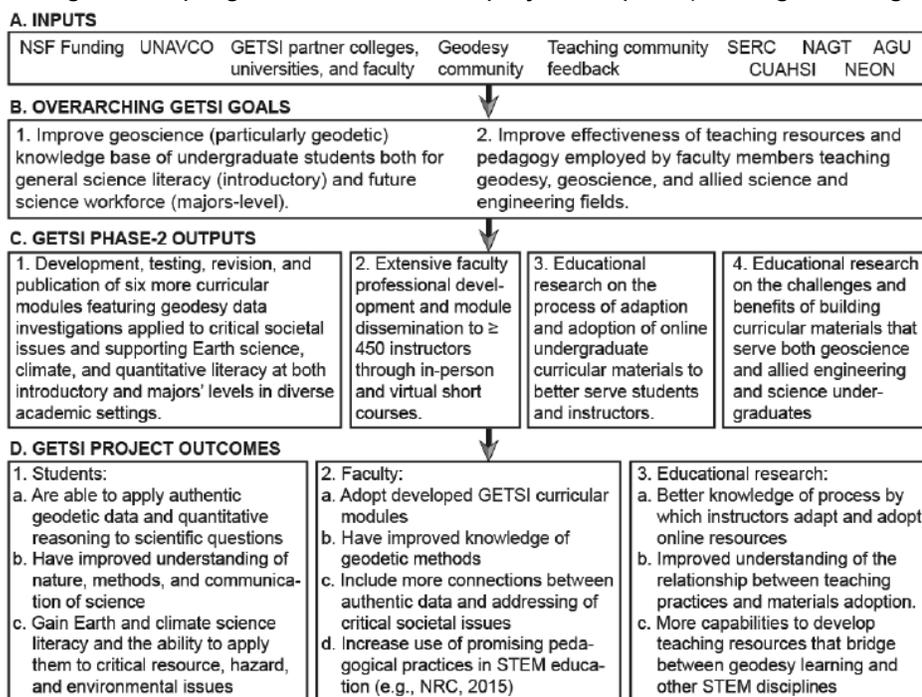


Figure 1: GETSI Phase II Logic Model. The overarching GETSI goals remain the same from phase I, while the phase 2 outputs include a new emphasis on materials adoption

PROGRESS ON PROJECT GOALS

Goal 1: develop, test, revise, and publish six additional curricular modules (each ~two weeks in length) that are centered on geodesy applied to issues of societal importance and to aid students in achieving Earth science, climate, and quantitative literacy

- Year 2 evidence of progress includes material reviews, reporting pages, and course assessment data. Major accomplishments of the year include significant progress developing six modules, all reviewed through checkpoint four. Four of six modules have completed all three pilot tests. Two modules have one pilot test remaining for fall 2019 (see Table 1).

Goal 2: conduct in-person and virtual short courses to disseminate GETSI teaching materials and provide faculty development to >450 instructors in geoscience and allied science/engineering fields

- Evidence for Year 2 progress on Goal 2 includes registration and end-of-event survey data from the fall 2018 AGU short course and 2019 Earth Educators' Rendezvous workshop.

Goal 3: research the process of adaption and adoption of curricular materials through follow up with at least 75 instructors

- Evidence of Year 2 progress for Goal 3 includes the AGU short-course registration and end-of-event survey as well as faculty "Share your Experience" submissions. Analysis from 2019 Earth Educators' Rendezvous workshop feedback is pending.

Goal 4: research the challenges and benefits of building curricular materials that serve students in geoscience and allied fields.

- Data analysis of student data will begin in Year 3.

Module Development

Module development was the focus of Year 2, where all six teams developed teaching materials and assessments that met the standards of the GETSI materials development rubric. All materials were reviewed against the rubric by project PI and an assessment consultant, and all passed by January 2019 (see checkpoint 4 in table below for details). Three teams are set to complete pilot testing this spring, and will begin revisions during the summer of 2019. Three teams have a final pilot scheduled for fall of 2019 and will begin revisions in winter of 2020. All modules plan to publish by spring of 2020.

	✓ 1	✓ 2	✓ 3	✓ 4	Pilot tests (/ 3)	✓ 5	✓ 6	✓ 7
Volcanic Hazards	2/11/18	12/22/18	12/22/18	1/3/2019	1: DLD, Sp 2019 2: RT, Sp 2019 3: KK, Sp 2019	5/19		
Measuring the Earth with GPS	2/11/18	4/18/18	6/17/18	8/27/18	1: KK, Fa 2018 2: JS, Fa 2018 3: AW, Sp 2019	5/19	6/19	
Water Hazards and Resources	2/11/18	10/1/18	12/19/18	1/21/19	1: JH, Sp 2019 2: DG, Sp 2019 3: BW, Sp 2019	5/19		
Landscape and Environmental Change	2/11/18	10/9/18	12/4/18	1/18/19	1: BK, Sp 2019 2: SH, Sp 2019 3: SW, Sp 2019			
Storm and Flood Hazards	2/11/18	8/18/18	10/25/18	11/18/18	1: VM, Fa 2018 2: SS, Sp 2019 3:			
Climate Change	2/11/18	5/23/18	12/20/18	1/18/19	1: SK, Sp 2019 2: BD, Sp 2019 3: TA, Sp 2019	5/19		

Table 1: Materials Development Progress as of 5/17/19: Green=complete, Yellow=not all data was collected or submitted, white=not yet started

Faculty Development and Dissemination

In year two, GETSI Phase II continues to engage the broader community with adopting and adapting GETSI materials. Professional development events, including a webinar and two short courses, have engaged 61 participants since the Year 1 report (see table).

Event Measures

ENGAGEMENT PRODUCT	ENGAGEMENT MEASURES
AGU Short course: <i>Measuring Water Resources with GPS, Gravity, and Traditional Methods: Undergraduate Teaching Module</i> , December 11, 2018	<ul style="list-style-type: none"> • 22 participants? • 18 completed the end of event survey reporting a high satisfaction (9.1 out of 10) • Respondents had varied experience with GPS and Gravity prior to the event • Respondents plan to adapt or adopt most of the module with little modification (10/18), significant modification (7/18), or a few module elements in reduced scope (1/18)
AGU Short course: <i>Measuring Water Resources with GPS, Gravity, and Traditional Methods: Undergraduate Teaching Module</i> , December 11, 2018	<ul style="list-style-type: none"> • 39 participants • 39 completed the end of event survey reporting a high satisfaction (9.4 out of 10) • Respondents appreciated the hands on experience working through the modules • 100% slightly, moderately, or strongly agreed they could find the materials online. 98% slightly, moderately, or strongly agree are confident they can use the GETSI modules, 95% slightly, moderately, or strongly agree they have a workable plan to implement the modules

Table 2: Summary of GETSI Y2 dissemination event

Website Measures

The website usage has continued to grow (see Table 3) with 36,151 unique users to date. Phase II has a focus on dissemination of the materials, and the site analytics continue to show a marked increase in use during this phase (see Figure 2) punctuated by periods of high use.

	Pageviews	Unique Pageviews	Users*
January – December 2015	5,114	3,823	915
January – December 2016	11,906	8,980	3,046
January – December 2017	23,833	17,993	6,076
January – December 2018	51,981	40,879	21,558
January 2015 – April 2019	105,862	81,503	36,151

Table 3: Summary of GETSI website analytics. * Users calculated on 5/17/19, historic records can vary slightly as new information is collected about users

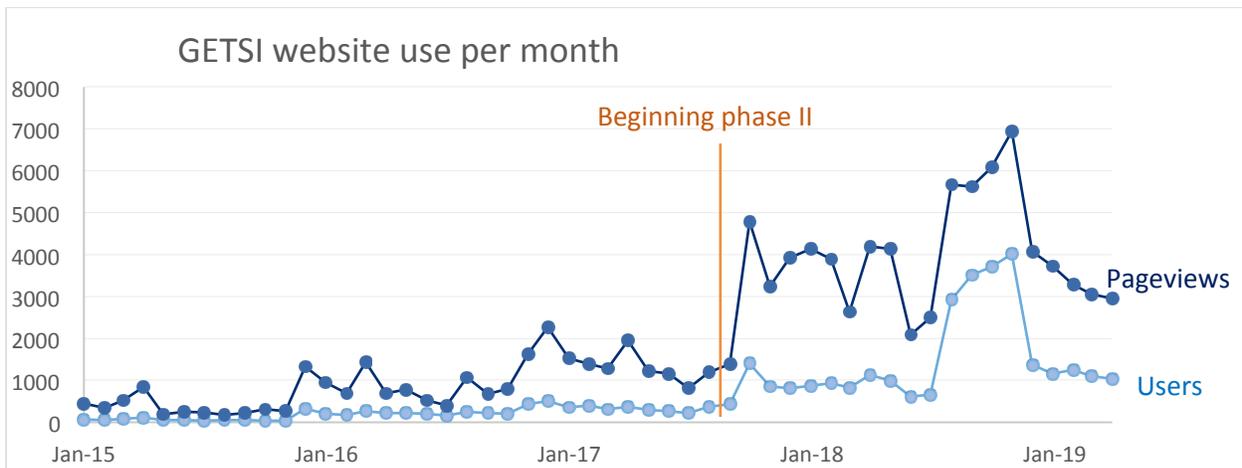


Figure 2: GETSI website monthly use over time

Faculty Materials Use

In addition to professional development feedback, requests to access protected material on the website indicates a higher level of interest and engagement with the GETSI modules. Since the last evaluation report in April 2018, an additional 145 instructors have requested access. Of those, 141 responded to a question about how they might use the materials, where 53% intended to use or had already used the materials in a particular course (see Figure 3).

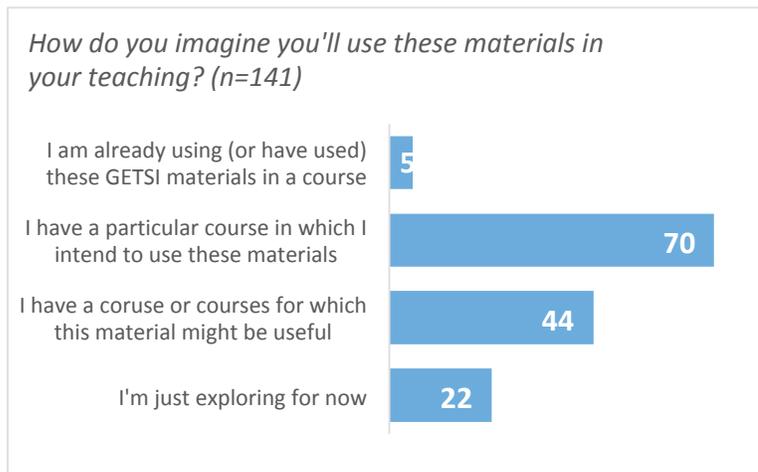


Figure 3: Intended use of materials of those requesting access to instructor-only files

Faculty feedback is also collected through an online "Share Your Experience" form, and helps to characterize the experience of teaching with GETSI materials. Feedback from 30 instructors across 35 implementations indicates that the materials are used in a variety of ways, add value to coursework, and that professional development increases confidence to implement modules. Faculty indicated that the materials' use of geodetic data and methods, development of quantitative skills, and focus on societal issues were important and that students enjoyed working with "real" data. Faculty also indicate the different components of GETSI materials are useful (Figure 4), the quality of the materials is high with an average of 8.7/10 (Figure 5), and 100% indicate that they would likely or very likely to use the materials again.

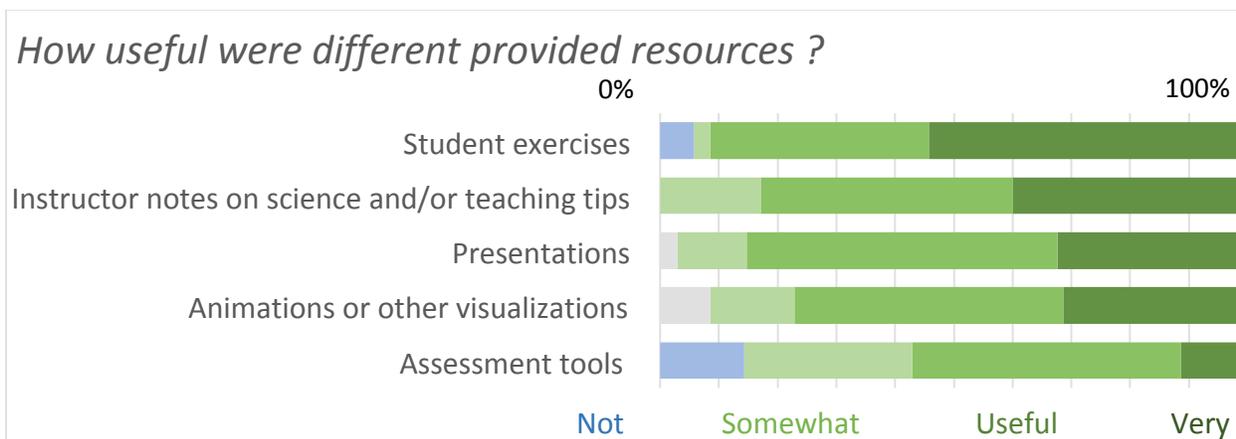


Figure 4: "Share your experience" feedback on usefulness of module components

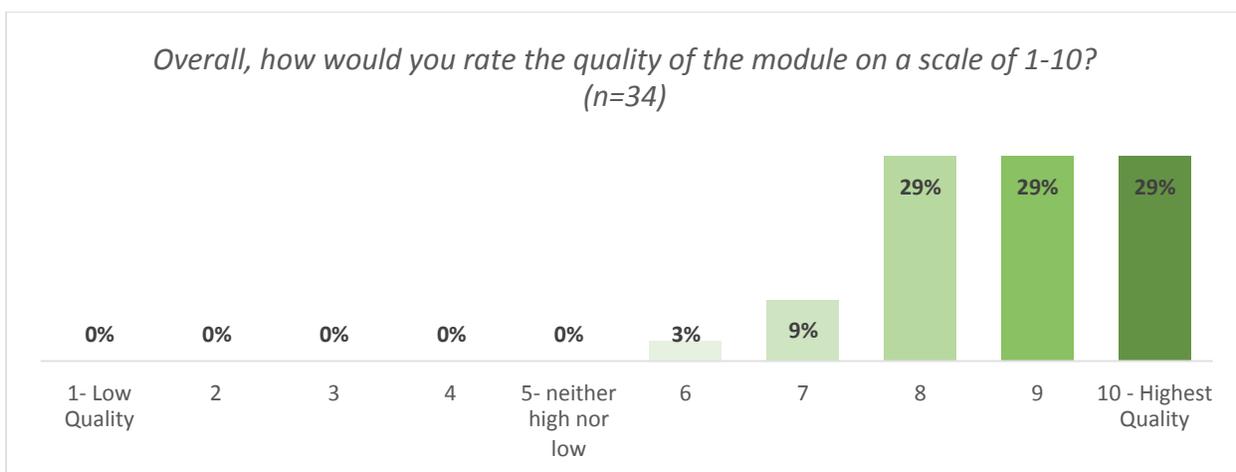


Figure 5: Instructor ratings of overall quality of GETSI modules from "Share your Experience" form