RIT

2019 PROVOST'S LEARNING INNOVATIONS GRANTS
CALL FOR PROPOSALS

The **Provost's Learning Innovations Grants** (PLIG) program was developed to broaden and enrich the learning experience of RIT students by funding faculty-initiated projects that enhance student learning. Managed by the Innovative Learning Institute (ILI), this program has been designed to:

- Better support dissemination of individual faculty learning to the wider faculty population
- Integrate funding with Institute priorities
- Support the scholarship of teaching and learning

I. ELIGIBILITY

All full-time RIT faculty (tenured, tenure-track, visiting, lecturers, etc.) are eligible to apply.

II. GRANT TYPES

There are two types of grants—Exploration and Focus—for PLIG 2019. Full details are available on the Grants Types page of the PLIG website (www.rit.edu/plig).

III. USE OF GRANT FUNDS

Provost's Learning Innovations Grants for 2019 may range from $1,000-$5,000.

Examples of the use of PLIG funds include:

- Course release (reasonable, actual replacement costs for faculty members removed from teaching)
- Development of new technology-based learning tools and/or environments
- Technologies or equipment required that are not normally provided by the department/college
- Resources for research design and consultation, data collection and aggregation, instrument development and/or purchase, secure data storage, data analysis, and report generation
- Travel to support research activity and/or meet with potential funding sources

IV. PLIG TIMELINE AND TASKS

The grant timeline assumes that most recipients will use the Spring 2019 and/or Summer 2019 term(s) to plan and develop their PLIG-funded project for delivery or implementation during the Fall 2019, Spring 2020, and/or Summer 2020 term(s). The full timeline, including grantee tasks, is available on the PLIG website.

V. SELECTION COMMITTEE AND EVALUTION CRITERIA

Applications for PLIG funds are evaluated by the PLIG selection committee according to the following criteria:

- *Utility* (solves a defined problem; has potential to benefit many courses/faculty)
- *Creativity* (is a novel approach or application; represents a new paradigm)
- *Efficacy* (uses an evidence-based approach; impact to student learning and/or the student experience can be demonstrated)

The criteria are further defined, illustrated, and explained in the Proposal Evaluation section of the PLIG website.

VI. QUESTIONS

Please email plig@rit.edu with any questions about the PLIG process.

(*Examples of previously funded projects are available in the Previous Awards section of the PLIG website).*

RIT

2019 PROVOST'S LEARNING INNOVATIONS GRANTS

APPLICATION

INSTRUCTIONS

1. Complete this Application Form and save as "Lastname_Firstname_APP" (*using your name*).
2. Ask your Department Head to complete the Department Head Certification, scan and save as, "Lastname_Firstname_SIG" (*using your name*).
3. Email all documents to plig@rit.edu, ***no later than 11:59pm ET, January 21, 2019.***

If you have any questions about completing this application, please contact Michael Starenko at 585-475-5035 or mssetc@rit.edu.

APPLICANT INFORMATION

This application is for a (please select *one* type of grant):

☐ **Exploration Grant**

☒ **Focus Grant – Active Learning Across All Course Modes**

Principal Applicant Name: Sharon Mason

Faculty Title: Professor **Email**: Sharon.Mason@rit.edu **Phone:** X 56989
(Full-time only)

College: GCCIS **Department:** IST

Department Head Name: Stephen Zilora **Email**: Stephen.Zilora@rit.edu

Others involved in the project (if any): _____

Project Name: Network Essentials Using a Project-based Learning Approach

Total Funds Requested (*as calculated on the budget worksheet on the next page*): $5,000.00
(requests of $1,000 to $5,000 will be considered)

BUDGET

Complete the table below to calculate your budget

- The total shown on this worksheet must match the "Total funds requested" in the Applicant Information section on page 1 of this application form.
- If awarded, additional funds will be provided to cover any benefits and ITS expenses associated with the salary budget requested.
- Note that any equipment or other materials purchased with grant funds are the property of your department and revert to the department after your project is completed

Personnel	Purpose/Justification	Amount
Full-time Faculty/Staff		
Sharon Mason	Curriculum development, testing and data analysis	$2500
Adjuncts, Part-time Faculty/Staff, Summer Salary		
Student Workers, Graduate Assistants		
	Personnel Total	**$ 2500.00**
Equipment	**Purpose/Justification**	**Amount**
Linksys home networking devices	Network devices to setup and configure (similar to Linksys EA6350, ~$100 each * 10)	$1000
	Equipment Total	**$ 1000.00**
Travel	**Purpose/Justification**	**Amount**
Sharon Mason Conference Travel	Dissemination of findings	$1500.00
	Travel Total	**$ 1500.00**
Other (*Specify*)	**Purpose/Justification**	**Amount**
	Other Total	**$ 0.00**
	Total Award Requested	**$5000.00**

STATEMENT OF UTILITY (two pages maximum)

Objectives:

This proposal aims to: (1) bring active learning to students in a Networking Essentials for Developers course through the integration of collaborative and project-based learning and (2) present the course in a way that networking fundamentals can be accessible to non-computing students. Curriculum will be developed to shift the existing Networking Essentials for Developers course from a lecture-only based format to a hands-on collaborative learning and project-based format. While the current lecture-only mode curriculum exposes students to the networking topics that will impact them as software developers, the format lacks the practical experiences that cement the knowledge needed for the practice-based domain of computing. Additionally, the expectation is that by shifting to an active learning mode, the course content will be more appealing to students outside the computing domain, as setting up and configuring a small network is seen as a valuable skill in today's data driven world. As such, this course may also present an opportunity for broadening overall participation in computing.

Through this proposed project-based learning approach, students will be posed with a real-world project whereby they will need to collaboratively explore technical content in order to design, setup and configure a small/home scale network to an operational state by the end of the semester. Specific topics required to design, setup and configure a functioning network will be explored in-depth throughout the semester, with the project requirements and instructor guiding the work. This framework, shifts the mode of instruction from a teacher-centered, didactic format to a student-centered, collaborative learning environment that will provide software development students with the hands-on experience to prepare them for their future work in the domain and non-networking students with the hands-on experience to configure and understand their home or small office network setup.

This proposed curriculum development model is grounded in both social constructivist theory and project-based learning, which serve as the frameworks for the curricular design. Social constructivism is rooted in the social interactions learners have, along with their personal critical thinking process and cooperative learning which serves as a fundamental aspect of deeper understanding (L.S. Vygotsky, 1930-1934/1978). Social constructivist theory asserts that knowledge results from meaning-making through social interaction and indicates that education and learning is essentially a social process. This quality is realized in the degree in which individuals collaborate and form a community group. According to Webb (1989) interaction among peers in academic group work involves small groups of students who are given material to learn or a problem to solve. The expectations, and typically instructions as well, are that all students are to master the material while helping each other to learn the material or solve the problem. All group members, as part of the team, share the same information regarding the material or problem with no specific group roles identified. The resulting outcome of group work may be a group product or a demonstration of individual mastery of the material (Webb, 1989).

Project-based learning integrates the problem-based constructs of examining a problem with uncertain outcomes, yet also involves tasks that are closer to professional reality and may take longer periods of time to complete as well as being directed to the application of knowledge. It begins with an identified scenario, whereby students' attention is directed toward solving a particular problem for study and relies upon student-initiated research in order to progress their own understanding as with constructivist learning. Yet, collaborative group work is an important aspect in working through the problem. Student reflection also serves as an important facet of project-based learning, in order to fully evaluate progress and outcomes (Mills and Treagust, 2003).

Overall, this model of social constructivism and project-based learning redirects the instructor's attention toward creating a learning environment where knowledge co-construction and social mediation are critical to completing the defined real-world project. The instructor, as a pedagogical content knowledge expert, acts a guide in blending content and pedagogy into an understanding of how the topics, problems, or issues are organized, represented, and adapted to meet the needs of the students. (Shulman, 1987).

A social constructivist and project-based learning theoretical framework provides an ideal approach for this course as students will engage in a semester-long collaborative project to design, setup and configure a small network that provides a real-world topology for a software development environment as well as a home or small office environment. Specific to this proposal, the instructor will define the overarching problem of designing, setting up and configuring a small/home area network. Curriculum supporting this problem state will be developed as a series of domain topic guides to assist the teams as they collaboratively work through the project.

The Problem

This project addresses the key problem of shifting computer networking course curriculum from a teacher-centered didactic mode to a student-centered hands-on project-based learning approach using collaborative teams. This shift aims to engage students in the course content in a manner that serves as a fundamental aspect of deeper learning as part of constructivist learning theory (von Glasersfeld, 1995).

Furthermore, computer networking serves as a foundational computing aspect as society more and more heavily replies on data sharing across wired and wireless networks in the use of business transactions, medical services, games, personal communications, entertainment, research, education and scholarly activity. As such, a fundamental understanding of the network over which our data traverses is critical for software developers as they design, build and maintain the systems that use these networks as well as home users who want to take advantage of data sharing services. The existing course, Networking Essentials for Developers, aims to present software development students with such a context as they prepare for their work in the domain. While the current course topics explored are relevant to the understanding that is critical for these software developers, the existing lecture-only delivery format is ill-suited to preparing them for their future work that centers on a practice-based environment. In this respect, students are missing the real-world experiences of designing, setting up and configuring a network in order to more deeply understand the impact the network has on the systems they are developing and using as part of their daily lives. Additionally, the course is currently ill-suited to presenting non-computing students with an understanding of the networks they are using for data transfer in a home or small office scenario.

Significance

This approach is significant in ensuring success of existing software development students through deeper learning as the curriculum is presented in a social constructivist and project-based learning format. Additionally, this work is potentially significant in broadening participation in computing by presenting computer networking in a format accessible to non-computing students. Current work in broadening participation in computing predominantly centers on computer programming (CollegeBoard, 2017; CSTA, 2017; ISTE, 2017). While programming is a critical aspect of computing, its focus leaves other areas such as computer networking unattended. This course will be developed with components of networking that are specific to the needs of software developers, yet the framework of the course will be such that the content is accessible to a more general population. As such, this curriculum development will potentially broaden the interest in the course to non-computing majors, thereby also potentially broadening the overarching understanding of computing beyond computer programming.

Integration with RIT priority area or previous successful use at RIT

This proposal aligns with Dimension 1 of the RIT Strategic Plan: People. In this dimension, RIT commits to “Enroll and support a diverse mix of increasingly creative, multi-talented students who are attracted to RIT’s interdisciplinary, experiential, and collaborative educational model.” By shifting the curriculum in the Networking Essentials for Developers course, this proposal supports the above dimension with an experiential and collaborative networking course experience for students. Furthermore, project-based learning has been successfully implemented at RIT through the closely aligned problem-based learning PLIG grants from the previous 2018 funding round including Jeanne Christman’s Design Thinking and Problem Based Learning, Bruce Hartpence’s Applying Active Learning to New Courses on Software Based Networking and Yasmine El-Glaly’s Incorporation of Creativity and Active Learning into Freshman Curriculum in Software Engineering.

STATEMENT OF CREATIVITY (three paragraphs maximum)

While collaborative learning and project-based active learning has been studied with successful results in computer programming, little work has been done around examining these aspects in courses focused on computer networking content (Danielewicz-Betz and Kawaguchi 2015; Hanks et al., 2004; Lewis et al., 2012; Murphy et al., 2010; Vihavainen, Airaksinen, & Watson, 2014). Similarly, integration and study of this framework at RIT and particularly among networking courses at RIT is rare. While many courses incorporate collaboration and hands-on project-based work for students, this proposal further extends the experiences for students by integrating intentional and structured collaborations among students as part of a semester-long project, rather than shorter week-long problem scenarios using unstructured collaborations. Thus, this proposal presents a novel opportunity to implement a semester-long collaborative project-based learning experience in a computer networking course and study the impact through the examination and comparison of both student and instructor perspectives throughout the semester.

STATEMENT OF EFFICACY (two pages maximum)

Research Design/Methodology

This project will use aspects of a case study methodology by following a naturalistic inquiry approach (Lincoln & Guba, 1985). This naturalistic approach allows for examination of collaborative project-based learning in the natural instructional computing environment, a context free from requirements for the control or manipulations of behavioral events. Student and instructor reflections will provide a well-rounded perspective of the case. These aspects are particularly relevant as a case study relies on multiple sources of evidence and is informed by theoretical propositions that guide data collection and analysis (Yin, 2013).

Data Sources and Collection

Two data sources will be used for qualitative analysis in this project: (1) student reflections and (2) instructor reflections.

Student reflections. Students will be asked to provide a minimum of four reflections throughout the semester. The reflections will be collected via MyCourses which allows for anonymous instructor reviews. By de-identifying the student reflections, the instructor/researcher will reduce bias in the analysis. Furthermore, the reflections will be scored as part of the course on a basis of participation only. As such, students will be able to more fully present their thoughts on their experiences.

Student reflections will focus on the coursework in regards to both the instructional approach and the technical content. A preliminary instrument for student reflection has been developed from and tested on a previous assignment during the Fall 2081 semester and initial review indicates its effectiveness in determining meeting student learning objectives. This instrument will be used as a foundation in developing reflective assignments specific to the needs of the new course curriculum.

Instructor reflections. The instructor will record daily reflections of her classroom experiences. A reflexive approach to qualitative research is widely accepted and researcher reflections provide an opportunity to consciously and transparently present experiences, thoughts, opinions and feelings throughout the research process (Ortlipp, 2008). A daily reflection template will be developed using the instructor/researcher's previous experience in classroom site observations and previous reflective journals.

Data Analysis

Qualitative analysis methods will be used to analyze the impact and effectiveness of the curriculum development and delivery. A combination of emergent and a priori coding schemes (developed from previous researcher work and alongside social constructivism and problem-solving literature) followed by a thematic analysis will be used. Thematic analysis is a search for emergent themes important to describing the phenomenon under investigation. The data is carefully read and re-read to identify themes. Patterns are recognized within the data, where emerging themes become the categories for analysis (Braun & Clarke, 2006; Daly, Kellehear, & Gliksman, 1997; Fereday & Muir-Cochrane, 2006). Creswell (2013) noted that when analyzing data with a priori or prefigured codes developed from a theoretical model or the literature, the additional use of emergent codes is recommended in an effort to reflect the views of participants in a traditional qualitative manner. The two data sources from the project, alongside the emergent and a priori coding methods will allow for the following:

(1) Student reflection analysis
(2) Instructor reflection analysis
(3) Student and instructor reflection comparative analysis to examine convergence or disparity of perceptions and experiences

References

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ADDITIONAL CONSIDERATIONS

Please address these questions, if needed.

Will your project require assistance for extensive or unusual media, multimedia, simulation, and/or software development? If so, please explain?

n/a

All courses offered by RIT must be accessible to students with disabilities, according to Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act of 1990 (rit.edu/studentaffairs/disabilityservices/info). Is your proposed teaching approach accessible to all students, with reasonable accommodation? If not, please explain.

Yes, this project is accessible to all students with reasonable accommodation.

RIT abides by the Family Educational Rights and Privacy Act of 1974 (FERPA), which prohibits instructors from making students' identities, course work, and educational records public without their consent (rit.edu/xVzNE). Will any data gathering or sharing for your project raise any FERPA issues? If so, please explain.

No data gathering or sharing will raise any FERPA issues as all data will be anonymized for reporting.

DISSEMINATION AGREEMENT

By completing this grant application, I agree to provide the materials and services described here, in support of disseminating what is learned from this project to the RIT community.
I also agree to return all/a portion of the funds that I receive for this project to RIT if I fail to complete or provide the materials described here:

- Full Project Plan (*including roles and responsibilities, milestone dates, and pertinent project details*)
- Preliminary Findings report (*may include experiment/study design, lessons learned, initial data collection, and/or literature review summary*)
- Participation in an ILI/TLS Preliminary Findings Roundtable dissemination event (*share and discuss your preliminary findings with your PLIG cohort*)
- Final Summary of Findings (*including data collection, lessons learned, implications for further study, and which may be in the form of an article abstract, conference presentation outline, or short report*)
- Final budget accounting (*reconciliation of budget provided with your application and the actual project expenses)*
- Participation in an ILI/TLS PLIG Showcase dissemination event (*present a poster or other display at the annual Showcase*)

By submitting this application, I accept this agreement. spm *(applicant, please initial here)*

TIMELINE AND TASKS

Please indicate any variances to the planned PLIG 2019 schedule as described in the above Dissemination Agreement and the reasons for this variance. *If you do not intend to deviate from the schedule, you may leave this section blank.*

Task	Date	Proposed Variance and Reason
Full Project Plan submitted to TLS	August 16, 2019	
Preliminary Findings report submitted to TLS	January 10, 2020	
Participation in an ILI/TLS Preliminary Findings Roundtable dissemination event	February, 2020	
Summary of Final Findings report submitted to TLS	August 21, 2020	
Final Budget Accounting report submitted to TLS	August 21, 2020	
Participation in an ILI/TLS PLIG Showcase dissemination event	November 2020	

DISSEMINATION PLAN (*optional*)

Provide details about the journals, conferences, shows, or other external vehicles with strong potential for dissemination of your results (in addition to the ILI/TLS Preliminary Findings Roundtable and PLIG Showcase dissemination events). Include supporting documentation, such as preliminary interest or acceptance, with your application, if available. *(Please note that special consideration will be given to proposals that have a defined opportunity for external dissemination, such as an academic journal or professional conference.)*

The work produced from the project will likely be of particular interest to the computing education research community. As such, publication at computing education conference venues including SIGITE (https://www.sigite.org/), SIGCSE (https://sigcse.org/sigcse), ICER (https://icer.acm.org/) and ITiCSE (https://iticse.acm.org/) will be pursued.

RIT

DEPARTMENT HEAD CERTIFICATION

I support this PLIG application and verify that the principal applicant is a full-time faculty member in good standing in my department.

Principal Applicant Name: Sharon Mason

Department Head Name (PRINT): Stephen Zilora **Email**: Stephen.Zilora@rit.edu

Department Head Signature: _____ **Date**: _____

NOTE: When signed, please scan and email with your Application Form to: plig@rit.edu