PROVOST’S LEARNING INNOVATIONS GRANTS

2016 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. More than 200 RIT faculty projects have received funding since the program was initiated in AY 2000-2001. (Examples of previously funded projects are available at the PLIG website, rit.edu/ili/plig).

The launch of the Innovative Learning Institute (ILI) in 2012, and its charge to assist in the creation of exceptional learning experiences for students, led to an evaluation of PLIG and a revitalization of the program to:

- Better support dissemination of individual faculty learning to the wider faculty population
- Provide funding for the implementation of successful pilot projects
- Integrate funding with Institute priorities
- Support the scholarship of teaching and learning

The 2016 Application Form is found on page 3 of this document.

I. ELIGIBILITY

The principal applicant(s) must be tenured or tenure-track RIT faculty. PLIG 2016 projects can include visiting assistant professors, lecturers, adjunct faculty, staff, students, and other contributors.

II. PLIG TYPES

There are two types of grants—Exploration and Focus Grants—for PLIG 2016. Full details are available at rit.edu/ili/plig.

III. USE OF GRANT FUNDS

Provost’s Learning Innovations Grants for 2016 may range from $1,000-$5,000.

Examples of the use of PLIG funds include:

- Course release (reasonable, actual replacement costs for full-time, tenure-track or tenured faculty members removed from teaching)
IV. PLIG TIMELINE

The grant timeline assumes that most recipients will use Summer 2016 to plan and develop their PLIG funded project for delivery or implementation during the Fall 2016 and/or Spring 2017 semester(s). The full timeline is at rit.edu/ili/plig.

V. SELECTION COMMITTEE AND EVALUATION 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)

Details on proposal evaluation and selection committee membership is on the website (rit.edu/ili/plig).

VI. QUESTIONS OR COMMENTS

Please email plig@rit.edu with any questions or comments.
PROVOST'S LEARNING INNOVATIONS GRANTS

2016 APPLICATION

INSTRUCTIONS

Complete this form in its entirety and email it to plig@rit.edu no later than January 27, 2016. Please note to save and rename this document substituting your name (in place of "NAME") in the file name.

Ask your Department Head to complete the Department Head Certification and return the signed copy along with your application. Note: the signed copy may be scanned and emailed.

If you have any questions about completing this application, please email them to plig@rit.edu or call Michael Starenko at 585-475-5035.

APPLICANT INFORMATION

This application is for a:

☒ FOCUS GRANT
☐ EXPLORATION GRANT

Principal Applicant Name: Dr. Anju Gupta Email: argche@rit.edu
Faculty Title: Assistant Professor Phone: 585-485-4093
(Full-time, tenured and tenure track only)

College: Kate Gleason College of Engineering Department: Chemical Engineering

Department Head name: Dr. Steve Weinstein Email: sjweme@rit.edu

Proposed Project title: Student-driven process oriented guided inquiry learning (POGIL): Hands-on fermentation activity

Total funds requested (requests of $1,000 to $5,000 will be considered): 5000

Others involved in the project (if any): ________________________________
**BUDGET**

There is a fillable PDF worksheet to calculate your budget. You can download the worksheet at rit.edu/plig.

- The total shown on this worksheet must match the "Total funds requested" in the Applicant Information section 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.

**TIMELINE**

Please indicate any variances to the planned PLIG 2016 schedule and your reasons. If you do not intend to deviate from the schedule, you may leave this section blank.

<table>
<thead>
<tr>
<th>Task</th>
<th>Date</th>
<th>Proposed variance and reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full project plan submitted</td>
<td>Aug. 24, 2016</td>
<td></td>
</tr>
<tr>
<td>Preliminary findings submitted</td>
<td>Jan. 25, 2017</td>
<td></td>
</tr>
<tr>
<td>Summary of final findings submitted</td>
<td>Aug. 23, 2017</td>
<td></td>
</tr>
<tr>
<td>Final budget accounting submitted</td>
<td>Aug. 23, 2017</td>
<td></td>
</tr>
<tr>
<td>Faculty Teaching and Learning Commons posting (a summary of findings, examples of teaching designs or materials, etc.) due</td>
<td>On or before Oct. 24, 2017</td>
<td></td>
</tr>
<tr>
<td>Participation in Teaching and Learning Services PLIG dissemination event</td>
<td>On or before Nov. 17, 2017</td>
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</tbody>
</table>
Using the proposal evaluation criteria outlined in the Evaluation section of the website (rit.edu/ili/plig), please provide an overview of the project you are proposing, including:

- Project objectives
- An explanation of the teaching/learning problem(s) it is designed to address
- An explanation of the significance of the project to student outcomes and/or the student experience.
- A brief description of how the project integrates with activity already underway at RIT in the priority area and/or how this approach has been successfully used at RIT already.

Objectives: To provide an integrated and practical educational experience on Fermentation to the Chemical Engineering students through a student-driven process oriented guided inquiry learning (POGIL) technique.

Goals: To provide integrated and practical educational experience to students interested in fermentation and to create an environment for students to develop transferable and applicable skills and appreciate scientific inquiry

Problem statement(s) This proposal addresses two deficiencies with the current Chemical Engineering curriculum

1. Traditional laboratory courses follow a "recipe-based" teaching method which does not reflect real-life problem solving situations that students experience during their co-ops and jobs. Resources for different laboratory teaching styles are limited

2. Governor Cuomo recently announced more than $16 M investment and support to grow New York's Craft beverage industry[1]. The industry grew 59% between 2013 and 2014 leading to a surge of breweries, wineries and cideries [2]. There is a need for trained and knowledgeable Fermentation engineers to fill scientific positions in this rapidly growing industry.

Expected outcomes:

1. Students will be able to demonstrate the basic concepts of the chemistry, biology mass transfer and reaction engineering underlying the process of fermentation (Biochemical process, classes of microbes involved, analysis of fermented products)

2. Students will be able to demonstrate the knowledge of aspects of a Fermentation facility (analysis of ingredients, sanitation and safe practices)

3. Students will be able to demonstrate professional skills (oral and written communications, laboratory notebook documentation, written reports, teamwork, collaboration)

Focus areas- student-driven course: This project is well-aligned with RIT's mission of being a student-centered research and experiential learning university with the goal of developing T-shaped graduates with the disciplinary depth and breadth across multiple skills and competencies. RIT is a cooperative education university, the proposed student-driven process oriented guided inquiry learning (POGIL) activity will provide them an industry-style environment requiring them to work in teams with well-defined roles and acquire content knowledge and process skills. The central idea of POGIL-based learning is that each student constructs his/her own knowledge of the topic, and that knowledge is influenced by the students prior knowledge. This is achieved by forming collaborative groups with well-defined roles that teach them to manage, acquire the necessary process knowledge and skills to accomplish a task.
STATEMENT OF CREATIVITY (three paragraphs maximum)

Provide a brief description of how this is a novel approach, or a new application of an existing mode or model of teaching and learning, and/or research about how teaching and learning represents an entirely new paradigm. (Please note that special consideration will be given to proposals that demonstrate a new use/application of a model, system, or technology already in use at RIT.)

This work proposes a novel combination of two education models a) student-driven and b) process oriented guided inquiry learning (POGIL) based laboratory activity on Fermentation to meet the need for trained Biochemical Engineers to prepare a new generation of workforce to address the surge of breweries, wineries and cideries in the State of New York. Requested funds will be utilized to develop an upper-level experiential laboratory module for the Biochemical Engineering technical elective course (CHME-499) for Chemical engineers and possibly for Chemistry, Biotechnology and molecular biosciences majors because of its multidisciplinary nature for Fall 2016. The lab module will be continued in Chemical Engineering Principles laboratory course (CHME-391) offered in Spring 2017. The proposed lab module will build up on POGIL design and teaching elements outlined by RIT’S Teaching and Learning Services (TLS) [4,5].

Currently all the Chemical Engineering laboratories and processes are taught in traditional recipe-style method wherein the students follow a prescribed experimental procedure in a set time which limits the level of learning and often leading to incomplete understanding of the aims and the generated results in context to the theory provided in the lecture. Additionally, traditional methods leave little or no room for creativity, out-of-box thinking and contextualization [6]. The proposed student-driven POGIL strategy will emphasize teamwork, oral and written communication, management, problem solving, information processing and assessment, and critical thinking [7]. The key differences between the proposed and traditional method are summarized as follows:

<table>
<thead>
<tr>
<th>Style</th>
<th>Approach</th>
<th>Procedure</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recipe-based</td>
<td>Deductive</td>
<td>Provided</td>
<td>Predetermined</td>
</tr>
<tr>
<td>2. Student-led/POGIL</td>
<td>Inductive</td>
<td>Student generated</td>
<td>Undetermined</td>
</tr>
</tbody>
</table>

This activity based class module will focus on beer brewing via a fermentation process. The benefits of this topic will be twofold: 1) preparing the students for co-op at local breweries, 2) preparing the students to compete nationally at the beer brewing contest that will be in effect starting Fall 2017 at the American Institute of Chemical Engineers annual conference. The students will be introduced to basic concepts - Biochemical process, classes of microbes involved, analysis of fermented products. There will be a guest speaker from the industry in the class discussing the industrial process specifications, namely scale up and process safety. The students will be divided into groups and will be asked to follow fermentation process to form beer by simple a fermentation reaction of starch with strains of yeast in Week 1. The groups will be expected to choose a starch source and combination of yeast strains. In week 2 the students will characterize the product by aromam and color test. The final presentation and report will involve design of a fermentor and the process combining the concepts taught in the lectures with their lab experience. This lab module will be repeated in the spring 2017 chemical processes lab during which the focus will be acceleration of the brewing process and separation of the final product.

This course is restricted to fourth and fifth year students. Although there is no beer-testing involved in the proposed module, the students will be required to sign a form testifying their age and agreeing not to drink any of the product.
STATEMENT OF EFFICACY (two pages maximum)

Provide a brief description of the experiment/research design, methodology, and methods of data collection you will use to gauge efficacy.

POGIL design: To address the teamwork component, the elements outlined in RIT ITS’s "Teaching Elements Building Group Process Skills" document listed as follows, will be adopted-[4]

1. Students will be divided into teams of three or four based on their strengths in understanding of course materials, interpersonal skills, management skills

2. Student in the team will be assigned two primary roles- a) Manager (ensures the accomplishment of tasks on time, participation of each member, smooth communications between the members), and b) Recorder (documents the discussions and team observations).

3. Students will be provided with the ground rules- valuable contribution, active participation by each team-member, this will be evaluated by anonymous peer-review survey

Student-led methodology: The students will be required to participate in every stage of the activity developments and implementation. Some of the key components of project activity will include-

Stage 1: Development of project plan, Literature review on methodology for research, carrying out project risk assessment

Stage 2: Experimental group work, Data collection and evaluation

Stage 3: Documentation and presentation of finding and learning outcomes

Measurement of student outcomes: Learning outcomes will be measured by peer-reviewed student evaluations of the oral presentations, and instructor's evaluation of the oral presentations and written reports. A student survey will be conducted to investigate student's experiences after the completion of the activity through the following questionnaire (adopted [8])-

Q1. The lab activity help me understand the background, learning goals, and fundamentals to study the subject and complete the lab work.

Q2: The background information, concept questions and problems, and design problems of the class activity are clear and understandable.

Q3: Every group member was prepared well for the activities and she/he was willing to work together to complete the lab assignments in a timeline.

Q4: The class activities, lab modules, and assignments designed by Process Oriented Guided Inquiry Learning (POGIL) are effective to study the subjects and to do the experimental work.

Q5: I was able to see the demonstration of lab experiment and it helped me understand the point of the lab work.

Q6: The lab experiments actually helped me learn certain concepts better and develop critical thinking and problem skills.

Q7: Terms and/or concepts that I was unsure of became clearer with the lab activities.

Q8: Each group member was knowledgeable and skillful in the subjects.

Q9: The instructor was helpful to guide the activities and to develop skills (learning, thinking, and problem solving) during the class and lab.
References

7. The POGIL Enquirer, Vol 2(1), Spring 2012, 6-13
DISSEMINATION PLAN (optional)

Provide details about the journal, conference, show, or other external vehicle with strong potential for dissemination of your results. 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.)

ILI will arrange channels for disseminating results within RIT.

PI Gupta is an active member of Chemical Engineering Education division at American Institute of Chemical Engineers (AIChE), American Chemical Society (ACS) and American Society for Engineering Education (ASEE). The learning outcomes of the proposed activity will be disseminated as follows-

1. Chemical Engineering Education division presentation at the AIChE Annual conference, Fall 2017 (funds requested)

2. Students will compete at student conference beer-brewing competition at AIChE Annual conference, Fall 2017 (competition required shipping the samples to the site, expenses will be covered by the AIChE student chapter at RIT)

3. Submit a paper to peer-reviewed Chemical Engineering Education Journal Publication (publication cost will be covered through Gleason start-up funds)
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?

PI Gupta will use mycourses.rit.edu to post the materials related to the proposed activity that is easily accessible to the students.

The project will not require assistance for extensive or unusual media, multimedia, simulation, and/or software development.

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 the proposed course is a professional technical elective and accessible to all students

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.

There will be no FERPA issues associated with the proposed project
DISSEMINATION AGREEMENT

By completing this grant application, I agree to provide the materials described here, in support of disseminating what is learned from this project to other faculty at RIT.

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)
- Overview of preliminary findings (may include experiment/study design, lessons learned, initial data collection, and/or literature review summary)
- Final project summary (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)
- Teaching and Learning Commons posting (a summary of findings and examples of teaching designs or materials)
- Participation in a faculty dissemination event
- Final budget accounting (reconciliation of budget provided with your application and the actual project expenses)

By submitting this application, I accept this agreement. AG (Applicants initials)
DEPARTMENT HEAD CERTIFICATION

I support this PLIG application and budget, and verify that the principal applicant Anju Gupta is a full-time, tenured or tenure-track faculty member in good standing in my department.

Department Head Name (PRINT): Steve Weinstein Email: siweme@rit.edu

Department Head Signature: ___________________________ Date: 02/04/2016