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 an Exploration Grant.

Principal Applicant Name: Wade Robison

Faculty Title: Ezra A.Hale Professor in Applied Ethics **Email**: wlrgsh@rit.edu **Phone:** 3155243249
(Full-time only)

College: Liberal Arts **Department:** Philosophy

Department Head Name: Brian Schroeder **Email**: bxsgla@rit.edu

Others involved in the project (if any): Sarah Brownell, Elizabeth DeBartolo

Project Name: An Ethical Checklist **Principal Applicant**

Total Funds Requested (*as calculated on the budget worksheet on the next page*): $
(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		
Sarah Brownell		$1000
Elizabeth DeBatroto		$1000
Wade Robison		$1000
Adjuncts, Part-time Faculty/Staff, Summer Salary		
Student Workers, Graduate Assistants		
TBA	Data collection/ Analysis	$500
Personnel Total	**$0.00**	$3500
Equipment	**Purpose/Justification**	**Amount**
Equipment Total	**$0.00**	
Travel	**Purpose/Justification**	**Amount**
Travel Total	**$0.00**	

Other (*Specify*)	Purpose/Justification	Amount
Conference		$1000
Workshop		$500
Other Total	**$0.00**	
Total Award Requested	**$0.00**	$5000

Statement of utility (two pages maximum)

Using the evaluation criteria outlined in the Proposal Evaluation section of the PLIG website, 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 a priority area and/or how this approach has been successfully used at RIT already.

The project objectives are (1) to fashion a simple ethical method — a checklist perhaps — for students to use in solving engineering design problems, the intellectual core of engineering, and (2) to create a standardized method for assessing how well students are performing against the ABET outcomes:

- Outcome 2: “an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors” and
- Outcome 4: “an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts”

There is no doubt that the artifacts engineers design can cause harm. Samsung’s exploding phone is just one of the latest examples. There is also no doubt that when engineers choose a design solution, they are choosing something that, when introduced into the world, will produce some combination of benefits and harms. At a minimum, engineers ought not to cause unnecessary harms: that is an ethical requirement. But as things now stand, there is no way to ensure that a design solution meets even that minimal standard. Without some way of checking off the various ways in which a design solution may cause harm, neither students nor practicing engineers can be sure that they have examined all the ways in which a design solution may cause harm. We want

to graduate engineers who self-consciously make ethical choices when they become practicing engineers. The aim is to help ensure that students graduate with an understanding of the ethical aspects of engineering.

ABET requires that engineering programs have an ethics component, but has only very recently introduced, in Outcomes 2 and 4, ethical considerations into its list of outcomes by focusing on making informed judgments and developing designs that consider a wide variety of factors. This is a huge advance over what one finds if one looks at ABET's definition of engineering design. In the list of constraints ABET lists, there is nary a word of ethics: 'accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.' Legal considerations make it into the list, but not ethical concerns.

ABET gives no guidance on how to implement ethical considerations into engineering. The College of Engineering had begun a process that did not make it through the transition from quarters to semesters, and the result is what we now have, a hodgepodge of solutions, with no single solution finding its way into every department and with no assurance that students are in fact taking ethics into consideration when solving their various design problems. There is now little attempt to integrate ethical considerations into engineering design. If we examine the ways in which engineering departments at RIT fulfill the ABET requirement of considering ethics, we will find departments having students read the various codes of conduct, a few articles on engineering disasters (e.g., the Challenger), but nothing about how ethical considerations enter into making decisions about what solution is best for a design problem.

We have begun the process of integrating ethical considerations into two courses, the first-semester Grand Challenges course and the Multidisciplinary Senior Design Program, and we would build on those beginnings, formalizing, if we can, what has so far been a relatively informal procedure.

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 a new paradigm.

Engineers cannot help but make ethical decisions in solving design problems. Once a choice is made and the design solution is realized in an artifact that is put into the causal stream of the world, it is going to have effects, upstream and downstream, some good, and some harmful. Think here of a cell phone with a battery so tightly packed that it would burst into flame. Such a design solution is harmful enough that such a cell phone was banned from being taken on airplanes. Just as it would be unethical for a passenger to sneak one on a plane, it was unethical to choose a design that, when realized in an artifact, would destroy itself and put at risk everything around it. So design solutions are ethical decisions.

We propose creating a procedure that students — and practicing engineers — could use to assess whether their design solutions are in fact ethical. The aim is to see, first, if we can design a procedure that will enable us to more easily evaluate our students' ability to achieve the outcomes in Criteria 2 and 4 above and, second, whether those two criteria capture all the ethical considerations relevant to engineering practice.

Is our approach novel? In one way it is: as far as we know, there is now no such checklist or anything like it used in engineering classes or among practicing engineers. But in the most important way, it is not novel at all. Engineers are already making ethical decisions, and all that is new is that we want to make those decisions explicit. The gain is that once such decisions are noted and the grounds for them made clear, engineers will be in a better position to expand their ethical concerns — to the sourcing of the material their design solution will require once realized in an artifact to the difficulties that arise in deposing of the artifact once its useful life is finished.

Statement of efficacy (two pages maximum)

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

We will implement the new checklist approach and assessment tool into at least two courses during the PLIG period, Grand Challenges: Fresh Water and Multidisciplinary Senior Design, with the intent of incorporating it into additional courses once it has been piloted. These two courses have been selected because they have already been a testbed for incorporating additional ethics content into the engineering curriculum. One represents an elective course and one represents a course required by >80% of graduating KGCOE students. A new tool that works in these two classes should be transferable to nearly any other course in the curriculum.

In the Multidisciplinary Senior Design course sequence, ethics is integrated into the students' required risk management activities. The Risk Management instructional module will be improved to include the new checklist tool. At the end of the semester, we will evaluate *how many* risks with external impact (e.g., impact downstream of their project, rather than impact that could prevent students from completing their required work) the students were able to identify, separated out into categories of Technical, Resource, Safety, Environmental, and Social. A similar study was completed after the prior risk management instructional improvement, as outlined in [DeBartolo, E. A., & Robison, W. L. (2018, June), *Board 86 : Risk Management and Ethics in Capstone Design* Paper presented at 2018 ASEE Annual Conference & Exposition , Salt Lake City, Utah. https://peer.asee.org/30123]

We have had students in the Grand Challenges: Fresh Water consider the ethical aspects of their solutions to providing fresh water, and they have had no difficulty understanding how desalination, for instance, creates pollution that they must somehow address. All this has all been done informally, by asking students at various times as they work on their team projects what the potential benefits and harms are. Even so, students have improved their capacities to identify, analyze and sort out the ethical issues in a situation. going from 42% to 75% in identifying ethical implications, from 47% to 55% on analyzing an ethical issues, and from 58% to 70% on recognizing the ethical issues in a situation. These are self-assessments, and we obviously take them with grain of salt, but since the students also showed improvement in these capacities in their assignments, the gains certainly have some validity.

We have another source of evidence for the efficacy of introducing ethical considerations into design solutions in Senior Design. Students are to do a risk analysis as part of their project, but the standard procedure is that they examine risks to completing their project. The risk assessment has now been expanded to consider safety as well as societal and environmental risks. These additional assessments

concern the harms their design choices may cause. The students have had no difficulty doing these assessments
.
We can see the importance of this addition by considering that they now have to ask themselves not only, ‘What problems may we face in getting through our project and getting our grade?’, but also, ‘What problems is our solution introducing into the world?’ This second question is one every engineer ought to ask in solving design problems, and introducing it successfully into senior design will better prepare our graduates for what they ought to be doing as practicing engineers.

But the main lesson is that we have some basis for gauging the efficacy of the approach we want to require and make more formal. It works on a relatively informal basis, and that is some evidence that it will work, and perhaps work better, on a more formal basis.

In order to gauge efficacy of the new checklist approach, the checklist we develop will be introduced to students in the two classes, and we will compare the students’ ability to identify ethical issues in the past with their ability to do so using the new tool. This will be a binary assessment: *did* the students identify ethical issues, with no consideration of the *quality* of the work. Additionally, we will develop a rubric to score the *quality* of the students’ work, which will be useful for demonstrating achievement of ABET student outcomes 2 and 4.

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?

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.

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.

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. ___WR

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.)*

We propose having a workshop at the end of our study to inform RIT engineering faculty of what we have been able to accomplish and, if we are successful in creating a method to evaluate our students' ability to achieve ethical outcomes.

We plan on presenting our findings at the International Conference on Ethics Across the Curriculum in the fall of 2020 and in at the annual meeting of the American Society for Engineering Education that summer. Submissions to these conferences are peer-reviewed, and so we do not know if our papers will be accepted. But we intend to submit papers for both conferences and to several others in engineering, including one that may be sponsored by the National Academy of Engineers in its Grand Challenges program.

We will, in addition, be submitting at least one paper for publication to a peer-reviewed journal, either **Teaching Ethics** and/or a similar journal in engineering education.

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: Wade Robison

Department Head Name (PRINT): Brian Schroeder **Email**: bxsgla@rit.edu

Department Head Signature: _____ **Date**: January 18, 2019

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