

## 2019 PROVOST'S LEARNING INNOVATIONS GRANTS CALL FOR PROPOSALS

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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](http://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 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)

The criteria are further defined, illustrated, and explained in the [Proposal Evaluation](#) section of the PLIG website.

### VI. QUESTIONS

Please email [plig@rit.edu](mailto: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).

## 2019 PROVOST'S LEARNING INNOVATIONS GRANTS

# APPLICATION

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### 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](mailto: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](mailto: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:** Thomas B. Kinsman, Ph.D.

**Faculty Title:** Lecturer **Email:** thomask@rit.edu **Phone:** 585-475-5188  
(*Full-time only*)

**College:** GCCIS **Department:** Computer Science

**Department Head Name:** Mohan Kumar **Email:** mjkvcs@rit.edu

Others involved in the project:

Lana Verschage, Director of The Women in Computing (WiC) program,  
Potentially several groups could benefit from this, including: the Neurodiversity Hiring Initiative (NHI),  
the Spectrum Support Program (SSP), and the Program of Color Science.

**Project Name:** The Diversity Appreciation Game: improving understanding of feature selection, diversity, and mutual understanding.

**Total Funds Requested** (*as calculated on the budget worksheet on the next page*): \$3,942.00  
(*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
<b>Full-time Faculty/Staff</b>		
<b>Adjuncts, Part-time Faculty/Staff, Summer Salary</b>		
<b>Student Workers, Graduate Assistants</b>		
Student worker(s)	Setup, run, and cleanup six workshops. At 3 hrs per event times 2 students. \$12/hr x 36 hrs.	432.00
<b>Personnel Total</b>		<b>\$ 432.00</b>
Equipment	Purpose/Justification	Amount
Laser Goggles	Temporarily change perception of colors. Fifty pairs of goggles to accommodate a class of 44 students. (Eleven sets of four plus extras.)	800
Noise cancelling ear protectors.	Temporarily change perception of sounds. Five pairs of noise cancelling earphones.	350
<b>Equipment Total</b>		<b>\$1,150.00</b>
Travel	Purpose/Justification	Amount
Conference Registration, ACM SIG-CSE	Dissemination	350
Flight to Minneapolis, Minn	Dissemination	350
Hotel, four nights at 150 per.	Dissemination	600
<b>Travel Total</b>		<b>\$1,300.00</b>
Other (Specify)	Purpose/Justification	Amount
Printing Custom Jigsaw Puzzles	19 printings at \$40 each.	760
Incidentals – storage boxes, zip lock bags, supplies, glasses straps, etc..	Used for storage of developed materials, glasses straps, contingency purchases, clipboards, etc...	300
<b>Other Total</b>		<b>\$1,100.00</b>
<b>Total Award Requested</b>		<b>\$3,942</b>

## 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:

The purchase of materials and development of workshops to support multidisciplinary and multi-faceted objectives, including:

- Improved understanding of the importance of feature selection for Machine Learning, Artificial Intelligence, and Computer Vision.
- Improved acceptance of diversity, people of diverse backgrounds or genders, and diversity of thought.
- Improved understanding that everyone is *wired differently*, with different strengths and weaknesses.
- Improved student hiring through the Neurodiversity Hiring Initiative (NHI).

People who are red-green colorblind, cannot see subtle changes in red versus green. However, colorblind people *can* also see through camouflage, and have better spatial resolution than normal people. They are not distracted by nuisance colors, and can read signs further away.

Similarly, some people with Asperger's Syndrome have difficulty perceiving subtle emotions and sarcasm. Some speak their mind regardless of the social context. However, some of these same people *can* think in terms of mathematical equations, are good with pattern recognition, are honest, persistent, loyal, and determined. They are more often cooperative than competitive.

Using color filtered goggles (laser goggles), and custom color printed jigsaw puzzles; students, faculty, staff, and hiring representatives will temporarily experience a reduced ability to differentiate colors. During this time they are asked to solve a cooperative color sensitive problem-solving task. Teams of four work together on solving a color jigsaw puzzle. Each team member has a different kind of perceptual-deficit, because each wears different colored goggles. This difference in color perception is analogous to how others view: sarcasm, emotion, writing, mathematics, science, engineering, creativity, and methods of critical thinking and problem solving.

To simulate hearing difficulty, participants may be fit with headphones, which diminish their ability to communicate verbally. Yet, as a team, the participants have a collaborative puzzle to solve. The goal is to complete the puzzle in the minimum amount of time.

A competitive element against other teams may be used to encourage collaboration within each team.

Participants will learn to appreciate other people's diverse view of the world. Programs can use this to improve our understanding of others, and the importance of diverse viewpoints when solving problems. The developed methods will apply directly to courses in Computer Vision (CSCI-631), and Data Science (CSCI-420 and CSCI-720). Additionally, the workshop and methods may also benefit other programs at RIT: the Spectrum Support Program (SSP), the Neurodiversity Hiring Initiative (NHI), and the Women in Computing (WiC) program.

### Teaching/Learning Problems to Address:

While the cause is unknown, there is a dramatic rise in the number of students who are atypical or neurodiverse. Some estimates put the number students who are on the Asperger's spectrum at 20 to 30 percent of the population. These students can think in mathematical equations, are good with technology, and mentally see conceptual connections. However, these same exceptional students have difficulty integrating into the college culture due to the differences in emotional intelligence, and difficulty perceiving social cues.

These students are drawn to STEM fields, and are found in disproportionate numbers in STEM related disciplines. These disciplines especially include: Computer Science, Statistics, Mathematics, and Engineering.

Diverse people are beneficial to RIT and to STEM related companies. Yet, companies, students, and faculty misunderstand how atypical people perceive the world, and do not realize the benefits they can provide.

(continued)

## **Significance, Outcomes, and Student Experience:**

Some of these students recognize each other as “*atypical nerds*”, and do not socialize with each other. This accentuates their feelings of isolation and aloneness on campus, even if they are all in the same “Nerd Herd”. This is detrimental to our overall community’s mental health. The goal here is to promote mutual admiration and mutual acceptance.

Some people and companies presume that students with Asperger’s syndrome (or on the Autistic Spectrum) have nothing to offer them. They ostracize students who are “wired differently”, and do not hire them. The goal here is to have companies recognize that everyone has strengths and weaknesses, and that they want the students who are technically savvy.

People assume that others, who are deaf, or hard of hearing, do not hear anything at all. This is similar to assuming that people who are color blind cannot see any colors. The goal here is to have participants realize that others with a decreased ability to differentiate a perception (such as sight, color, or sound) may still have the ability to perceive that sensation, just as people who are less sensitive to emotions can still be empathetic.

## **Integration with Existing Activity:**

These materials and workshops would help support the teaching of courses on Machine Learning and Artificial Intelligence. Machine Learning and Data Science courses emphasize learning sophisticated algorithms and new technologies. Yet, they fail to teach that *the features used in an algorithm are more important than the algorithm used*. If garbage is put into a deep learning algorithm, the algorithm will learn deep garbage. Instead, participants will learn to appreciate the use of different features during the problem-solving task: color contexts, texture contexts, shape context, negative space, and other cues are used. Furthermore, the most important features change over the course of solving the jigsaw puzzle.

These very same materials and workshops can be loaned to others on campus. The Neurodiversity Hiring Initiative (NHI) program, the Spectrum Support Program (SSP), and the Women in Computing (WiC) could all use the developed materials for teaching an appreciation of how everyone has different strengths. One target audience is the Career Readiness Program run by the SSP and NHI over the summer. Additionally, workshops are done with recruiters to help them understand the benefits of hiring our neurodiverse students.

The same set of materials can be used to teach different workshops, depending on the pedagogy, methodology, and lesson delivered. Just as one building can teach Sunday school on Sundays, and grade school the rest of the week, this equipment and materials can be used for multiple workshops.

Ultimately, this is literally having participants see the world through other people’s glasses. You cannot know what they are seeing until you see the world through their eyes.

## 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.

The development of these materials requires a novel understanding in the areas of, Human Visual perception, Color Science, Feature Selection, Machine Learning, Computer Vision, and Computer Graphics. Few individuals have all this collective skill set. Dr. Thomas B. Kinsman has a Ph.D. in imaging science. During this process he studied Color Science in the Munsell Color Science Laboratory with Dr. Roy Berns, and Dr. Mark Fairchild.

Additionally, Dr. Kinsman has a child who is deutan/deutanomalous, and a wife who is protan/protanomalous. (These are different forms of colorblindness). This provides Dr. Kinsman with a unique motivation and appreciation of how others perceive the world differently. Additionally, some of Dr. Kinsman's family members are on the spectrum. Again, this provides him with a unique motivation to develop these materials and disseminate the information.

Some of the jigsaw puzzles will be designed with camouflage so that in order to see the texture variations, the participant must either be: naturally color-blind, or be wearing the correct laser goggles (to cause a higher blue-vs-yellow contrast and a reduced red-vs-green contrast). Those who have normal color vision, or are wearing the alternative laser goggles will not be able to perceive the features used.

Here, being colorblind is an asset, not a liability. Again, one goal is to have students (participants) learn that *being different is not a deficit*.

During the course of the workshop, participants can rotate goggles to see what other participants are seeing in the puzzles. They will suddenly be able to see what they were missing before. They will realize that their ability to see red-green camouflage was preventing them from seeing the other underlying patterns.

Periodically during a workshop, all of the teams are all stopped at once. Participants are asked to consider and record what features they are using at that time. This is to promote metacognition and self-reflection.

Over the course of the problem solving, participants will realize that they are switching between different features: shape contexts, color contexts, texture and contrast cues. Participants will be asked to record what strategy they are using, and later compare them to each other. Using this approach, participants will learn that other participants are using different strategies, and/or how their own strategy evolves over the course of the problem solution. The puzzles are solved much faster at the end, when the process of elimination effectively narrows down the puzzle pieces to choose from.

A novel strategy to solve jigsaw puzzles is sometimes used in which one puzzle piece, which almost fits into a target location, is used as a proxy pattern. This piece, which *nearly* works, is used to search and compare to other available pieces for pieces that have similar features. This strategy is the same as a recommender system, or recommender algorithm, used in marketing. The proxy piece helps narrow down the possible choices, in the same way that previous searches on a website (e.g. Amazon) are used to help narrow down choices. This can be used to help teach aspects of data science, but using a concrete kinesthetic method, instead of a purely theoretical or mathematical technique.

The techniques used here have wide applicability and will impact a full range stakeholders at RIT. The workshops can be used with students, faculty, staff, advisors, and potential employers.

## 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.

### Research Questions:

There are several research questions to be explored here:

- Can working together on a collaborative project help students form social bonds with each other? Many of these STEM students are uncomfortable with social interactions, to the extent that they are uncomfortable working together on group projects – a necessary skill for the workplace. Can this type of collaborative project used as an *ice breaking activity*, increase the comfort level of students working in groups?
- Can students learn that others, who are less sensitive to stimulus and sensations, are still aware of these sensations and stimulus?
- What is the correct level of complexity for the challenge puzzle? Is a 250 piece puzzle sufficient, or is a 500 piece jigsaw puzzle better for time utilization? If the task is too easy, and over too quickly, does it limit bond forming between participants?

Pre-event and post-event feedback surveys and measurement instruments will be used to evaluate the effectiveness of different modes of presentation. Trying to measure a person's perception is a latent variable, and requires some method of asking the participant to be introspective about their experiences and changes. Measurement surveys will be developed to ascertain the participant's changes in perception.

## 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?

One purpose of this grant is to obtain the specialized laser goggles and hearing protection needed. These are expensive, but readily available.

The grant is also to print and calibrate the colors for these unusual jigsaw puzzles. Dr. Kinsman will develop the images needed for the puzzles.

There are no additional special considerations.

The workshops developed, and materials, will be accessible to all RIT students.

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](http://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](http://rit.edu/xVzNE)). Will any data gathering or sharing for your project raise any FERPA issues? If so, please explain.



No FERPA issues will be raised.

## 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. TBK (*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	

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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.)*

**Dissemination** will occur through a paper submitted to ACM SIG-CSE conference, IEEE Frontiers in Education Conference, or appropriate similar conference.

The project may also be displayed at the New York State Computers and Technologies in Education (NYSCATE) conference, and other public forums, such as Maker-Faires, and Imagine-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:** \_\_\_\_\_ Thomas B. Kinsman, Ph.D. \_\_\_\_\_

**Department Head Name (PRINT):** \_\_\_\_\_ Mohan Kumar, Ph.D. \_\_\_\_\_ **Email:** mjkvcs@rit.edu \_\_\_\_\_

**Department Head Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

NOTE: When signed, please scan and email with your Application Form to: [plig@rit.edu](mailto:plig@rit.edu)