**Teaching Innovation Grants 2024**

Application for Course and Program Projects

Please list all applicants, with PI listed first. The PI will be the primary contact and will be responsible for budget oversight if the grant is awarded.

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| **Name** | **Job Title** | **Department/Program/Office** |
| PI: Rose Bohrer | Assistant Professor | Computer Science |
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**Title of Proposal:** Pedagogical Comics for Programming Language Design Instruction

**Brief Proposal Description (maximum of 80 words, for publicity purposes).** This project funds production of a series of one-page comics, each illustrating a key concept from respective lessons of the PI’s courses on programming language designs. Not only do comics serve as mnemonics for key concepts, but the diverse cast of characters promotes a subtle message of belonging in the classroom.

**Course(s) or Projects Affected:** CS 4536, CS 536

**Approximate Number of Students Affected Annually:** 85

**TOTAL BUDGET REQUEST: $6,240**

**Start Date:** Spring/Summer 2024

**End Date (when final report will be submitted):** December 2024

**CERTIFICATION**

I agree to abide by the grant conditions in the program guidelines if an award is made.

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| **Signature(s) of Applicant(s):** (typed signature is acceptable) | **Date** |
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**DEPARTMENT HEAD / PROGRAM DIRECTOR ENDORSEMENT** is required. Please ask them to send it as an email message to [morgan-center@wpi.edu](mailto:morgan-center@wpi.edu) by February 8, 2024.

Budget Details and Justification

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| **Student support** (specify hourly wage, estimated hours, time period, and activities). Consider $15/hr for undergraduates and $15-20/hr for graduate students, depending on required skill set and time of year. | $6240 |
| *Explanation and justification:* The course materials consist of 21 lessons, each which will receive a 1-page comic illustration. These comics feature five characters, which will each receive a character sheet as part of the design process. Commissioned comic illustration is typically billed by page, not by hour. I budgeted based on mean market rate for indie illustration according to fairpagerates.com. For line art, color, and lettering combined, this rate is $240/page. For an experienced illustrator, this page rate averages to $15-20/hour. For 26 pages, this yields (21+5)\*240 = $6240 for illustrating the entire project.  This work is expected to be completed by one undergraduate student with specialized art skills over (e.g.) the period Apr-Dec 2024. This budget includes intermediate products such as four iterations of the illustrations as well as planning meetings. | |
| **Faculty compensation** (specify individuals, time period, and activities) | **$ 0** |
| *Explanation and justification:* The PI’s time commitment is at a level which does not necessitate additional compensation. The PI’s activities include scriptwriting, storyboarding, meeting with the commissioned artist, and providing feedback on works-in-progress, taking place from April to December. Though these activities are in addition to the PI’s typical course development workload, no additional compensation is sought, due to the intrinsic satisfaction provided by the work. | |
| **Travel and/or professional development activities** | **$0** |
| *Explanation and justification: N/A* | |
| **Supplies, software, equipment** (itemize and explain why department capital or IT budgets are not an appropriate source of funding) | **$0** |
| *Explanation and justification:* The PI has consulted with her top candidate for the art commission, who has confirmed they already have access to all necessary supplies and software. | |
| **Assessment/evaluation support** | **$0** |
| *Explanation and justification: N/A* | |
| **Other costs (itemize)** | **$0** |
| *Explanation and justification: N/A* | |
| **TOTAL =** | **$6240** |

**Project Description:** This narrative should not exceed three single-spaced typewritten pages with 11 point or larger font. Use of the following headings is required. *For guidance on each of these sections of the proposal, see C. How to Prepare a Strong Proposal, on p. 2 of this document.*

***Need for the project***

The field of programming language foundations has not only a diversity problem, but a belonging problem. This field often presents itself to the outside world as a “prestige” subfield of computer science, where the need for rigorous mathematical proof is reflective of deep intellectual prowess. For marginalized scholars in this field, no amount of rigorous mathematics is enough to “prove” that we belong. Though rarely formalized through the academic literature, this is pervasive in our daily lived experience. Whenever a group of marginalized scholars in programming languages connect at an academic conference, conversation quickly turns to feelings of exclusion and non-belonging. All too often, these fears prove true: restricting my attention even to my own intersectional identity of transgender women, I can name multiple PhD graduates in this subfield whose academic careers were derailed by interpersonal transmisogyny from their direct supervisors, a fate I narrowly avoided myself. This is equally true for other marginalized groups.

Perceptions of oneself as not belonging are known to start early in one’s educational journey, and thus students’ first exposure to a given topic is a key moment at which messages of belonging (or non-belonging) can be sent. Perhaps without thinking, contemporary course materials for programming language foundations passively tell marginalized students that they are the Other. Such courses frequently employ identitarian language telling students they must “be Computer Scientists” – for students whose status as “a real computer scientist” has already been questioned in other environments, this reads as an announcement that their courses are not for them. Exacerbating this problem, traditional course materials rely heavily on prerequisites in higher mathematics, a field with similar belonging problems, and rely heavily on formal mathematical notations, to the point it may impact the self-efficacy of students whose prior opportunities to take higher mathematics courses were limited. On a different front, it is also common to emphasize the idea of doing theoretical work for theory’s sake, yet the academic consensus is that engagement of diverse student bodies improves when applied motivations are included in the narrative.

“Human Centered Programming Languages” (HCPL) is my long-term project to address this issue through the development of an entirely new introductory PL curriculum. Deliverables thus far have included an open-access textbook, assignments, slides, autograders, and two full-length research papers. ***The proposed project is a series of pedagogical comics with diverse characters, one to accompany each lesson of the HCPL curriculum.***

The proposed project is important because ***course materials are media***, and as media, they implicitly communicate social messages such as who belongs and who does not. In this light, the use of comics is intentional. For many of today’s students, the mere use of advanced mathematical notation can recall memories of math anxiety, whereas the use of visual art is more likely to evoke positive memories, perhaps moments of self-expression or recreation. These memories serve to communicate the first key message: there is no need for math anxiety. The characters then serve to communicate the second key message, one of belonging. In addition to being diverse in terms of their gender, race, and disability status, these characters are also

Textbooks-as-media

***Goals and objectives***

***Approach***

***Deliverables and Impact***

***Project timeline***