

SoTL Grant Application Form (2020-2021)

1 Basic Information

Title of project: Designing integrated career-focused activities in physics using personas

Principal Investigator

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IRB Protocol: Pending

Requested Funds: \$2500.00

2 Project Abstract

The career landscape in physics is complex and there is often a lack of transparency about possible career trajectories. The goal of this project is to create a set of career-focused activities for physics students. The activities will be designed to help students navigate the complex landscape of physics careers and to connect to DePaul's mission through the concept of vocation. In order to create activities that will resonate with DePaul physics students, this project proposes an innovative approach to curriculum development: the use of "personas" which are fictional representations of students based on real data. The research phase will develop a set of personas that well characterize the diverse needs and motivations of DePaul physics students around issues of career planning and sense of purpose. Then, the design phase will be conducted in collaboration with members of the physics department to use these personas to create activities that can be integrated throughout the curriculum. Since the use of personas for curriculum development is new, one of the outcomes of this project will be a research article on the development and use of personas to address design problems in curriculum development. This grant requests funding for transcriptions services and to provide compensation for interview participants.

3 Project Description

3.1 Purpose of Project

As noted in *Phys21: Preparing Physics Students for 21st-Century Careers* [1], students who graduate with a bachelors degree in physics are often “hidden physicists”, using their physics training in jobs which do not explicitly mention physics. This often makes for a lack of transparency about possible career trajectories and a complex career landscape, which is especially problematic for groups that are historically underrepresented in physics, such as first generation college students, women, and racial minorities [1, 2].

Given the complexity of the career landscape and the impact on underrepresented groups, there have been calls for and efforts within the broader physics community to address these issues [3–7]. However, curricular efforts designed for classrooms have primarily been geared toward high school and two-year college introductory classes [5, 6] and those geared at upper-level undergraduates are typically used outside of the classroom [7], which means that only a subset of students have access to these resources.

Finally, part of DePaul University’s mission [8] endeavors to help students develop a sense of personal meaning and social purpose, exemplified in the “Explore Your Purpose” initiative [9], which has curated a set of activities that facilitate enduring understandings around issues of purpose and vocation. However, there is not always a clear pathway for integrating these activities with the content of a physics classroom or for adapting these activities to resonate with students at different points in their undergraduate experience.

Thus, the overall goal of this project is to design (and/or adapt from existing materials) a set of career-focused activities for physics students that will help them navigate the complex landscape of physics careers and are integrated within our local context to help students also connect to DePaul University’s mission through the concept of vocation. Research shows that successful change in instructional practice requires understanding the local system and designing to work within that system [10]. Thus, addressing the design goal requires first answering a research question: **What are the needs and motivations of DePaul physics students around issues of career planning and exploring one’s sense of purpose?**

3.2 Theoretical Framework

This project will use “personas” as a means to address the research question and ultimately use these personas to facilitate the design process. Personas are “detailed descriptions of imaginary people constructed out of well-understood, highly specified data about real people” [11, pg. 3]. The use of personas for design is rooted in ethnography and primarily used in the field of human-computer interaction [12, 13]. In recent years, personas have also been used in education for professional development design [14, 15] and for program design [16, 17].

3.3 Research Methodology

Personas are constructed using data from real people and represent the end-users in a design process [11]. In this case, the primary data will be a series of semi-structured interviews with current students and alumni in Fall 2020 that will provide rich, detailed, qualitative information about student needs and motivations around issues of career planning and sense of purpose.

The process of creating personas involves first synthesizing the experiences of real students from the data: identifying major themes and highlighting important variations and/or conflicting experiences [18]. This synthesis helps move away from the individual identities of the participating students and protects their anonymity. It also identifies patterns and highlights aspects of student experiences that are most relevant to the design question at hand, removing some of the complexity that comes with qualitative ethnographic data.

The synthesized data are used to construct a small set of believable characters, personas, that maintain the key features and variations from the data analysis. In constructing fictional characters that are rich and detailed, one maintains the anonymity of the original participants but allows the design to focus on a small set of realistic users who represent the wants and needs of those for whom we are designing. These personas will then guide the development of curriculum in Spring 2021 to address the design goal. The design phase will be conducted in collaboration with members of the faculty in the Department of Physics and Astrophysics in order to ensure that the activities can be well integrated throughout the curriculum.

3.4 Impact of Project

The activities created through this project will be designed to help our students develop enduring understandings about personal meaning and social purpose; and will better prepare them for the complex landscape of physics careers. By helping students to better connect with DePaul's mission through the concept of vocation, these activities will contribute to the first priority of DePaul's current strategic plan: to "deepen our commitment to DePaul's Catholic, Vincentian, and urban mission" [19]. In addition, these activities will be designed to provide better support for our diverse student body, particularly first generation college students and those from underrepresented groups, which speaks to the second priority of the university's strategic plan [19] and the fourth priority of the strategic plan for the College of Science and Health [20].

In considering calls within the broader physics and physics education research communities, this project will contribute in several ways. First, the process of building personas from local data and using them for curriculum development is an innovative approach that addresses calls to design for the local environment [10]. Second, the activities themselves, although designed for our local environment, will contribute to the larger conversation about how we address the complexity of the physics career landscape in the classroom [1]. Finally, curriculum development that focuses explicitly on connecting to a university's mission is rarely seen in the literature and provides an important and unique perspective.

3.5 Dissemination of Results

Research outcomes:

- A set of personas based on actual DePaul physics students and alumni that can be used for on-going curriculum development related to career planning and sense of purpose.
- A research article for either *Science Education* or *Physical Review Physics Education Research* on the development and use of personas for curriculum design.

Teaching outcomes:

- An set of activities designed for integration within the current physics curriculum.
- A plan for implementing and assessing these activities beginning AY 2021-2022.

4 Project Plan and Timeline

- Fall 2020:
 - Conduct interviews with current students and alumni (Oct-Nov)
 - Visit Kansas State University to work with collaborators on data analysis (Nov-Dec)
- Winter 2021
 - Complete persona development and validation
 - Map existing curricula to the needs and motivations of the personas
 - Meet with individual faculty and identify areas to target for activity development
 - Begin drafting research article
- Spring 2021
 - Adapt and/or design new activities based on personas and feedback from faculty
 - Meet with faculty to discuss and revise activities
 - Create implementation and assessment plan for AY 2021-2022
 - Complete and submit research article

5 Budget

My effort on this project is being funded through a Quality of Instruction Council Paid Leave. My collaboration with Kansas State University is supported by a scholar-in-residence grant through the American Association of Physics Teachers Physics Education Research Topical Group.

This proposal requests funding for:

- Transcriptions services (e.g. Rev.com, GoTranscript): typically \approx \$1.50 per minute, and
- Compensation (gift cards) for participants: \$20 for current students and \$30 for alumni.

Thus, the total cost per hour-long interview will be \$110 for current students and \$120 for alumni. We hope to do 22 interviews (14 current students and 8 alumni): $14 \times \$110 + 8 \times \$120 = \$2500$.

Selected References

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