Scientific Identity Development: The Value of High Impact Practices in Undergraduate Research for Underrepresented Students

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Introduction

- **Undergraduate research experience (URE)** is a high-impact practice that prepares students for graduate school, and provides high level skills (teamwork, problem-solving, communication, etc.).
- Students of color who participate in UREs see themselves in academic roles and have a greater persistence toward degree completion. These research experiences develop their scientific identity, self-efficacy, personal and academic skills and influence their decision to pursue research in the future.
- Students of color have lower participation rates in UREs due to a lack of representation, self-doubt, unawareness of opportunities, or financial and psychosocial barriers (Amayá, et. al., 2018; Lapatto, 2010; Pierszalowski, 2021; Eccles & Barber, 1999; Krieger, et al, 2003; Dovidio et. al, 2001).
- We used Carlone & Johnson's (2007) three dimensions of scientific identity:
  - **1. Competence** (acquiring scientific knowledge)
  - **2. Performance** (demonstration of scientific knowledge)
  - **3. Recognition** (self-recognizing and others recognizing one as a "scientific person").

Purpose of this study:

- To document the journey of three underrepresented psychology students in their quest to develop their scientific identity through URE **(Study 1)**, which included a workshop on health disparities, and collecting pilot data on its impact on undergraduate psychology students **(Study 2)**.

- To provide recommendations for promoting the scientific identity development of underrepresented students in universities.

Method

Participants

Study 1: Three underrepresented undergraduate psychology students who identified as Filipino/a (n = 2); Latina (n=1), ages ranging from 20-22. Data collection came from the answers that participants provided to a 21-item open-ended questionnaire.

Study 2: Ten psychology college students participated in a pilot study. They filled out a 9-item questionnaire assessing the learning and impact of the workshop "Addressing Health Disparities Through Psychological Principles".

Data analysis
We conducted qualitative analysis to identify main themes and categories from the questionnaires (Study 1 & 2).

Results

Study 1: Scientific Identity Model (Carlone & Johnson (2007))

- ***1. Competence.*** Scientific knowledge of psychological theory and research methods was strongly demonstrated by:
  - The comprehensive review of the literature included in the PowerPoint workshop-e.g., microaggressions, stigma, cultural competence, unconscious bias, inclusive language, institutional racism, etc.
  - The identification of the core psychological principles involved in health disparities: implicit bias and aversive racism, stereotyping and stigma, microaggressions, color blindness, and medical gaslighting.

- ***2. Performance:*** The mastery of scientific knowledge was clearly demonstrated by:
  - The delivery of the health disparities workshop to undergraduate psychology students.
  - The submission and acceptance of an abstract to the **Western Psychological Association (WPA)**. The development and presentation of a poster reporting the results of the studies (April 28, 2023).

- **3. Recognition:** The self-recognition of being a researcher and being recognized by others as a "scientific person" was demonstrated by:
  - Completing the research experience (three semesters) students unequivocally identified themselves as scientists. Scientific self-recognition was evident by developing and delivering a research-based workshop to undergraduate psychology students, which had a positive impact.
  - The feedback provided by undergraduate students validated the scientific identity of the undergraduate researchers as having the expertise of presenting evidence-based research in the workshop.
  - The acceptance of the WPA poster, which is selected through a competitive process, demonstrated recognition of the undergraduate researchers' scientific identity.
  - Both the recognition from undergraduate students and the WPA committee demonstrated that others recognized the work of undergraduate researchers as scientists, thus strengthening their scientific identity.

Study 2: Impact of the workshop

- Learning about health disparities for racial and ethnic minorities elicited negative emotions (sadness, frustration, anger), which lead to motivation to act. Students felt empowered to impart change and continue learning about health inequities.
- Participants questioned institutions and their ability to create tangible solutions to bridge disparities in all areas of healthcare.
- Before the workshop, students felt naive and uninformed on health disparities, but the workshop increased their awareness,"opened their eyes", and motivated them to educate others.
- The final feedback included very positive comments: valued the solutions to reduce health disparities, the five psychological principles, etc.

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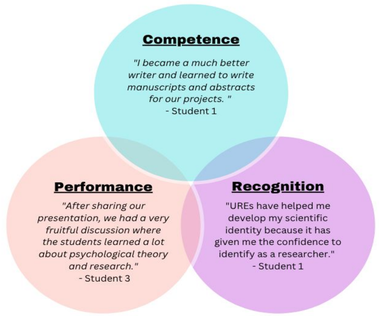
Scientific Identity Model



Recommendations

What can universities do to increase research participation of underrepresented students?

- Need to directly advertise opportunities in programs/departments with high representation of underrepresented students (programs/clubs).
- May provide direct financial support so students of color can devote time to research as opposed to having multiple jobs.
- Can clearly advertise on their website any research program opportunity that is available on campus (McNair, summer research opportunities, faculty labs).
- Create strong and supportive mentorship relationships with students, with a focus on those with underrepresented backgrounds.
- Implement research methods in curriculum and coursework to broaden exposure to undergraduate students.
- Should provide opportunities for scientific exploration through research internships, research lectures, etc.
- Should offer full funding for students of color presenting their work at conferences.

Discussion

- We found that through undergraduate research experience, a strong scientific identity can be achieved at all the three levels: competence, performance and recognition (Carlone & Johnson's (2007).
- Fostering scientific identity development contributes to the pipeline and diversity representation in graduate school and the workforce.
- Overall, universities should support underrepresented students participation in UREs as early as possible in their college experience. The advantages are undeniable.

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