Beyond the Bench and Bedside: Women's Success in STEM via Active-Learning Projects

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Introduction

Gender Inequality: Women in STEM

- Women in the U.S. are underrepresented in science, technology, engineering, and math (STEM) fields, including healthcare (Landivar, 2013).
- There is a call to action to enhance inclusivity in STEM (Koizumi, 2015).

Women in STEM encounter challenges and report gendered experiences:

- Women in STEM experience gender bias in recruitment and hiring (Moss-Racusin, et al., 2012), from colleagues/peers (Robnett, 2016), and in the workplace (Settles, et al., 2012).
- Women in medicine pursue largely gendered specialties (e.g., family medicine vs. surgery; Erikson et al., 2012; Lambert & Holmboe, 2005) despite enrolling in medical school at equal rates to men (AAMC, 2015).

Current Study: What about the Women Succeeding in STEM?

- One approach to enhancing inclusivity in STEM is to understand what facilitates women's success in STEM. Potential constructs of interest in this quest are:
- **Career identity** which links to later STEM **career commitment** (Chemers et al., 2011).
- **Resilience** which facilitates STEM academic achievement (Kwok et al., 2007), and is encouraged to meet STEM workplace challenges (Jackson et al., 2007; McAllister & McKinnon, 2009).
- **Active learning** promotes STEM retention and engagement (Holdren & Lander, 2012)

Women's success in STEM, including healthcare, provides the missing link to understanding women's career paths and experiences in STEM.

Objective

Our work explores STEM success among students pursuing STEM careers in applied contexts.

- This work has important ties to individual psychological outcomes (e.g., career achievement and development), and career/workplace outcomes (e.g., employee commitment) in STEM.

Methodology

Sample:

- Our sample (N =46) includes an ethnically diverse set of STEM undergraduate and post-baccalaureate students participating in two active learning programs – a summer research program and a community health program.
- Participants were largely young adults (M_{age} = 24.9, SD = 6.3) and primarily women (n = 29, 63%). The majority of the women were pursuing a career in the biological sciences (n = 25, 54.3%).
- The analyses here focus only on the responses and experiences of the women in our sample.

Method:

- In our mixed method design, students were administered online questionnaires that measured individual resilience, situational resilience, and career identity status. Demographic information was also collected.
- Students were also interviewed and observed at program events and project sites. Interviews and observations focused on probing behaviors and experiences relative to career identity and resilience.

Resilience

Individual Resilience

Brief Resilience Scale (BRS)(Smith et al., 2008)

Six items rated on a 5-point scale that identifies individual (trait-based) resilience.

Situation/Contextual Resilience

Scale of Protective Factors (SPF-24) (Ponce-Garcia, Madewell, & Kennison, 2015)

Twenty-four items rated on a 7-point scale that indicates situational resilience.

Career Identity

Marcia's Career Identity Status - Extended Objective Measure of Ego Identity Status (EO-MEIS) (Bennion & Adams, 1986)

Eight items rated on a 6-point scale that indicates participant's likelihood of falling under one of Marcia's four identity statuses based on levels of career exploration and commitment to a given profession.

Results & Discussion

Quantitative Findings

Initial analyses indicated women scored high in both situational and individual resilience.

Measure	Descriptives	Reliability
Scale of Protective Factors (SPF-24)	M=23.04, SD=2.51 (Maximum Score Possible: 24)	α =.90
Brief Resilience Scale (BRS)	M=3.73, SD=.72 (Maximum Score Possible: 5)	α =.81

The majority of students reported an *achieved* or *moratorium career identity status* (n= 22, 82.6%) indicating that they are engaging in active career exploration to determine their career identity or after such exploration have committed to STEM careers.

- A positive correlation between situational resilience and a moratorium status (r = .43, p = .005), suggests that **active career exploration in STEM is supported by situational resilience.**
- A negative correlation between an achieved status and situational resilience (r = -.44, p = .004), suggests that **perhaps situational resilience is less helpful in maintaining STEM career identity.**
- Linear regression indicated that **BRS score significantly predicted the extent of one's moratorium status** (β = 2.058, p = .005). The BRS accounts for 27.9% of the variance in identity status (R^2 = .279, F(1,25) = 9.68, p = .005). [Moratorium status = 2.058*BRS score + .958].

Qualitative Findings

Preliminary analyses indicated that women expressed nuanced experiences relative to individual and situational resilience while describing their career journey to date.

Individual Resilience	Situational Resilience
Presented primarily as **personal attributes or behaviors** that helped students cope with a difficult situation or that they tend to rely on when things get difficult for them	Presented primarily as expressions indicating **reliance on external people, circumstances, or resources/objects** that helped them cope with a difficult situation or that they tend to rely on when things get difficult for them
Example: "I guess a positive thing um that I've done my whole life is just like seeing like the I'm like optimistic so I see the better side of things rather than telling myself oh I can't do them it's too hard." (Summer Research Participant)	*Example: "Having a support group, there are times where I think 'Do I even want to pursue a Ph.D. program, I can just do my masters and maybe I'll be okay with that.' But having someone, not just someone but a group of people telling me 'No you can do this, I know you can. You just have to do it' Because I'll get a little shaken sometimes whether or not worth it for me to pursue a Ph.D." (Summer Research Participant)*

The word clouds below illustrate some of the **common phrases indicative of each type of resilience** (Figure 1: Individual Resilience; Figure 2: Situational Resilience).

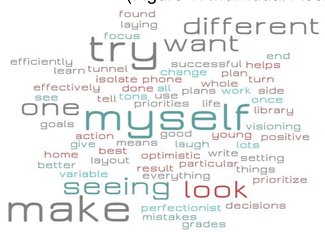

Figure 1: Individual Resilience

Figure 2: Situational Resilience

Conclusions

Key Takeaways:

- Women reported high levels of both individual and situational resilience.
- Situational resilience was associated with career identity status, suggesting that environmental factors may support the formation of STEM career identity.
- Individual and situational resilience are experienced differently and appear important to the experiences of successful women in STEM.

Connections to Gender Parity:

- Women experience resilience and career identity in unique ways by virtue of being underrepresented in STEM careers, including healthcare.
- Enhancing inclusivity in STEM fields may be addressed by way of promoting the factors supportive of women's success in STEM, such as resilience and career identity formation.

Limitations & Future Directions:

- Literature suggests that resilience may be taught (McAllister & McKinnon, 2009), though there is still debate as to whether nature or nurture plays more of a role. Future work can pursue empirical intervention studies to establish the efficacy of resilience interventions in the STEM workplace for women.
- The students involved in the two active learning programs we examined might be more resilient than the average population. Further work is needed to examine to what extent resilience exists in successful women in STEM across various contexts.
- Our students were primarily early-career women in STEM. Additional research can explore to what extent our findings hold in mid and later career women in STEM, who may experience career success differently.

References & Suggested Reading

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