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Exploring Sense of Belonging in Computer Science Students

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ABSTRACT

Student *sense of belonging* has been shown to be associated with many attributes such as motivation and persistence. However, sense of belonging can show variations according to factors such as race and gender. In this study, we examine the relationship between undergraduate Computer Science students' participation in networking, outreach, and mentoring activities and their sense of belonging. Results reveal lower levels of sense of belonging in women and self-identified minorities. However, we observed a higher sense of belonging in female students who participated in networking, outreach, and mentoring activities.

KEYWORDS

Sense of Belonging; Gender Equality; Inclusion; Diversity; EDI

1 EXTENDED ABSTRACT

Sense of belonging has been described as "one's personal belief that one is an accepted member of an academic community whose presence and contributions are valued" [1]. Prior research has found that sense of belonging is associated with motivation, achievement, persistence and student retention, and that race and gender are known predictors of sense of belonging [1–3]. We explored the effect that gender, self-declared minority status and participation in structured departmental initiatives involving student networking (Women@CompSci), outreach (CS Sparks) and mentoring (Buddy-Coders) may have on the sense of belonging of undergraduate CS students. We utitised a survey adapted from the "Math Sense of Belonging Scale" [1]. This consists of 18 positively-framed questions (e.g. I feel accepted/I feel respected/etc.) and 12 negatively-framed

questions (e.g. I feel excluded/I feel disregarded/etc.). All items are preceded by "When I am in a computer science setting...". For each item, participants rated their agreement on an 8-point Likert scale. All undergraduate students in our school were invited to take part. *Belongingness* was measured as the sum of positively-framed question scores minus the sum of negatively-framed question scores.

127 (39 F) completed the survey. Unfortunately, due to small N, students not declaring as either a man or a woman were excluded to protect their privacy. When asked "Do you consider yourself part of a minority in CS?" 46 (28 F) answered positively. Women cited the following additional reasons: race; LGBTQIA+; mature student; religious; and no previous coding experience. Similar reasons were given by men, in addition to: feeling under-skilled socially, and being shy, "nerdy" or more sporty. It is important to note that 11 women (28%) did not consider themselves a minority in CS.

Welch's t-tests were performed to check for significant differences between the groups. Overall, we found a significantly higher belongingness in men (N=88, M=54, SD=34) compared to women (N=39, M=39, SD=39), $t(64)=2.0$, $p=.046$, and a significantly lower belongingness in students who considered themselves part of a minority (N=46, M=33, SD=38) compared to those who did not (N=81, M=59, SD=32), $t(80)=4.0$, $p<.001$. However, the 13 women who participated in the structured initiatives (M=44, SD=47) did not show significantly lower belongingness compared to the 13 male participants (M=53, SD=7.8), $t(19)=0.7$, $p=.512$. There was no significant improvement in belongingness for minorities who participated (N=10, M=29, SD=43) compared to those who did not (N=36, M=34, SD=38), $t(13)=0.3$, $p=.763$.

Although the present study is not without limitations, creating inclusive learning environments for all students is of primary importance. We are gathering more data with a view to building upon these preliminary results which suggest that creating opportunities for student networking, outreach and mentoring may have a positive role to play in fostering students' sense of belonging.

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