

Place-based learning community increases academic achievement and narrows equity gaps for first-year STEM students

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National Relevance

American higher education is fraught with inequity. College graduation rates in the US continue to be tied disproportionately to race and ethnicity, socioeconomic status, and family history in higher education. For example, there is a 20% gap in the national rate of black and Latinx students earning credentials compared to white and Asian students, and these gaps are even larger in science, technology, engineering, and math fields (STEM). Closing these equity gaps is both a moral imperative and essential to improve science, by bringing in a wider range of voices and viewpoints. Broader reforms are urgently needed to disrupt the status quo and substantively re-imagine how campuses welcome and support all STEM students.

Local Background

Humboldt State University is the most remote and geographically isolated campus of the California State University (CSU) system. It is located in Humboldt County, which is both predominantly non-Hispanic White (~75%) and home to nine federally recognized American Indian tribes. Reflecting the national trend in higher education, the number of HSU students who are from a cultural or economic background traditionally underrepresented on college campuses and/or are first in their family to attend college has been steadily increasing. Many arrive from distant urban centers in Southern California (32%, 600-700 miles away) and the San Francisco Bay Area (17%, 200-300 miles away), places that are environmentally, economically, and culturally quite different than Humboldt County (Figure 1, Table 1).

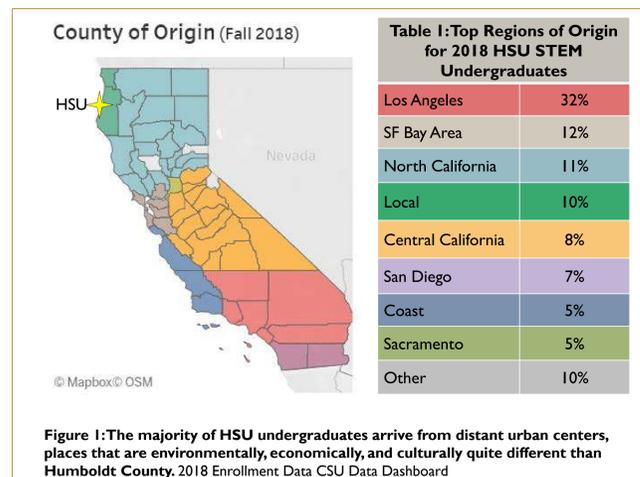


Figure 1: The majority of HSU undergraduates arrive from distant urban centers, places that are environmentally, economically, and culturally quite different than Humboldt County. 2018 Enrollment Data CSU Data Dashboard

A new approach

The HSU College of Natural Resources and Sciences (CNRS) is trying to help first year STEM students develop a sense of belonging to our unique campus and the greater Humboldt community, overcome barriers to academic success, and cultivate intercultural knowledge through the implementation of **place-based learning communities** (PBLCs). Our PBLCs are comprised of five High Impact Practices shown to be effective in increasing diversity in STEM (Figure 2). Woven throughout each PBLC is an integrative assignment that links a hands-on research experience that explores scientific, cultural, and environmental themes of our unique location, with a particular emphasis on their impact on local Native American people.

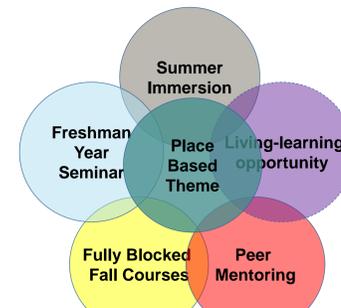


Figure 2: Our place-based learning communities link five high-impact practices around themes unique to the geography and cultures of our region.

Analysis

We used a quasi-experimental design and propensity score matching to examine three cohorts of students participating in our longest running PBLC – called the Klamath Connection (2015, 2016, 2017, n = 270). We compared self-reported psychosocial factors, academic behaviors, and measures of academic performance and retention to a non-participating reference group of STEM freshmen matched on high school GPA, underrepresented status, high school AP units, remediation status, and gender (n = 508). Responses to Skyfactor @ Mapworks surveys were used to assess sense of belong & community and academic skills & attitudes. We examined pass rates in foundational first year STEM courses, and we determined first year retention at HSU regardless of ending major, and first year retention at HSU and remaining in a STEM major. Future analyses will examine outcomes beyond the first year, including graduation, as these student cohorts matriculate through the university

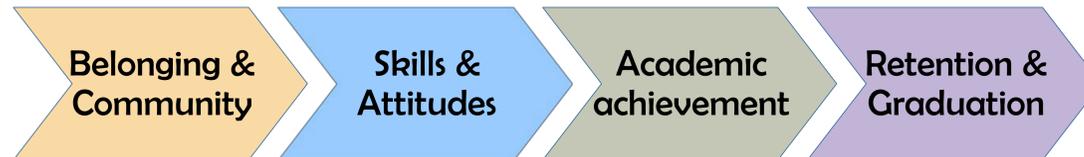


Figure 3: Our hypothesized model that place-based learning communities can foster the sense of belonging, skills, and habits that favor academic success and increased graduation.

Belonging & Community

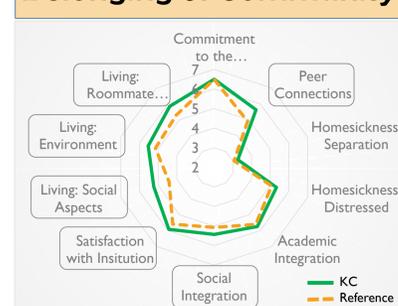
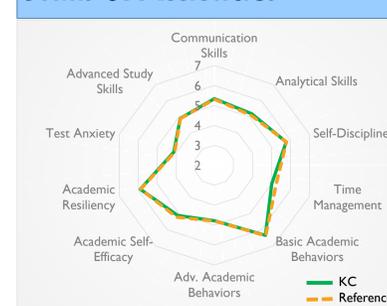


Figure 4. Mapworks surveys showed relatively strong sense of belonging and social connection (left) for students in the Klamath Connection, with higher self-reported values than the reference group in several factors (boxed). Homesickness was the most acute social challenge reported for all students. Among academic skills & attitudes (right), Klamath Connection students and the reference group reported very similar scores; students reported lowest scores for test anxiety and advanced study skills.

Skills & Attitudes



Academic Achievement

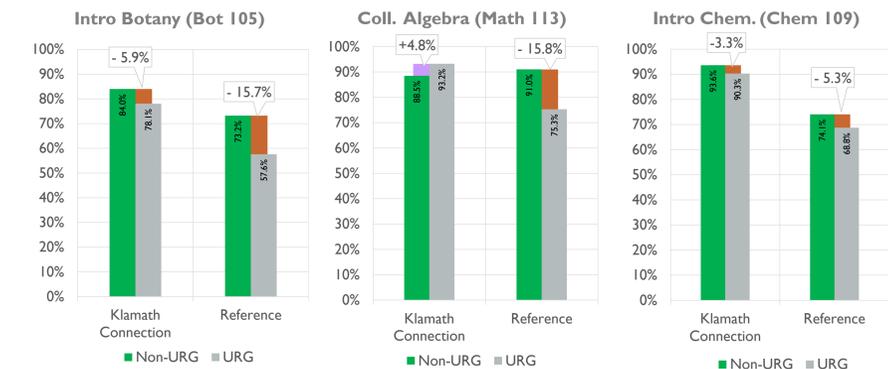


Figure 5. Participation in the Klamath Connection PBLC increased pass rates and narrowed equity gaps in key STEM courses. Graphs depict pass rates (A, B, C grades) in three first-year STEM courses for students participating in the Klamath Connection and a matched reference group. Data are disaggregated by URG status, with equity gaps identified by callout boxes and inset red bars.

Participants in Klamath Connection also completed more units (26.8 vs. 24.0 units) and had marginally higher first-year GPAs (2.76 vs. 2.67).

Retention

First year retention rates were higher for Klamath Connection students than for the reference group, with almost no URG equity gaps in the Klamath Connection.

Retention @ HSU: +8.9%

81.5% Klamath Connection vs. 72.6% reference group

with a URG gap <1%

vs. 4.1% URG gap in reference group

Retention in STEM: +12.9%

72.2% Klamath Connection vs. 59.3% reference group

with a URG gap <1%

vs. 9.1% URG gap in reference group

Our Challenges

Despite multiple institutional initiatives, data from our campus indicate that we still struggle to cultivate the self-efficacy, academic behaviors, and the sense of belonging necessary for academic achievement, particularly for students of color in STEM majors. As of 2018, HSU's 4-year graduation rate for incoming STEM freshmen was 20% overall, 13% for students from traditionally underrepresented ethnic groups (URG), and 11% for first-generation students. Though improved, the 6-year graduation rates are still unsatisfactory and opportunity gaps persist (43% URG vs. 54% overall).



Acknowledgements

We thank the faculty coordinators of each PBLC and the rest of the HSI STEM and HHMI staff for their tireless efforts to deliver the Summer Immersion, which would not be possible with the vital help of RAMP, Freshmen Orientation, EOP, Housing and Residence Life, Admissions, and many community partners from the Karuk, Wiyot, Yurok Tribes and Blue Lake and Trinidad Rancherias. We thank the HSI STEM Steering Committee and the deans of CNRS and CAHSS for their guidance and support. Funding provided by grants from the US Dept. of Education (HSI STEM) and the Howard Hughes Medical Institute (Inclusive Excellence award), with additional funding from HSU via the GI2025 initiative.