FOSTERING INQUIRY: COURSE-BASED UNDERGRADUATE RESEARCH IN COMMUNITY COLLEGE

Emily Berg; Joseph Lin; Andrew Strankman
Presentation outcomes

◦ Understand demographics and challenges of one college
◦ Learn about growing inequalities in STEM fields
◦ Hear research on high-impact practices for student engagement
◦ Learn about practices implemented at one college and plans for scaling up pilot project
REEDLEY COLLEGE

Eastern Fresno County
## STUDENT INFORMATION

<table>
<thead>
<tr>
<th>Gender</th>
<th>Ethnicity/Race</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>African American</td>
<td>2.4%</td>
</tr>
<tr>
<td>Male</td>
<td>American Indian/Alaska Native</td>
<td>0.5%</td>
</tr>
<tr>
<td>Unknown</td>
<td>Asian</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Ethnicity/Race</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20 years old</td>
<td>Hispanic</td>
<td>70.0%</td>
</tr>
<tr>
<td>20 to 24 years old</td>
<td>Pacific Islander</td>
<td>0.1%</td>
</tr>
<tr>
<td>25 to 39 years old</td>
<td>White</td>
<td>18.6%</td>
</tr>
<tr>
<td>40 or more years old</td>
<td>Two or more Races</td>
<td>2.2%</td>
</tr>
<tr>
<td>Unknown</td>
<td>Unknown</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

## INSTITUTIONAL INFORMATION

- Full Time Equivalent Students: 7,260.4
- Credit Sections: 2,310
- Non-Credit Sections: 880
- Median Credit Section Size: 57
- Percentage of Full-Time Faculty: 58.0%
- Percentage of First-Generation Students: 52.4%
- Student Counseling Ratio (FALL 2016): 570:1

Source: 2018 Student Success Scorecard
Reedley College

**Completion Rate**
(% of the cohort and count of students who achieved the outcome)

- 2005-06: 44.9% (945)
- 2006-07: 45.4% (1,068)
- 2007-08: 44.6% (1,244)
- 2008-09: 46.5% (1,407)
- 2009-10: 46.3% (1,338)
- 2010-11: 47.5% (1,334)

**Transfer to four-year institution**
(% of the cohort and count of students who achieved the outcome)

- 2005-06: 31.6% (665)
- 2006-07: 32.3% (768)
- 2007-08: 33.1% (805)
- 2008-09: 33.4% (1,010)
- 2009-10: 32.7% (943)
- 2010-11: 34.4% (966)

**Earned AA/AS**
(% of the cohort and count of students who achieved the outcome)

- 2005-06: 18.7% (393)
- 2006-07: 20.1% (474)
- 2007-08: 18.0% (439)
- 2008-09: 13.6% (378)
- 2009-10: 13.2% (393)
- 2010-11: 16.2% (467)

Source: CCC DataMart
WHERE IS CALIFORNIA’S EDUCATIONAL ATTAINMENT GAP?

Some of the highest rates of adults (ages 25 and older) who never graduated from high school are in the central San Joaquin Valley. Studies show a correlation between educational attainment, average earnings, and poverty rates.

Map: Tim Sheehan / The Fresno Bee • Source: U.S. Census Bureau American Community Survey • Get the data
### Educational Attainment in Central Valley

#### Median annual income for Fresno County People Ages 25+, 2017

<table>
<thead>
<tr>
<th>Educational Attainment</th>
<th>Men</th>
<th>Women</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>No high school diploma</td>
<td>$21911</td>
<td>$12427</td>
<td>$31581</td>
<td>$21596</td>
</tr>
<tr>
<td>High school graduate</td>
<td>$38724</td>
<td>$29668</td>
<td>$57129</td>
<td>$43264</td>
</tr>
<tr>
<td>Some college / associate degree</td>
<td>$89225</td>
<td>$76676</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau
2017 Educational Attainment in Fresno County: Bachelor’s Degrees

Source: U.S. Census Bureau
WHY THE NEED

The Research Behind Course-Based Undergraduate Research
Need for STEM professionals

- **Shortage for one million more STEM professionals** within a decade
  - (Deming and Noray, 2018; Espinosa, McGuire, & Jackson, 2018)

- **Lack of ethic and gender diversity within STEM majors**
  - Hispanics, African-Americans, and Native Americans make up 31% of the nation’s population
  - Women and minorities comprise 70% of college students but less than 45% of STEM degrees
  - 18% of bachelor’s degrees
  - 7% of doctoral degrees in STEM fields
  - (Bangera & Brownell, 2014)
Shifting U.S. Demographics

- **Increase of under-represented groups:**
  - 20 million young people of color who are underrepresented in STEM
    - (Espinosa, McGuire, & Jackson, 2018)

- **Change in Immigration Trends**
  - Decrease of Indian and Chinese STEM majors and immigrants
    - (Espinosa, McGuire, & Jackson, 2018)
Blacks and Hispanics underrepresented across most STEM job clusters

<table>
<thead>
<tr>
<th>% of employed in each occupational group who are...</th>
<th>White</th>
<th>Asian</th>
<th>Black</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>All employed</td>
<td>65%</td>
<td>6%</td>
<td>11%</td>
<td>16%</td>
</tr>
<tr>
<td>STEM jobs</td>
<td>69%</td>
<td>13%</td>
<td>9%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Among those who work in ___jobs

<table>
<thead>
<tr>
<th>STEM jobs</th>
<th>White</th>
<th>Asian</th>
<th>Black</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>73%</td>
<td>12%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Health-related</td>
<td>70%</td>
<td>9%</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td>Physical science</td>
<td>68%</td>
<td>16%</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Math</td>
<td>68%</td>
<td>14%</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>Life science</td>
<td>67%</td>
<td>19%</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td>Computer</td>
<td>65%</td>
<td>19%</td>
<td>7%</td>
<td>7%</td>
</tr>
</tbody>
</table>


Source: Pew Research Center Analysis of 2014-2016 American Community Survey (IPUMS)
### TABLE 1.
Representation of CC BER among all articles in seven BER journals sampled over a 3-year period

<table>
<thead>
<tr>
<th>Journal</th>
<th>Total papers</th>
<th>CC BER papers</th>
<th>% CC BER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advances in Physiology Education</td>
<td>243</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>The American Biology Teacher</td>
<td>557</td>
<td>14</td>
<td>2.5</td>
</tr>
<tr>
<td>Anatomical Sciences Education</td>
<td>239</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>BioScience</td>
<td>36(^b)</td>
<td>1</td>
<td>2.8</td>
</tr>
<tr>
<td>CBE—Life Sciences Education</td>
<td>249</td>
<td>7</td>
<td>2.8</td>
</tr>
<tr>
<td>Journal of College Science Teaching</td>
<td>257</td>
<td>17</td>
<td>6.6</td>
</tr>
<tr>
<td>Journal of Microbiology and Biology Education</td>
<td>196</td>
<td>16</td>
<td>8.2</td>
</tr>
<tr>
<td>Total</td>
<td>1741</td>
<td>57</td>
<td>3.2</td>
</tr>
</tbody>
</table>

What can be done?

- Course-based undergraduate research is a high impact tool for:
  - Retention of knowledge
  - Engagement
  - Retention in student enrollment

Greatest impact: women and ethnic minorities

- (Murray, Obare, & Hageman, 2016; Hensel & Davidson, 2018)
WHAT’S BEING DONE AT REEDLEY COLLEGE
Shift in Recruitment Efforts

- Traditional recruitment for honors: high school seniors
- Recruitment for honors forum: ongoing non-honors Reedley College students
Honors Forum classes

- Honors 3A, Applied Sciences
- Honors 3B, Humanities
- Honors 3C, Natural and Biological Sciences
Interdisciplinary Research Projects

- “Do Looks Matter? Identifying Infected Plants Through Physical Appearance”
- “Green Thumbs: Will Legal Cannabis Have an Effect On Food Prices in California?”
- “Life as an Endless Canterbury Pilgrimage: Chaucer’s The Canterbury Tales and its Role in Understanding Group Relations”
- “Gitta Ka-Sa-Nin (Tomorrow Rises): Reconstituting Dhegiha tribal culture through communal activity”
- “Wire me a Pizza: A Preliminary Design Study of a Novel Intermediate-Range Parcel Delivery System”
Research benefits: Sense of purpose

I feel like it wasn't something being talked about enough and that it was something I noticed was like a huge issue in my community, but no one was really talking about it.

I knew that it was affecting a lot of my loved ones, so I wanted to do something about it and no one else was doing something about it.
It's All in Your Head! Views on Mental Illness by Rural Hispanic Communities

Abstract

Mental illness has long been stigmatized by society, especially throughout ethnic minority groups where culture—though rich and diverse—often impedes on one’s ability to seek mental health treatment. Almost 20% of the fifty-two million Hispanics living within the United States are projected to be living with a mental illness, and of those, only 20% seek medical treatment. Fresno County is no exception, with a Hispanic population of 165,000 and more than 14,000 diagnosed mental health cases existing among them. However, this can be resolved by bridging the conventions of culture and mental health within Fresno County’s Hispanic communities. Doing so would present these individuals not only with relief that they no longer have to choose between their beliefs and health, but with affirmation that their needs matter. If doctors and patients learn to adapt to environments where mental health and culture are invariably linked, true progress can be made.

Methods

Qualitative data for this research was gained through interviews with professionals from rural mental health clinics in order to understand how culture affects a patient’s mental health treatment. These professionals include:

- Juliana Yates, P.A., Adventist Health
- Oscar S. Fajardo Gomez, M.D., Adventist Health
- Ariana Quinones, Psy.D., Reedley College
- Sylvia Ramirez, Psy.D., United Health Centers

Quantitative data was derived from surveys that measured participants’ attitudes toward mental health through a series of statements. Respondents were asked to select their level of agreement to each statement. Surveys were then scored on a Likert scale and graphed on a histogram (Figure 1). A high score indicated a positive and more knowledgeable attitude toward mental health.

Results

- Hispanic participants tended to have lower scores than non-Hispanic participants (Figure 1).
- Hispanic participants were more culturally inclined than non-Hispanic participants (Figure 2).

Conclusion

Though stigma on mental illness is prevalent throughout many different cultures, it is clear from this research that Hispanic culture especially targets the mentally ill. As noted, more than half of Hispanic survey respondents agreed that they would feel ashamed if others found out that they had a mental illness (Figure 3). By targeting these stigmas and beliefs, a bridge between mental health awareness and Hispanic culture can truly be formed.

Future Perspective

Further research can be conducted by testing the effectiveness of outreach events. This could be done by creating a local mental health outreach event targeted specifically at the Hispanic community and then monitoring how much traffic both the event gamers, as well as the local mental health clinics, see over the years. This could help with further bridging of mental health awareness and the conservative culture of rural Hispanic communities.

References


Acknowledgements

I would like to thank my advisor—Dr. John Heschburg and Vanessa Brails— as well as my classmates, whose hard work inspired me to see this project through until the end. I would also like to thank all of the people who took time out of their busy schedules to meet with me for interviews or to fill out one of my surveys. Your actions have made this research possible. Last but not least, I would like to thank my mother for raising me to be culturally sensitive, and for supporting my desire to find the answers to the impossible hard questions. I love you, Mom!
Research benefits: Persistence

I need to do this for myself and for them because they know I can do better.

And I know myself I can do better.
Research benefits:
Increased critical thinking skills

This pushed me more to do better. To spend more time with the material. And to critically think about what the subject is.
Research benefits: Confidence

Being given the opportunity to begin and then continue researching my topic of conotoxin venom allowed me to understand the process of researching data and how to find good data.

Taking my time to fully understand this topic and expand my knowledge really allowed me to build up my confidence in research. I had never done a research project that was so in depth before and this allowed me to learn how to really dig deep to understand how this toxin would process in the body.
A Snails’ Answer to Pain Addiction

Heather Crumley
Reedley College

Conotoxin Background
- α-conotoxin inhibits Neuromuscular junction blocker
- δ-conotoxin inhibits Na+ channel
- κ-conotoxin inhibits K+ channel
- μ-conotoxin inhibits Na+ channel
- ω-conotoxin inhibits Ca+ channel

*Photo found on Medical and Pharmaceutical Drug Innovation
Honors 3C Survey 2017-2019

I am aware of the Reedley College Honors Program which promotes research and engagement on campus.

The faculty and staff members at Reedley College closely consider my interest when developing and guiding research.

The course I take at Reedley College represent diverse viewpoints and focus on engagement.

Reedley College faculty and staff are committed to promoting and accepting CC based research.
Overall, this course was a positive learning environment and achieved the course's objectives.

The content in this course will help me with my goal (research, transfer to four-year, future opportunities).

My ability to think critically and analyze research has increased.

Reedley College research course such as the Honors 3C supports the use of engagement focused learning.
WHAT DO THESE CHANGES LOOK LIKE?
What is meaningful engagement? What does it look like?

- Engagement is not just an instructor putting on a show, rather, it is a relationship between a student and instructor (Fredricks, et al 2004)

  - HIGH IMPACT PRACTICES
    - Learning Community
    - Service Learning
    - Internship/Field Experience
    - Hackathon
    - Capstone/Portfolio
    - Course Based Undergraduate Research
The Role of Faculty in Engagement

- Students’ interactions with faculty: the single greatest contributor to their academic achievement, even with just one faculty member (Komarraju et al., 2010)

- Formal and informal interactions with faculty:
  - Greater retention
  - Greater satisfaction (Tinto 2012)

- Research projects increased the number of faculty points of contact outside of class (Hensel & Davidson, 2018; E.T. Pascarella & Terenzini, 2005)
Future Directions

◦ Restructuring of Honors Program with emphasis on student ownership.
◦ Integration of ‘wet lab’ scientific experimentation.
◦ Implementation of sustained local research conference.
References


U.S. Census Bureau's American Community Survey, 2017 1- and 5-year estimates