Demographics and Student Success in Introductory Calculus-based Physics at Santa Fe College

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Research Question:
Are there achievement gaps in calc-based physics at Santa Fe college?

Motivation
• Equity-Minded Education: Uniting for Student Success is the theme of the current quality enhancement plan (QEP) at Santa Fe college.
• The first semester of calculus-based physics is a gateway course for STEM students.
• There is a lack of PER studies in Two-Year colleges

Source of Data
Demographics data covering the fall 2015-fall 2020 period from the Institutional Research office on campus.

Acknowledgements
Thanks to
• Dr. Vertigo Moody, chair of Natural Sciences, for support
• William Clark, Data and Policy Analyst for providing the data

Data
• N = 1324 students with complete data out of 1396 registered students.
• 16 semesters from Fall 2015 to Fall 2020
• Course: PHY2048 first course in the two-course introductory physics sequence.

One-way ANOVA analysis of average course grades

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>F value</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>3.06</td>
<td>1.09</td>
<td></td>
<td>0.00067</td>
<td>0.015</td>
</tr>
<tr>
<td>Black</td>
<td>2.72</td>
<td>1.11</td>
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<td>0.005</td>
<td>0.015</td>
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<tr>
<td>Hispanic/Latino</td>
<td>3.16</td>
<td>0.94</td>
<td></td>
<td>0.04</td>
<td>0.015</td>
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<tr>
<td>Multi-racial</td>
<td>3.28</td>
<td>0.83</td>
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<td>0.04</td>
<td>0.015</td>
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<tr>
<td>White</td>
<td>3.26</td>
<td>0.88</td>
<td></td>
<td>0.04</td>
<td>0.015</td>
</tr>
<tr>
<td>Total population</td>
<td>3.19</td>
<td>0.94</td>
<td></td>
<td></td>
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</tbody>
</table>

Discussion
Success rates and course GPA data do not indicate a gender-based achievement gap in PHY2048 at Santa Fe college. A significant difference (p = 0.04) with a small effect size (d= 0.16) was found in course grades.

A one-way ANOVA analysis reveals a significant (p < 0.05) difference in course grades based on Race/Ethnicity with a small effect size (η²=0.015).

The main area of focus for future interventions is on success rates and average course grades for black male students.

Future studies will extend this analysis to other physics courses offered at Santa Fe college. Comparisons will also be made with other STEM courses within the Natural Sciences department and calculus courses.

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