Assessing the Effectiveness of The LIAT College Access and Success Model (L-CAS) on Low-income Hispanic Engineering Students (Experience)

Manuel Jimenez, Luisa Guillemard, Nayda Santiago, Aida Santiago, Sonia Bartolomei, Marcelo Suárez, Pedro Quintero, and Carla López

University of Puerto Rico Mayagüez
College of Engineering
June 29, 2022
Acknowledgment

• This research was supported by the National Science Foundation under Award S-STEM DUE-1833869

• Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation
Outline

• Introduction
• The L-CAS Model
• Implementing the L-CAS Model
• L-CAS Model Application Impact
• Reflections and Projections
Introduction

• After 50 years of efforts, the Socio-economic Status (SES) gap prevails
• Program for Engineering Access, Retention, and LIATS Success (PEARLS)
  • College-wide initiative in the UPRM (HSI)
  • Focus on Low-Income Academically Talented Students (LIATS)
  • Ninety-two undergrad students
  • Nine BS and two MS degree programs
• Interventions via LIAT-College Access & Success (L-CAS) Model
• Results of three years of L-CAS application
Research Question

How does the application of the L-CAS model impact actions of engineering LIATS in an HSI in their path to graduation and professional preparation?
The L-CAS Model [9]

- A hybrid model aimed at boosting success metrics among LIATS
  - Lent’s Social Cognitive Career Theory (SCCT)
  - Tinto’s Departure model
Academic Setting: The UPRM

The University of Puerto Rico Mayaguez (UPRM)

- A Hispanic Serving Institution with ~12,703 students
- Part of the 11-campus UPR System
- 99.8% are Hispanic Students

Four Major Colleges

- Agriculture, Arts & Sciences, Business, and Engineering

The College of Engineering

- Fourth largest provider of US Hispanic engineers
- 5,270 students in degree programs
- Nine (9) five-year-long BS programs
- 15 Graduate Programs (9 MS + 6 Ph.D.)
Participant’s Profiles

Served Population

- Public schools in PR serve 71.8% of all high school students
- 91.9% of public school students come from low-income families
- 70% UPRM students qualify to receive Pell grants

CoE Graduation Rate @ 150% time: 51.5%

- On-time Graduation 6.5%

Graduation Rates vs. Family Income Gap
PEARLS Students’ Distribution

Study Program Distribution

- Mechanical Engineering: Scholars 6, Participants 9
- Chemical Engineering: Scholars 5, Participants 9
- Electrical Engineering: Scholars 3, Participants 9
- Computer Engineering: Scholars 4, Participants 5
- Industrial Engineering: Scholars 2, Participants 5
- Civil Engineering: Scholars 6, Participants 8
- Software Engineering: Scholars 3, Participants 6
- Surveying & Topography: Scholars 2, Participants 6
- Computer Inf. Sci. & Egr: Scholars 3, Participants 6
- Materials Sci. & Engineering: Scholars 1, Participants 6

TOTAL: Scholars 58, Participants 23

*Initially 92 students

Gender Distribution

- Scholars: 52% Female, 48% Male
- Participants: 74% Female, 26% Male

Students by Level

- 3rd Year: Scholars 8, Participants 8
- 4th Year: Scholars 20, Participants 18
- 5th Year: Scholars 18, Participants 18
- Grads: Scholars 7, Participants 2

Origin School Type

- Scholars: 17% Public, 83% Private
- Participants: 42% Public, 58% Private
Implementing the L-CAS Model

- Ideas into actions
- Industry, academia, leadership

- Growth
  - Create career awareness
  - Study program identity

- Belonging
  - Develop know-how
  - Boost interest

- Formation
L-CAS Belonging Stage

Faculty & Peer Mentoring

Curricular Activities
- INGE-3001: Introduction to Engineering
- INGE-3002: Engineering Learning Communities

Co-curricular Activities
- Lectures & Talks: 3 – 4 per term
- Recognition Activities

INGE-PEARLS

ASEE 2022 ANNUAL CONFERENCE
Excellence Through DIVERSITY
L-CAS Formative Stage

Faculty & Peer Mentoring

Curricular Activities
- INGE-3003: Undergraduate Seminar
- INTD-3355: Information Literacy

Co-curricular Activities
- Workshops and Panels
- Recognition Activities
L-CAS Growth Stage

Faculty & Peer Mentoring

**Industry Experiences**
- XXXX-4995: Cooperative Education
- Summer Internships

**Research Experiences**
- XXXX-4998: Undergraduate Research & REUs
- Graduate Research

**Special Projects**
- National Competitions
- Team Projects

**Leadership Opportunities**
- PEARLS Peer Mentor Program
- Student Associations
# Co-Curricular Activity Record

<table>
<thead>
<tr>
<th>Year 2018 - 2019</th>
<th>Year 2019-2020</th>
<th>Year 2020-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall 2018</strong></td>
<td><strong>Fall 2019</strong></td>
<td><strong>Fall 2020</strong></td>
</tr>
<tr>
<td>Pearls Info Session</td>
<td>How to Manage a Budget</td>
<td>Resume writing, e-portfolio &amp; LinkedIn*</td>
</tr>
<tr>
<td>Scholarship Awards Ceremony</td>
<td>National Fellowship Workshop</td>
<td>PEARLS Scholarships: Seeds for Transforming Lives*</td>
</tr>
<tr>
<td>First Meeting: Work Plan and Rules</td>
<td>Undergraduate Research Experiences Report</td>
<td>Mentors and Mentees, Resume, e-portfolios, LinkedIn*</td>
</tr>
<tr>
<td>IDP Preparation*</td>
<td>From Business Idea to Business Plan</td>
<td>A New Perspective on Leadership*</td>
</tr>
<tr>
<td>Thanksgiving Pearls Dinner (Social)</td>
<td>Building Resilience for a Better Life*</td>
<td></td>
</tr>
<tr>
<td><strong>Spring 2019</strong></td>
<td><strong>Spring 2020</strong></td>
<td><strong>Spring 2021</strong></td>
</tr>
<tr>
<td>Creating Your Career Path</td>
<td>Anxiety Management in the Midst of Adversity</td>
<td>Academic Honesty in Times of Crisis - Panel*</td>
</tr>
<tr>
<td>Introduction to Research</td>
<td>The Business Model Canvas</td>
<td>Responsible and Appropriate Conduct of Research*</td>
</tr>
<tr>
<td>Creating an ePortfolio</td>
<td>Undergraduate Research: A Necessity in Cross-Disciplinary Engineering Education*</td>
<td>Ethics in the Engineering Profession*</td>
</tr>
<tr>
<td>Plagiarism and Academic Honesty</td>
<td>Social activity canceled due to Covid-19 pandemic</td>
<td>How to Write Compelling Research &amp; Personal Statements for Grad School Applications*</td>
</tr>
<tr>
<td>Semester Closing &amp; student recognitions</td>
<td></td>
<td>Benefits &amp; tools to carry out undergraduate research: Mentoring, research networks, &amp; professional development plan*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data Presentation: Dos and Don'ts of Figures, Plots, &amp; Images*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEARLS Semester Closing Activity (Social)*</td>
</tr>
</tbody>
</table>
# Results: Student Participation in Activities

## • Curricular

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NPS</td>
<td>PS</td>
<td>NPS</td>
</tr>
<tr>
<td>INGE-3001</td>
<td>62</td>
<td>28</td>
<td>13</td>
</tr>
<tr>
<td>INGE-3002</td>
<td>3</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>INGE-3003</td>
<td>-</td>
<td>23</td>
<td>-</td>
</tr>
<tr>
<td>INTD-3355</td>
<td>42</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>107</strong></td>
<td><strong>77</strong></td>
<td><strong>33</strong></td>
</tr>
</tbody>
</table>

## • Co-curricular

<table>
<thead>
<tr>
<th>Activity Sequence</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Spring</td>
<td>Fall</td>
</tr>
<tr>
<td>Talk/Workshop 1</td>
<td>628+</td>
<td>78</td>
<td>56</td>
</tr>
<tr>
<td>Talk/Workshop 2</td>
<td>78</td>
<td>66</td>
<td>NR</td>
</tr>
<tr>
<td>Talk/Workshop 3</td>
<td>79</td>
<td>71</td>
<td>NR</td>
</tr>
<tr>
<td>Talk/Workshop 4</td>
<td>71</td>
<td>51</td>
<td>-</td>
</tr>
<tr>
<td>Talk/Workshop 5</td>
<td>56</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>Talk/Workshop 6</td>
<td></td>
<td></td>
<td>46</td>
</tr>
<tr>
<td>Talk/Workshop 7</td>
<td></td>
<td></td>
<td>65</td>
</tr>
</tbody>
</table>
L-CAS Application Results

• Retention, Persistence, and Graduation

<table>
<thead>
<tr>
<th>Observation Year</th>
<th>Student Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st year</td>
</tr>
<tr>
<td>PEARLS Yr. 1</td>
<td>97.1%</td>
</tr>
<tr>
<td>PEARLS Yr. 2</td>
<td></td>
</tr>
<tr>
<td>PEARLS Yr. 3</td>
<td></td>
</tr>
<tr>
<td>CoE 10Yr Avg.</td>
<td>91.9%</td>
</tr>
</tbody>
</table>

• Academic Performance

<table>
<thead>
<tr>
<th>GPA</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 3.00</td>
<td>85.9%</td>
<td>85.2%</td>
<td>91.4%</td>
</tr>
<tr>
<td>Above 3.50</td>
<td>58.2%</td>
<td>54.7%</td>
<td>53.1%</td>
</tr>
<tr>
<td>Above CoE Avg.</td>
<td>97.9%</td>
<td>96.5%</td>
<td>100%</td>
</tr>
<tr>
<td>CoE AvG</td>
<td>2.66</td>
<td>2.66*</td>
<td>2.66*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>Achievement Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scholars</td>
<td>Yr. 1</td>
</tr>
<tr>
<td>Participants</td>
<td>94%</td>
</tr>
</tbody>
</table>

* GPA & Progress towards graduation
Resulting Student Engagements

- Research Experiences
- Industry Experiences
- Leadership
- Growth Opportunities
- Honors & Awards
- Special Projects

Bar chart showing the number of engagements by year and category:

- Year 1:
  - COOP Experiences: 19
  - Off-Campus research: 44
  - Honor/Award: 11
  - Leadership: 14
  - Special Projects: 14

- Year 2:
  - COOP Experiences: 18
  - Off-Campus research: 14
  - Honor/Award: 5
  - Leadership: 14
  - Special Projects: 8

- Year 3:
  - COOP Experiences: 17
  - Off-Campus research: 32
  - Honor/Award: 11
  - Leadership: 26
  - Special Projects: 27

Category abbreviations:
- COOP Experiences
- Off-Campus research
- Honor/Award
- Leadership
- Special Projects
- PMP

17
Reflections and Projections

• Academic performance indicators have remained high
  • Retention, persistence, GPA, and progress towards graduation

• Limited graduate student participation
  • Grad. PEARLS Scholarship Vs. Graduate Assistantships

• Challenges for Scaling-up the L-CAS Model Success
  • Faculty & peer mentoring
  • Economic Aid
  • Curricular course offer
    • Course allocation (faculty, schedule, space)
    • Study program insertion (credit count)
  • Co-curricular Activities
    • Lecturers & Schedules
Q&A

Web Site: www.uprm.edu/engineering/pearls
email: engineering_pearls@uprm.edu
office: Stefani Building S-118