A Multivariate Study of Graduate Student Satisfaction and Other Outcomes Within Cooperative Research Centers

Thesis Research

by

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Problem Statement

Graduate students who participate in CRCs are perceived as having educational advantages

- Advantages: experiential education
  - Teamwork, multidisciplinary experiences, contact with industry
- Center experiences and advantages to graduate students are for the most part speculative assumptions
- More research needs to be conducted to better understand:
  - How experiences in a center impact student’s satisfaction
Past Research

- CRCs have a positive impact on student’s training (e.g. Scott, C., Schadd, D. & Brock, D. (1991))

  - Center alumni were rated superior in job performance, being more prepared, and needing less training when hypothetically compared to their organizations’ peers by themselves and their supervisors (Ailes, Roessner, & Feller, 1997; Parker, 1997; Fitzsimmons, Grad, & Lal, 1996; Scott, Schaad, & Brock, 1991)
Assumptions

- The training experience provided by individual centers varies
- Those differences have the potential to affect student outcomes

**Satisfaction**

Scale Mean = 3.68 (S.D. = .72)
Key Question

To what extent are these differences attributable to:

- Center-level factors
- Research group-level factors
- Advisor/Committee-level factors
- Individual differences
Purpose of Research

- To explore benefits, experiences, and satisfaction of current graduate students in cooperative research centers
- To identify key center mechanisms needed to achieve those educational benefits
Primary Research Question

• After controlling for significant demographic, student, and center characteristics, to what extent are center experiences and interactions significantly related to graduate students’…
  – satisfaction with their center experiences?
  – perceived benefits (such as Advanced Technical & Problem Solving Skills and Soft Skills)?
  – organizational commitment?
Methodology

- **Design**
  - Predictive study: Multivariate regression
  - Web-based questionnaire

- **Response Rate**
  - Number of Centers: 34 (89%)
  - 528 sent out
  - 190 total (37% response rate)

- **Analysis**
  - Descriptive statistics
  - Exploratory factor analyses
  - Multivariate regressions (OLS, Logistic)
Individual Center Mechanisms to Outcomes

**Predictors**

**Individual Characteristics**
- Gender, Age, Ethnicity, Citizenship

**Student Characteristics**
- Funding, Department, Degree sought, GPA, Years at University, Terminal Degree, Job experience

**Center Mechanisms**
- Multidisciplinary Center Experiences
- Experiential Center Experiences
- Formal Center Training Activities
- Technical Project Involvement
- Thesis/Dissertation Committee

**Interactions:** Industry, Center Director, Advisor, Students, etc.

**Process/Outcomes**

**Satisfaction**

**Perceived Benefits**
- Advanced Technical and Problem Solving Skills
- Soft Skills

**Organizational Commitment**

**Scholarly Achievement**

**Competitive Advantage**

**Career Goals**
<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage of centers who offer activity (n = 34)</th>
<th>Mean level of involvement (Range 1-5) (n = 190)</th>
<th>Mean level of involvement if center has mechanism (n = 177)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular meetings with your project team</td>
<td>85.3</td>
<td>3.42</td>
<td>3.60</td>
</tr>
<tr>
<td>Regular meetings with your entire center team</td>
<td>79.4</td>
<td>2.54</td>
<td>2.78</td>
</tr>
<tr>
<td>Periodic center industrial advisory board (IAB) meetings</td>
<td>79.4</td>
<td>2.43</td>
<td>3.05</td>
</tr>
<tr>
<td>Scientific/technical seminar series featuring outside speakers (e.g., professors, industry participants)</td>
<td>79.4</td>
<td>2.14</td>
<td>2.32</td>
</tr>
<tr>
<td>Scientific/technical seminar series featuring student speakers (e.g., brown bag, student presentations)</td>
<td>64.7</td>
<td>2.25</td>
<td>2.88</td>
</tr>
<tr>
<td>New academic courses sponsored or developed by the center or center faculty</td>
<td>26.5</td>
<td>1.38</td>
<td>2.30</td>
</tr>
<tr>
<td>Co-op or Internship placements</td>
<td>29.4</td>
<td>1.3</td>
<td>1.84</td>
</tr>
<tr>
<td>Workshops on “soft skills” or non-technical topics (e.g., teamwork, communication, career development, leadership)</td>
<td>14.7</td>
<td>1.23</td>
<td>2.63</td>
</tr>
<tr>
<td>Mentoring (formal mentor assignments)</td>
<td>5.9</td>
<td>1.22</td>
<td>2.56</td>
</tr>
<tr>
<td>Educational interventions targeted at youth (K-12) and sponsored by the center</td>
<td>5.9</td>
<td>1.18</td>
<td>2.30</td>
</tr>
</tbody>
</table>
Testing the Level of Effects

- Intra-class correlation was used to test whether variance in various predictors was explained by center affiliation (e.g., were students within centers more alike than students across centers)

- This was not demonstrated
  - Center-level groupings did not explain variance in key IVs
  - Thus, cannot test for center-level effects

- All results represent individual-level prediction
## Regressions: Satisfaction

<table>
<thead>
<tr>
<th>Satisfaction</th>
<th>B</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (0 = Female, 1 = Male)</td>
<td>-0.15</td>
<td>0.01</td>
</tr>
<tr>
<td>Interactions: Advisor</td>
<td>0.20</td>
<td>0.00</td>
</tr>
<tr>
<td>Interactions: Industry Members</td>
<td>0.16</td>
<td>0.01</td>
</tr>
<tr>
<td>Technical Project Involvement</td>
<td>0.12</td>
<td>0.03</td>
</tr>
<tr>
<td>Multidisciplinary Center Experiences</td>
<td>0.22</td>
<td>0.01</td>
</tr>
<tr>
<td>Experiential Center Experiences</td>
<td>0.27</td>
<td>0.00</td>
</tr>
</tbody>
</table>

R Square = .44
## Regressions: Organizational Commitment

<table>
<thead>
<tr>
<th>Organizational Commitment</th>
<th>B</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity: Caucaisan vs. Asian/Asian American</td>
<td>0.24</td>
<td>0.00</td>
</tr>
<tr>
<td>Interactions: Center Director</td>
<td>0.13</td>
<td>0.05</td>
</tr>
<tr>
<td>Multidisciplinary Center Experiences</td>
<td>0.19</td>
<td>0.01</td>
</tr>
<tr>
<td>Number of Departments on Thesis/Dissertation Committee: No Committee vs. One Department</td>
<td>0.19</td>
<td>0.01</td>
</tr>
<tr>
<td>Number of Departments on Thesis/Dissertation Committee: One Department vs. Two or More Departments</td>
<td>0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Experiential Center Experiences</td>
<td>0.35</td>
<td>0.00</td>
</tr>
</tbody>
</table>

R Square = .40
## Regressions: Perceived Soft Skills

<table>
<thead>
<tr>
<th>Perceived Soft Skills</th>
<th>B</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizenship (0 = Non-U.S., 1 = U.S.)</td>
<td>0.17</td>
<td>0.01</td>
</tr>
<tr>
<td>Years at University</td>
<td>0.23</td>
<td>0.01</td>
</tr>
<tr>
<td>Interactions: Thesis/Dissertation Committee</td>
<td>0.12</td>
<td>0.07</td>
</tr>
<tr>
<td>Interactions: Industry Members</td>
<td>0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>Technical Project Involvement</td>
<td>0.28</td>
<td>0.00</td>
</tr>
</tbody>
</table>

R Square = 0.26
## Regressions: Perceived Advanced Technical and Problem Solving Skills

<table>
<thead>
<tr>
<th>Perceived Advanced Technical and Problem Solving Skills</th>
<th>$B$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years at University</td>
<td>0.17</td>
<td>0.06</td>
</tr>
<tr>
<td>Interactions: Thesis/Dissertation Committee</td>
<td>0.13</td>
<td>0.05</td>
</tr>
<tr>
<td>Number of Departments on Thesis/Dissertation Committee: One Department vs. Two or More Departments</td>
<td>0.16</td>
<td>0.08</td>
</tr>
<tr>
<td>Number of Departments on Thesis/Dissertation Committee: No Committee yet vs. One Department</td>
<td>0.22</td>
<td>0.01</td>
</tr>
<tr>
<td>Technical Project Involvement</td>
<td>0.23</td>
<td>0.00</td>
</tr>
<tr>
<td>Multidisciplinary Center Experiences</td>
<td>0.27</td>
<td>0.00</td>
</tr>
</tbody>
</table>

R Square = .36
Relationship of Satisfaction and Experiential Center Experiences for Citizenship

![Graph showing the relationship between Experiential Center Experience and Satisfaction for U.S. Citizens and Non-U.S. Citizens.](image)
Relationship of Satisfaction and Experiential Center Experiences for Gender

![Graph showing the relationship between experiential center experience and satisfaction for males and females.](image)
Conclusions

• Consistent and Powerful Outcome Predictors
  – Experiential Center Experiences
    » Satisfaction, Organizational Commitment
  – Multidisciplinary Center Experiences
    » Satisfaction, Perceived Advanced Technical and Problem Solving Skills, Organizational Commitment
  – Technical Project Involvement
    » Satisfaction, Perceived Advanced Technical and Problem Solving Skills, Perceived Soft Skills

• Intriguing Predictors
  – Interactions with Industry, Center Director, Advisor, Committee

• Effects may depend on type on individual characteristics
• Student experiences predict outcomes but center groupings do not
  – Effects may lie at research group and/or advisor level
Practical Implications

• Center should build on traditional educational practices
  – Interactions with advisor and committee
• Center’s educational standards should have:
  – Increased opportunities to interact with industry members
  – Increased collaboration with multiple disciplines
  – Experiential/hands on opportunities
  – Exposure to more of the project’s technical aspects

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References


