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

Thesis Research

by

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Past Research

- I/UCRCs 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)

Illustration of a mean difference
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.
Research Questions

- What student and/or center characteristics are related to graduate students’…
  - satisfaction with their center experiences?
  - perceived benefits (such as Advanced Technical and Problem Solving Skills and Soft Skills)?
  - scholarly achievements (e.g.: intellectual property events, publications with industry)?
  - organizational commitment?
Critical Measures

Center Experiences

- **Hypothesized**
  - Multidisciplinary
  - Team based
  - Experiential
  - Technical
  - Soft Skills

- **Results**
  - Multidisciplinary (4 items)
    - Scale Mean = 2.98; S.D. = 0.58
    - Example Item: “Working/interacting regularly with faculty from other disciplines”
  - Experiential (7 items)
    - Scale Mean = 3.2; S.D. = 0.41
    - Example Item: “Hands-on learning/learning-by-doing approach”

- Scale: “My involvement in the Center includes… 1 = “Strongly Disagree” to 4 = “Strongly Agree”
Critical Measures

- Formal Training Mechanisms (7 items)
  - Example Item: Involvement with…”Scientific seminar series featuring outside speakers“
- Technical Project Involvement (5 items)
  - Example Item: "Developing the methods and procedures used in the project”
- Advanced Technical and Problem Solving Skills (7 items)
  - Example Item: Proficiency in…“Computer, technical, and/or laboratory equipment” skills
- Soft Skills (4 items)
  - Example Item: Proficiency in…”Leadership” skills
**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**
  - 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**
Methodology

• Design
  – Predictive study: Multivariate regression
  – Web-based questionnaire

• Response Rate
  – Number of Centers: 34 (81%)
  – 528 sent out
  – 190 total (37% response rate)

• Analysis
  – Descriptive statistics
  – Exploratory factor analyses
  – Multivariate regressions (OLS, Logistic)
Degree and Thesis Topic

Highest degree student will be pursuing

- Masters: 13%
- PhD: 87%

Thesis/dissertation based on a Center project

- Yes, it is: 67%
- Yes, it will be: 9%
- No, it is not or will not be: 17%
- Don't know Yet: 7%
Career Goals

Current Career Goals

- Industry: 55%
- Academia: 30%
- Government: 3%
- Other: 1%
- Don't Know: 11%
Predicting Outcomes

**Regressions tested at a .10 significance level**
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 (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>
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<tbody>
<tr>
<td>Number of Departments on Thesis/Dissertation Committee: One Department vs. No Committee yet</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>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>Experiential Center Experiences</td>
<td>0.35</td>
<td>0.00</td>
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</table>

R Square = .40
Regressions: Self-Reported Soft Skills

<table>
<thead>
<tr>
<th>Self-Reported Soft Skills</th>
<th>B</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>Citizenship</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: Industry Members</td>
<td>0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>Interactions: Thesis/Dissertation Committee</td>
<td>0.12</td>
<td>0.07</td>
</tr>
<tr>
<td>Technical Project Involvement</td>
<td>0.28</td>
<td>0.00</td>
</tr>
</tbody>
</table>

R Square = .26
## Regressions: Self-Reported Advanced Technical and Problem Solving Skills

<table>
<thead>
<tr>
<th>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>Number of Departments on Thesis/Dissertation Committee: One Department vs. No Committee yet</td>
<td>0.22</td>
<td>0.01</td>
</tr>
<tr>
<td>Number of Departments on Thesis/Dissertation Committee: One Department vs. Two or More Departments</td>
<td>0.16</td>
<td>0.08</td>
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<tr>
<td>Interactions: Thesis/Dissertation Committee</td>
<td>0.13</td>
<td>0.05</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
### Regressions: Competitive Advantage

<table>
<thead>
<tr>
<th>Competitive Advantage</th>
<th>R Square = .23</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( B )</td>
</tr>
<tr>
<td>Experiential Center Experiences</td>
<td>0.43</td>
</tr>
<tr>
<td>Total Center Funding</td>
<td>-0.16</td>
</tr>
</tbody>
</table>
# Regressions: Scholarly Achievements

## Intellectual Property Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Odds Ratio</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years at University</td>
<td>1.41</td>
<td>0.02</td>
</tr>
<tr>
<td>Funding</td>
<td>1.91</td>
<td>0.08</td>
</tr>
<tr>
<td>Visited Industry</td>
<td>4.79</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Nagelkerke R Square = .24

## Publications with Industry

<table>
<thead>
<tr>
<th>Event</th>
<th>Odds Ratio</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visited Industry</td>
<td>2.19</td>
<td>0.03</td>
</tr>
<tr>
<td>Advanced Technical Formal Training Mechanisms</td>
<td>1.60</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Preliminary Conclusions

- There is considerable amount of variability across center students
  - Characteristics
  - Experiences
  - Outcomes
- Student experiences predict outcomes but center groupings do not
  - Lack of variability across centers; effects may lie at research group and/or advisor level
- Consistent and Powerful Outcome Predictors
  - Multidisciplinary Center Experiences
  - Technical Project Involvement
  - Experiential Center Experiences
- Intriguing Predictors
  - Interactions with Industry (Satisfaction)
  - Interactions with Center Director (Organizational Commitment)
  - Interactions with Advisor (Satisfaction)
Next Steps

• Consider using some components of the questionnaire to assess student outcomes on an ongoing basis