Assessing your STEP Project:

Approach to Disentangling the Effects of Interwoven Project Strategies

Presentation at the STEP 2011 Grantees Meeting
Washington, D.C.
March 17, 2011
Workshop Presenters

Diane Rover, Professor
Electrical and Computer Engineering [PI]

Frankie Santos Laanan, Associate Professor
Educational Leadership & Policy Studies [Co-PI]

Steven Mickelson, Professor
Agricultural and Biosystems Engineering [Co-PI]

Mack Shelley, Professor
Political Science and Statistics [Co-PI]
# AGENDA

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
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<tbody>
<tr>
<td>10:45 AM</td>
<td>Welcome</td>
</tr>
<tr>
<td>10:50-11:15 AM</td>
<td>About SEEC (Rover)</td>
</tr>
<tr>
<td></td>
<td>• Conceptual Model of SEEC Effect (Laanan &amp; Mickelson)</td>
</tr>
<tr>
<td></td>
<td>• Preliminary Results (Mickelson)</td>
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<td></td>
<td>• Other assessment/evaluation approaches (Laanan &amp; Shelley)</td>
</tr>
<tr>
<td>11:15-12:00 PM</td>
<td>Learning Activity (Mickelson)</td>
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<tr>
<td></td>
<td>• Work in STEP Teams</td>
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<td>• Group Sharing</td>
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<tr>
<td>12:00-12:15 PM</td>
<td>Q &amp; A &amp; Wrap-Up</td>
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Workshop Objectives

• Highlight a methodological strategy to assess/evaluate pre-engineering and post-transfer experiences of students at a research university.

• Understand the extent to which prior experiences at the community college relate to students' academic performance and retention in engineering at the university.

• Present a conceptual model of the “SEEC Effect” used to understand engineering transfer student success.

• Engage participants in aspects of development and analysis through small and large group discussion. Participants will also be guided in a short exercise related to measuring the effect of their own STEP project.
The STEM Student Enrollment and Engagement through Connections (SEEC) project seeks to increase the number of engineering graduates at Iowa State University by approximately 100 per year. The means to that end are connections rooted in community: learning communities, community colleges, and Iowa communities. The project is collaborative between Iowa State University (ISU) and Des Moines Area Community College (DMACC). The cornerstone of SEEC is the success of learning communities for recruitment and retention, and the project builds upon Iowa State’s established learning community infrastructure, leadership, and expertise. Retention at DMACC and ISU will be increased by a new learning community model, called a learning community.
SEEC: STEM Student Enrollment and Engagement through Connections

- Ankeny
- Boone
- Carroll
- Newton
- Urban/Des Moines
- West

College of Engineering
Overall Grant Goal

Increase College of Engineering graduates to 900, by approximately 100 per year. Included with this goal are increases in the number of pre-engineering students at DMACC and in the percentages of women and minority students in engineering at ISU and DMACC.
Iowa State University

STEM Student Enrollment and Engagement through Connections

Increase the number of engineering graduates at Iowa State by 100 per year to approximately 900 graduates annually. Included with this goal are increases in the percentages of women and minority graduates in engineering at Iowa State and the number of pre-engineering students at Des Moines Area Community College.

Logic Model Planning

Project Goals

Resources

Activities

Outputs

Outcomes

Impact

01. Learning Village

Objectives:
To build a learning village that enhances student engagement and creates Iowa State connections for community college pre-engineering transfer students.

2011 Highlighted Short-Term Outcomes:
1. The college has customized Iowa State’s Admissions Partnership Program (APP) with Iowa community colleges to support prospective transfer students in engineering, called E-APP.
2. The Transfer Peer Mentor Program includes a web-based professional network which promotes multiple points of engagement for community college students. Transfer peer mentors serve as leaders in E2000 (S-STEM) transfer cohort seminars.
3. All Iowa State engineering departments have learning communities, and some have started transfer learning communities.

02. Curriculum

Objectives:
To enhance first- and second-year learning experiences, with an emphasis on student success and engagement and classroom climate.

2011 Highlighted Short-Term Outcomes:
1. Targeted program offerings provide pre-engineering and engineering students with key learning experiences and professional development (e.g., ENGR 110 and 210 E2000 courses, biomimetic minor, and DMACC/ENG 100).
2. Departments are interested in the transfer student transition and curriculum aspects (e.g., transfer learning communities, sophomore courses, and 2+2 programs).
3. A university-wide student success summit and continued SREK project emphasis on data analysis of students’ academic performance and success will inform department activities.

03. Advising

Objectives:
To develop and enhance academic advising and mentoring programs for precollege, community college, and university students.

2011 Highlighted Short-Term Outcomes:
1. Transfer students are entering engineering with a clear plan and connections that will assist them in making a smooth transition.
2. ISU and CC advisors and faculty are engaged in activities aimed at dissemination of student success reports, best practices, curriculum and new resources.

04. Networking

Objectives:
To establish a recruiting and outreach network across Iowa to tap into diverse communities of students, and to improve the awareness and understanding of engineering among those who influence student choice.

2011 Highlighted Short-Term Outcomes:
1. CYSTEM (Connecting Youth with Science, Technology, Engineering and Math), an interactive, web-based GIS map information repository was launched to connect youth, parents, and informal and formal educators to STEM resources (programming, mentors, and introduction to engineering jobs) in Iowa.
2. Partnerships and networking continue with University Extension, academic departments, Program for Women in Science and Engineering, Iowa State Admissions, industrial boards, and alumni and educator networks.

05. Evaluation*

Objectives:
To evaluate project effectiveness that will enhance project activities.

2011 Highlighted Short-Term Outcomes:
1. Data sources and procedures for continuous tracking of retention and enrollment of College of Engineering students with a focus on DMACC transfers and new freshmen has been established.
2. Longitudinal qualitative and quantitative assessment and evaluation activities are in place.

* Led by Iowa State University Research Institute for Studies in Education (RISE)
Enrollment Data

CoE Total Enrollment and Graduates

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Students</th>
<th>New (first-year and transfer) Students</th>
<th>Total Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-07</td>
<td>4445</td>
<td>1320</td>
<td>794</td>
</tr>
<tr>
<td>07-08</td>
<td>4608</td>
<td>1423</td>
<td>790</td>
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<td>08-09</td>
<td>4717</td>
<td>1469</td>
<td>735</td>
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<tr>
<td>09-10</td>
<td>5086</td>
<td>1575</td>
<td>826</td>
</tr>
<tr>
<td>10-11</td>
<td>5514</td>
<td>1758</td>
<td>806*</td>
</tr>
<tr>
<td>11-12</td>
<td></td>
<td></td>
<td>891*</td>
</tr>
<tr>
<td>12-13</td>
<td></td>
<td></td>
<td>992*</td>
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*Predicted – Based on Iowa State University Institutional Research
CoE Female Enrollment and Graduates

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Women</th>
<th>New (first-year and transfer) Women</th>
<th>Total Female Graduates</th>
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</thead>
<tbody>
<tr>
<td>2006</td>
<td>653</td>
<td>181</td>
<td>139</td>
</tr>
<tr>
<td>2007</td>
<td>665</td>
<td>193</td>
<td>126</td>
</tr>
<tr>
<td>2008</td>
<td>682</td>
<td>211</td>
<td>118</td>
</tr>
<tr>
<td>2009</td>
<td>761</td>
<td>255</td>
<td>118</td>
</tr>
<tr>
<td>2010</td>
<td>841</td>
<td>260</td>
<td>113</td>
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</table>
CoE Minority Student Enrollment and Graduates

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Ethnic Minorities</th>
<th>New (first-year and transfer) Minorities</th>
<th>Total Minority Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>392</td>
<td>142</td>
<td>117</td>
</tr>
<tr>
<td>2007</td>
<td>390</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>2008</td>
<td>359</td>
<td>177</td>
<td>108</td>
</tr>
<tr>
<td>2009</td>
<td>440</td>
<td>228</td>
<td>87</td>
</tr>
<tr>
<td>2010</td>
<td>482</td>
<td>227</td>
<td>89</td>
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</tbody>
</table>

- **Total Ethnic Minorities**
- **New (first-year and transfer) Minorities**
- **Total Minority Graduates**
Figure 1. Conceptual Model of SEEC Effect
Engineering Transfer Student Retention and Success

Figure 2. Conceptual Model of SEEC Effect: Community College Environment

**Community College**

- **SEEC Effect**
  - E-APP: Engineering Admissions Partnership Program
  - EGR 100
  - Learning Community at CC

- **Academic Experiences**
  - General Courses
  - Faculty
  - Transfer Process
  - Counseling & Advising

- **GPA Associate’s Degree**
  - GPA
  - Associate Degree

**Engineering Basic Program**

- Mathematics 165, 166 (Calculus)
- Chemistry 167 or 177
- Engineering 101 (Orientation)
- Engineering 160 (Engineering Problems)
- Physics 221
- Library 160
- English 150, 250
SEEC Effect
Enrollment in Des Moines Area Community College (DMACC) EGR 100

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Total</th>
<th>Women</th>
</tr>
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<tbody>
<tr>
<td>07-08</td>
<td>13</td>
<td>13</td>
<td>1</td>
<td>1</td>
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<tr>
<td>08-09</td>
<td>16</td>
<td>18</td>
<td>34</td>
<td>1</td>
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<tr>
<td>09-10</td>
<td>16</td>
<td>6</td>
<td>39</td>
<td>6</td>
</tr>
<tr>
<td>10-11</td>
<td>32</td>
<td>27</td>
<td>59</td>
<td>5</td>
</tr>
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</table>
Figure 3. Conceptual Model of SEEC Effect: University of Environment

University

- GPA
- Learning Communities: E2020, Engineering, PWSE, Honors
- Academic Experiences

Outcomes

- Retention in Engineering Major
- Leave Engineering, Retention in STEM Major
- Retained at University (non-STEM)
- Leave University

Engineering Basic Program

Graduate with Engineering Degree
CoE Learning Community Participation

- **New Freshman in LCs %**
- **New Transfers in LCs %**

### CoE Learning Community Participation Graph

- **2000**: 43.3%
- **2001**: 48.2%
- **2002**: 61.0%
- **2003**: 60.9%
- **2004**: 65.6%
- **2005**: 76.0%
- **2006**: 82.3%
- **2007**: 79.9%
- **2008**: 84.7%
- **2009**: 83.1%
- **2010**: 85.7%

- **2000**: 1.8%
- **2001**: 4.8%
- **2002**: 12.6%
- **2003**: 3.4%
- **2004**: 7.5%
- **2005**: 13.6%
- **2006**: 34.6%
- **2007**: 32.2%
- **2008**: 22.0%
- **2009**: 37.7%
- **2010**: 31.8%
Figure 1. Conceptual Model of SEEC Effect Engineering Transfer Student Retention and Success

E-APP and Retention

• E-APP students are retained at significantly higher levels than non-E-APP students.
• E-APP significantly improves retention over Non-E-APP in early studies.
• E-APP is statistically significant for improving retention even when controlling for transfer GPA and basic program GPA.
• This is especially true for DMACC students.
10 Year Averages for Retention: One Year

For Each 100 Students that Start in Engineering: This Shows Where They are 1 Year Later

- Still in Engr
- Still at ISU
- Left ISU

<table>
<thead>
<tr>
<th></th>
<th>Still in Engr</th>
<th>Still at ISU</th>
<th>Left ISU</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMACC</td>
<td>60</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>All IA CC</td>
<td>66</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>DFHS</td>
<td>74</td>
<td>12</td>
<td>14</td>
</tr>
</tbody>
</table>
CoE LC One Year Retention Rates in Engr

- All IA CC Transfers Starting in Engineering
- Direct from High School starting in Engineering
CoE One Year LC Retention in Engr

5 yr Avg 2000-2004

<table>
<thead>
<tr>
<th>Direct From High School</th>
<th>IA CC Transfer Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.5%</td>
<td>55.3%</td>
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</table>

5 yr Avg 2005-2009

<table>
<thead>
<tr>
<th>Direct From High School</th>
<th>IA CC Transfer Students</th>
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<tbody>
<tr>
<td>75.5%</td>
<td>73.6%</td>
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College of Engineering Data Analysis Marcia Laugerman & Jason Pontius
Multiple-Learning Community Effect on Retention of Women in Engineering

Impact of LC Participation on COE Retention
(Female College of Engineering Students)

Source: 2011 SEEC Grant College of Engineering Retention Analysis
ENGR 160 Student Retention within COE
(All Entering Engineering Students)

Source: 2011 College of Engineering Retention Analysis
(All Entering Engineering Students)

ENGR 160 Student Retention within COE

Number at risk
engr160hilo = 0 1288 895 736 514 69 8 1 0
engr160hilo = 1 1144 1029 895 545 32 3 0 0

Source: 2011 College of Engineering Retention Analysis
ENGR 160 Student Retention within COE
(Iowa Community College Transfer Students)

Number at risk
engr160hilo = 0 129 99 61 19 5 1 1 0
engr160hilo = 1 103 88 42 11 0 0 0 0

Source: 2011 College of Engineering Retention Analysis

College of Engineering Data Analysis Marcia Laugerman & Jason Pontius
Other Assessment Approaches

E-TSQ: Engineering Transfer Student Questionnaire

- Online survey instrument; 133-item and open-ended questions
- Adapted from L-TSQ (Laanan, 1998, 2004)
- Comprehensive instrument that collects demographic information about transfer student and their academic and social experiences at the 2- and 4-year environments.
- Ability to link E-TSQ with student academic transcripts
E-TSQ: Engineering Transfer Student Questionnaire

Demographics

Community College Experiences
• General Courses
• Academic Advising/Counseling Services
• Transfer Process
• Course Learning
• Experience with Faculty
• Learning and Study Skills

University Experiences
• Reasons for Attending University
• Course Learning
• Experiences with Faculty
• General Perceptions
• Adjustment Process
• College Satisfaction

Open-Ended Questions
• What factors helped you adjust to university?
• What might the community college have done to enhance your success or ease the transition?
• If you could give some advice to community college students, what would that advice be?
• What have we not asked that you would like us to know about your experience at the community college or university?
SEEC Effect (E-TSQ)

- Participated in E-APP
- Attended ISU’s CoE Transfer Student Career Fair Event
- Participated in the E-APP Online Professional Network
- Interacted with an ISU Engineering Transfer Peer Mentor
- Interacted with an ISU Engineering Advisor
- Participated in an Engineering 100 course in your community college
- Interacted with an ISU Engineering faculty member
- Attended an ISU campus event/activity
- Obtained an ISU student ID
- Obtained an ISU email account
- Used ISU’s CoE Career Management System (CMS)

- Attended “Experience Iowa State Days”
- Attended Transfer Visit Days
- Attended Admissions Partnership Program (APP) Days
- Came to ISU campus during a prospective student visit
- Developed a Transfer Plan
- Utilized ISU’s TRANSIT to develop an ISU Transfer Plan
- Participated in an ISU student organization
- Participated in a community college learning community
- Interacted with community college advisors
- Interacted with community college pre-engineering faculty
- Interacted with ISU’s CoE website
- Lived in ISU residence halls

Indicate the services or programs that you participated in at the community college by selecting NO or YES. Please indicate the extent to which they influenced your transfer preparation using the four-point scale: 1) disagree strongly, 2) disagree somewhat, 3) agree somewhat, 4) agree strongly
Learning Activity

Instructions:

• Develop a conceptual model of your STEP project.

• Identify secondary data and other data collection strategies needed to measure your outcomes.

• Be prepared to report your results to the group.
Figure 1. Conceptual Model of your STEP Effect
Sharing Session

• What issues emerged as a result of this learning activity?
• What did you learn?
• What steps do you plan to take from this workshop?
• What did you learn about developing a conceptual map?
• Other issues?
The STEM Student Enrollment and Engagement through Connections (SEEC) project seeks to increase the number of engineering graduates at Iowa State University by approximately 100 per year. The means to that end are connections rooted in community: learning communities, community colleges, and Iowa communities. The project is collaborative between Iowa State University (ISU) and Des Moines Area Community College (DMACC). The cornerstone of SEEC is the success of learning communities for recruitment and retention, and the project builds upon Iowa State's established learning community infrastructure, leadership, and expertise. Retention at DMACC and ISU will be increased by a new learning community model, called a learning...