Strategies to Increase Transfer Students in Engineering

Conference on Diversity in Science, Technology, Engineering and Math
Creating Linkages to Serve All Students in STEM Career Pathways

April 22, 2011
FFA Enrichment Center
Des Moines Area Community College

Grant No. 0653236
July 2007–July 2012
Presenters

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Objectives

This session will discuss the National Science Foundation (NSF) funded project called “STEM Student Enrollment and Engagement through Connections (SEEC)” collaboration between Des Moines Area Community College (DMACC) and Iowa State University College of Engineering.

- Collaboration goals and objectives;
- Logic model and evaluation strategies;
- Transfer student programs and data including enrollment, retention, success outcomes; and
- Implications for increasing women and underrepresented minority students in 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.
STEM Student Enrollment and Engagement through Connections

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

College of Engineering
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.

**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 E2O20 (S-STEM) transfer cohort seminars.
3. All Iowa State engineering departments have learning communities, and some have started transfer learning communities.

**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, EE2000 courses, biotechnology minor, and DMACC/DES 100).
2. Departments are interested in the transfer student transition and curricular aspects (e.g., transfer learning communities, sophomore classes, and 2+2 programs).
3. A university-wide student success summit and continued STEM project emphasis on data analysis of students’ academic performance and success will inform department activities.

**Objectives:**
- To develop and enhance academic advising and mentoring programs for preengineering, 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.

**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. CSTEMM (Connecting Youth with Science, Technology, Engineering, and Math), an interactive, web-based GIS mapping information repository was launched to connect Iowa youth, parents, and formal and informal 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.

**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 transfer students 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 and Graduate 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>
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<tbody>
<tr>
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<td>891*</td>
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<tr>
<td>12-13</td>
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<td>992*</td>
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</table>

*Predicted – Based on Iowa State University Institutional Research
CoE Female Enrollment and Graduates

- **Total Women**
- **New (first-year and transfer) Women**
- **Total Female Graduates**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Women</th>
<th>New Women</th>
<th>Total Female Graduates</th>
</tr>
</thead>
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<td>2006</td>
<td>653</td>
<td>181</td>
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<td>2007</td>
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<td>193</td>
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<td>2008</td>
<td>682</td>
<td>211</td>
<td>118</td>
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<tr>
<td>2009</td>
<td>761</td>
<td>255</td>
<td>118</td>
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<tr>
<td>2010</td>
<td>841</td>
<td>260</td>
<td>113</td>
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</tbody>
</table>

Legend:
- Dark blue: Total Women
- Orange: New (first-year and transfer) Women
- Red: Total Female Graduates
Figure 1. Conceptual Model of SEEC Effect
Engineering Transfer Student Retention and Success

STEM Talent Expansion Program (STEP)

STEM Student Enrollment and Engagement through Connections

Figure 2. Conceptual Model of SEEC Effect
Community College Environment

Community College

SEEC Effect
- E-APP
- EGR 100
- Learning Community

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

GPA
- Associate’s Degree

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

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

Engineering Basic Program
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>
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<td>13</td>
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<td>08-09</td>
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<td>10-11</td>
<td>32</td>
<td>27</td>
<td>59</td>
<td>5</td>
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Figure 3. Conceptual Model of SEEC Effect
University Environment

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

University

Outcomes

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

Graduate with Engineering Degree
CoE Learning Community Participation

- New Freshman in LCs %
  - 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%

- New Transfers in LCs %
  - 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%
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

DMACC:
- Still in Engr: 60
- Still at ISU: 14
- Left ISU: 26

All IA CC:
- Still in Engr: 66
- Still at ISU: 15
- Left ISU: 19

DFHS:
- Still in Engr: 74
- Still at ISU: 12
- Left ISU: 14
CoE LC One Year Retention Rates in Engr

- All IA CC Transfers Starting in Engineering
- Direct from High School starting in Engineering

Yearly Retention Rates

- 2000: 50% (All), 77% (Direct)
- 2001: 71% (All), 77% (Direct)
- 2002: 54% (All), 80% (Direct)
- 2003: 60% (All), 77% (Direct)
- 2004: 44% (All), 76% (Direct)
- 2005: 62% (All), 74% (Direct)
- 2006: 70% (All), 76% (Direct)
- 2007: 74% (All), 77% (Direct)
- 2008: 67% (All), 77% (Direct)
- 2009: 80% (All), 76% (Direct)
CoE One Year LC Retention in Engr

5 yr Avg 2000-2004

- Direct From High School: 77.5%
- IA CC Transfer Students: 55.3%

5 yr Avg 2005-2009

- Direct From High School: 75.5%
- IA CC Transfer Students: 73.6%
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)

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)

Years enrolled at ISU

<table>
<thead>
<tr>
<th>Years</th>
<th>0.00 - 3.00 GPA</th>
<th>3.01 - 4.00 GPA</th>
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<td>8</td>
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Number at risk
- \text{engr160hilo} = 0: 129, 99, 61, 19, 5, 1, 1, 0
- \text{engr160hilo} = 1: 103, 88, 42, 11, 0, 0, 0, 0

Source: 2011 College of Engineering Retention Analysis
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?
STEM Talent Expansion Program (STEP)

STEM Student Enrollment and Engagement through Connections

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E2020 Scholars Program
ISU Extension
ISU Office of Community College Research and Policy

Fast Facts about ISU Engineering

The College of Engineering continues to be ranked among the top 25 public engineering colleges in the country, according to the graduate and professional school rankings.

The programs are among the top 10 in the Midwest among all engineering colleges (USN & WR ranking).

Data Briefs

SEEC Data Brief: Engineering Admissions Partnership Program (E-APP) (PDF) November 2010
SEEC Data Brief: Engineering Orientation (EGR 100) (PDF) November 2010
SEEC Data Brief: SEEC Engineering Transfer Student Profile (PDF)

www.eng.iastate.edu/seec