Introduction
Academic coursework common to all Iowa State University engineering majors is called the Basic Program. These core courses are listed in Table 1. Earlier research (SEEC Data Brief: Data Collection and Analysis Project—Retention) showed a correlation between academic success in engineering at Iowa State and grades in Basic Program courses. An engineering community college transfer student has the option of taking any of these courses at the community college (if available) or at Iowa State. This brief will detail empirical information related to success in engineering at Iowa State based on academic factors for community college students.

Dataset Demographics
The dataset for this study included 1,191 Iowa Community College (IA CC) transfer students who enrolled in Iowa State’s College of Engineering from Fall 2002 through Fall 2008. The demographics were as follows:
- Female: 81 or 6.8%
- Black: 40 or 3.5%
- White: 967 or 84.5%
- Hispanic: 18 or 1.6%
- American Indian: 10 or 0.9%
- Asian: 43 or 3.8%
- Hawaiian: 0
- U.S. Citizen: 1,106 or 92.9%

As of Fall 2010, for this group of 1,191 students:
- 51.3% (611) graduated or were still retained in engineering
- 16.1% (192) left engineering but had either graduated (in non-engineering majors) or were still retained at ISU
- 32.6% (388) left both engineering and ISU
Sample of Dataset
For the graduation evidence, a sample of 472 IA CC transfer students who entered Iowa State’s CoE from 2002 through 2005 was utilized. These cohorts of students were selected to provide a minimum of six years for students to graduate. An earned degree in engineering was the dependent variable. The demographic information for this sample is as follows:

- n = 472
- Female: 33 or 7.0%
- Black: 12 or 2.7%
- White: 366 or 83.0%
- Hispanic: 6 or 1.4%
- American Indian: 5 or 1.1%
- Asian: 25 or 5.7%
- Hawaiian: 0
- U.S. Citizen: 435 or 92.4%

As of Fall 2010, for this sample of 472 students, 53% graduated in engineering.

There was no statistical difference in demographics between the entire dataset of 1,192 students and the sample cohorts of 472 students. Table 1 below shows the demographics of the IA CC admits into the College of Engineering compared to all students that entered the College of Engineering between 2002 and 2008.

Table 2
Demographics of Data

<table>
<thead>
<tr>
<th>Admit Group</th>
<th>n</th>
<th>Female</th>
<th>Black</th>
<th>White</th>
<th>Hispanic</th>
<th>American Indian</th>
<th>Asian</th>
<th>Hawaiian</th>
<th>U.S. Citizen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community College Transfers 2002-2005</td>
<td>472</td>
<td>7.0%</td>
<td>2.5%</td>
<td>77.5%</td>
<td>1.3%</td>
<td>1.1%</td>
<td>5.3%</td>
<td>0.0%</td>
<td>92.2%</td>
</tr>
<tr>
<td>Community College Transfers 2002-2008</td>
<td>1191</td>
<td>6.8%</td>
<td>3.4%</td>
<td>81.2%</td>
<td>1.5%</td>
<td>0.8%</td>
<td>3.6%</td>
<td>0.0%</td>
<td>92.9%</td>
</tr>
<tr>
<td>All Entering Engineers 2002-2008*</td>
<td>12882</td>
<td>14.5%</td>
<td>2.5%</td>
<td>80.3%</td>
<td>2.6%</td>
<td>0.3%</td>
<td>4.2%</td>
<td>0.0%</td>
<td>91.3%</td>
</tr>
</tbody>
</table>

*Includes IA CC Transfers

Table 2 shows that there is no difference in the demographics of the students in the study except the percent of females entering engineering from Iowa community colleges is significantly lower than that of all admits to engineering.

An engineering transfer student has the option of taking some or all of the Basic Program courses at the community college and some or all of these courses at Iowa State. Therefore, the graduation rates in Tables 3 and 4 are separated by the institution where students took the basic program course(s).
Table 3  
Graduation Rates in Engineering by Iowa State Basic Program Grades

<table>
<thead>
<tr>
<th>GPA</th>
<th>Graduation Rate</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 1.0 GPA</td>
<td>0%</td>
<td>40</td>
</tr>
<tr>
<td>1.0 - 2.0 GPA</td>
<td>19%</td>
<td>62</td>
</tr>
<tr>
<td>2.0 - 2.5 GPA</td>
<td>48%</td>
<td>60</td>
</tr>
<tr>
<td>2.5 - 3.0 GPA</td>
<td>53%</td>
<td>75</td>
</tr>
<tr>
<td>3.0 - 3.5 GPA</td>
<td>68%</td>
<td>73</td>
</tr>
<tr>
<td>3.5 - 4.0 GPA</td>
<td>82%</td>
<td>65</td>
</tr>
</tbody>
</table>

Fall 2002-2005 IA CC Transfer Students

Table 3 shows actual graduation rates in engineering by the GPA achieved in Basic Program courses taken at Iowa State. This illustrates that a GPA of a 3.0 or better in the Basic Program courses taken at Iowa State increases the graduation rate to 68% which is a significant improvement over the average graduation rate of 53% for this same group.

Table 4  
Graduation Rates in Engineering by IA CC Transfer Basic Program Grades

<table>
<thead>
<tr>
<th>GPA</th>
<th>Graduation Rate</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 1.0 GPA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.0 - 2.0 GPA</td>
<td>0%</td>
<td>12</td>
</tr>
<tr>
<td>2.0 - 2.5 GPA</td>
<td>33%</td>
<td>67</td>
</tr>
<tr>
<td>2.5 - 3.0 GPA</td>
<td>50%</td>
<td>115</td>
</tr>
<tr>
<td>3.0 - 3.5 GPA</td>
<td>50%</td>
<td>139</td>
</tr>
<tr>
<td>3.5 - 4.0 GPA</td>
<td>64%</td>
<td>139</td>
</tr>
</tbody>
</table>

Fall 2002-2005 IA CC Transfer Students  
Transfer GPAs do not include F grades.

Table 4 shows the actual graduation rates in engineering by the GPA achieved in the Basic Program courses transferred from the community college. This illustrates how students with a GPA of better than 3.5 in the Basic Program courses transferred from IA CCs have a graduation rate of 64%. This is a significant improvement over the average graduation rate of 53% for this same group. Note that GPAs less than 1.0 from the community colleges were not recorded in the dataset. F grades are very rarely transferred to Iowa State. There was less differentiation in the graduation rates based on transferred Basic Program GPAs.

Table 5  
One and Two Year Retention Rates by Admit Status and Grade Point Averages

<table>
<thead>
<tr>
<th>Admit Status</th>
<th>Fall 2002 - Fall 2009 data</th>
<th>Fall 2002 - Fall 2008 data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Fall GPA</td>
<td>First Year GPA</td>
</tr>
<tr>
<td>Iowa CC transfer</td>
<td>2.31</td>
<td>2.42</td>
</tr>
<tr>
<td>Non-Iowa CC transfer</td>
<td>2.66</td>
<td>2.70</td>
</tr>
<tr>
<td>Four-year College transfer</td>
<td>2.75</td>
<td>2.86</td>
</tr>
<tr>
<td>High School Admit</td>
<td>2.72</td>
<td>2.78</td>
</tr>
</tbody>
</table>

Table 5 shows important retention data by admit status and GPA. In recent SEEC research, first fall GPA, first year GPA, and transfer GPA have emerged as significant predictors of success in engineering. This table includes both retention in engineering and retention at Iowa State. Both are important measures of success for students that enter the College of Engineering at Iowa State. In addition to first fall, first year and transfer GPAs, previous SEEC data briefs recommend participation in learning communities and Engineering Admissions Partnership Programs (E-APP), to further increase success in engineering.
Table 6 shows average grade points in key Basic Program courses by admit status to Iowa State. This shows the difference in key course grades (for unmatched pairs) between Iowa State and other transfer institutions. These courses are considered some of the most challenging in the Basic Program. This suggests that all groups of students have the most difficulty with Physics 221, since the grades are the lowest among all groups of students. Note of caution: The Iowa State grades shown are inflated because all Iowa State F grades were dropped. This was to equalize the comparison since transfer students rarely transfer F grades.

Table 7 shows the background characteristics by admit status to the College of Engineering. This may explain in part, why the success rates are lower for community college transfers, as shown in Table 5 and in previous retention data briefs. These students are able to increase their success by increasing their grades in Basic Program courses—either at the transfer institution or at Iowa State—as shown on Table 3 and 4, and by increasing their overall transfer GPA as shown on Table 5. These students are also able to increase their success by increasing their first fall and first year GPA at Iowa State. Previous SEEC data briefs recommend participation in learning communities and Engineering Admissions Partnership Programs (E-APP), to further increase success in engineering.

### Table 6
**Grade Comparisons in Key Engineering Courses by Admit Status**
Fall 2002-Fall 2010 admits to the College of Engineering

<table>
<thead>
<tr>
<th>Admit Status</th>
<th>Math 165 GPA at ISU</th>
<th>Math 165 GPA Transferred</th>
<th>Math 166 GPA at ISU</th>
<th>Math 166 GPA Transferred</th>
<th>Phys 221 GPA at ISU</th>
<th>Phys 221 GPA Transferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa CC transfer</td>
<td>2.47</td>
<td>3.06</td>
<td>2.60</td>
<td>3.08</td>
<td>2.40</td>
<td>3.01</td>
</tr>
<tr>
<td>Non-Iowa CC transfer</td>
<td>2.87</td>
<td>3.11</td>
<td>2.71</td>
<td>3.08</td>
<td>2.44</td>
<td>3.02</td>
</tr>
<tr>
<td>Four-year College transfer</td>
<td>2.95</td>
<td>3.10</td>
<td>2.94</td>
<td>2.96</td>
<td>2.68</td>
<td>2.87</td>
</tr>
<tr>
<td>High School Admit</td>
<td>2.87</td>
<td>3.35</td>
<td>2.95</td>
<td>3.14</td>
<td>2.68</td>
<td>2.96</td>
</tr>
</tbody>
</table>

### Table 7
**Background Characteristics of Students by Admit Status**
Fall 2002-Fall 2010 admits to the College of Engineering

<table>
<thead>
<tr>
<th>Admission Type</th>
<th>N</th>
<th>ISU Basic Program GPA</th>
<th>Math ACT Scores</th>
<th>High School GPA</th>
<th>CC Transfer GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean n</td>
<td>Mean n</td>
<td>Mean n</td>
<td>Mean n</td>
</tr>
<tr>
<td>Iowa CC transfer</td>
<td>1,191</td>
<td>2.32 830</td>
<td>25.0 650</td>
<td>3.24 585</td>
<td>3.08 1,183</td>
</tr>
<tr>
<td>Non-Iowa CC transfer</td>
<td>355</td>
<td>2.72 254</td>
<td>25.3 89</td>
<td>3.34 122</td>
<td>3.07 349</td>
</tr>
<tr>
<td>Non-CC transfer</td>
<td>825</td>
<td>2.85 603</td>
<td>27.1 314</td>
<td>3.54 326</td>
<td></td>
</tr>
<tr>
<td>High School Admit</td>
<td>10,511</td>
<td>2.71 8,997</td>
<td>28.0 9,849</td>
<td>3.63 10,441</td>
<td></td>
</tr>
</tbody>
</table>
The work reported herein is supported by the National Science Foundation, Science, Technology, Engineering and Mathematics Talent Expansion Program (STEP), Directorate for Education and Human Resources, Division of Undergraduate Education, Grant No. 0653236.

The SEEC Data Brief is published by the College of Engineering in collaboration with the Office of Community College Research & Policy (OCCRP) at Iowa State University. Established in 2004, the mission of OCCRP is to articulate and analyze the issues affecting policy and practice by conducting rigorous research which impacts students, faculty, administrators, and policymakers.

http://www.eng.iastate.edu/seec

---

**Principal Investigators**

Diane Rover  
Professor, Electrical and Computer Engineering  
Iowa State University  
Email: drover@iastate.edu

Harry McMaken  
Professor, Engineering and Math  
Des Moines Area Community College  
Email: hmcmaken@dmacc.edu

Frankie Santos Laanan  
Interim Director, Center for Excellence in Science, Mathematics and Engineering Education  
Associate Professor, Educational Leadership and Policy Studies  
Iowa State University  
Email: laanan@iastate.edu

**Co-Principal Investigators**

Monica Bruning  
Senior Research Associate and Lecturer, Educational Leadership and Policy Studies  
Iowa State University  
Email: mbruning@iastate.edu

**Senior Personnel**

Mack C. Shelley  
University Professor  
Political Science and Statistics  
Iowa State University  
Email: mshelley@iastate.edu

Mary Darrow  
Transfer and E-APP Coordinator  
College of Engineering  
Iowa State University

Andrew Ryder  
Research and Evaluation Scientist  
Research Institute for Studies in Education (RISE)  
Iowa State University

Karen Zunkel  
Program Manager  
Program for Women in Science and Engineering  
Iowa State University

**Other Personnel**

Virginia Anderson  
Information Assurance Center  
Electrical and Computer Engineering  
Iowa State University

Sandy Jennings-Hammond  
Communications Consultant  
Iowa State University

**Other Executive Team Members**

Joel Johnson  
Program Manager  
Engineering Academic/Student Affairs  
Iowa State University

Marcia Laugerman  
Graduate Assistant-Research  
Agricultural and Biosystems Engineering  
Iowa State University

Carlos Lopez  
Graduate Assistant-Research  
Educational Leadership and Policy Studies  
Iowa State University

**SEEC TEAM**

Collaboration between Iowa State University and DMACC

**DMACC**

Des Moines Area Community College

---

**Principal Investigators**

Diane Rover, Principal Investigator  
Electrical and Computer Engineering  
333 Durham Hall  
Iowa State University  
Ames, IA 50011  
Office: 515.294.2819  
E-mail: drover@iastate.edu  
www.engineering.iastate.edu/~drover/

Frankie Santos Laanan, Co-PI and Director  
Office of Community College Research and Policy  
Educational Leadership & Policy Studies  
Iowa State University  
N243 Lagomarcino Hall  
Ames, IA 50011  
Office: 515.294.7292  
E-mail: laanan@iastate.edu  
www.cclp.hs.iastate.edu/occrp/