



Basic Program — Empirical Research Results

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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.

Table 1

Iowa State University College of Engineering Basic Program

Credits	Course	Description
4	Math 165	Calculus I
4	Math 166	Calculus II
4	Chem. 167 or 177	General Chemistry I
5	Phys 221	Introduction to Classical Physics I
3	English 104 or 150	Critical Thinking and Communication
3	English 105 or 150	Written, Oral, Visual and Electronic Composition
3	Engineering 160 or Aer E 160, C E 160, Cpr E 185, E E 185, S E 185, or I E 1480	Engineering Problems with Computer Applications Lab
Required	Engineering 101	Engineering Orientation
0.5	Lib 160	Library Orientation
26.5	Total Credits	

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

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

*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**

Iowa State Basic Program Grades		
GPA	Graduation Rate	n
less than 1.0 GPA	0%	40
1.0 - 2.0 GPA	19%	62
2.0 - 2.5 GPA	48%	60
2.5 - 3.0 GPA	53%	75
3.0 - 3.5 GPA	68%	73
3.5 - 4.0 GPA	82%	65

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**

Transferred Basic Program Grades		
GPA	Graduation Rate	n
less than 1.0 GPA	-	-
1.0 - 2.0 GPA	0%	12
2.0 - 2.5 GPA	33%	67
2.5 - 3.0 GPA	50%	115
3.0 - 3.5 GPA	50%	139
3.5 - 4.0 GPA	64%	139

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**

Admit Status	Fall 2002 - Fall 2009 data						Fall 2002 - Fall 2008 data		
	First Fall GPA	First Year GPA	Transfer GPA	ENGR Retention after 1 year	ISU Retention after 1 year	n	ENGR Retention after 2 years	ISU Retention after 2 years	n
Iowa CC transfer	2.31	2.42	3.06	66%	81%	1,011	52%	70%	858
Non-Iowa CC transfer	2.66	2.70	3.05	73%	82%	271	57%	65%	231
Four-year College transfer	2.75	2.86	3.04	70%	80%	714	50%	59%	598
High School Admit	2.72	2.78	3.46	74%	89%	9,065	61%	81%	7,737

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**Grade Comparisons in Key Engineering Courses by Admit Status**

Fall 2002-Fall 2010 admits to the College of Engineering

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

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**Background Characteristics of Students by Admit Status**

Fall 2002-Fall 2010 admits to the College of Engineering

Admission Type	N	ISU Basic Program GPA		Math ACT Scores		High School GPA		CC Transfer GPA	
		Mean	n	Mean	n	Mean	n	Mean	n
Iowa CC transfer	1,191	2.32	830	25.0	650	3.24	585	3.08	1,183
Non-IA CC transfer	355	2.72	254	25.3	89	3.34	122	3.07	349
Non-CC transfer	825	2.85	603	27.1	314	3.54	326		
High School Admit	10,511	2.71	8,997	28.0	9,849	3.63	10,441		

Table 7 shows the background characteristics by admit status to Iowa State. These must be interpreted with caution since the data only had background characteristics for about half of the transfer students. Also, the transfer institution is the one listed most recently on the transcript. It is common for a transfer student to have attended more than one college.

Conclusion

Taken together, Tables 5, 6 and 7 portray a more academically challenged group of students transferring from community colleges (either in-state or out-of-state) than either the non-community college transfer (4 year transfer) or the high school admit 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 in Tables 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.

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