Prioritizing activities to achieve practical competency in the higher educational classroom

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Abstract: *This study examined the relationship between high impact practices (as identified by George Kuh) and a student's gain in practical competency as identified by National Survey of Student Engagement (NSSE). These practical competencies are: 1) analyzing quantitative information, 2) acquiring job or work-related knowledge and skills, 3) working effectively with others, and 4) solving complex real-world problems. The NSSE survey, a self-report measure, collects information annually from seniors and freshmen about the quality of their undergraduate experience and particularly focuses on student engagement issues as an indicator for student learning (NSSE Annual Report, 2011). The NSSE's purpose is to "provide data to colleges and universities to assess and improve undergraduate education, inform accountability and accreditation efforts, and facilitate national and sector benchmarking efforts, among others" (NSSE Annual Report, 2011, p. 7). The researchers used only senior data on high impact practices to assist in determining priorities for institutional support. Using a multivariate probit regression analysis, significance with high impact practices were determined in relationship to the competencies. Results indicated that several high impact practices were identified with significant relationships to the practical competencies. Ramifications for student learning and higher education practices are explored.*

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INTRODUCTION AND LITERATURE REVIEW

A myriad of stakeholders exist from both the internal and external environments within the industry of higher education. These stakeholders all have a keen interest in alumni outcomes. Most centrally, students care about the skills they acquire so that they can obtain jobs. Local and regional business desire students who are capable of critical thinking, good oral communication, ethical understanding, intercultural knowledge, quantitative reasoning, information literacy, ability to work in teams, etc. Society, at large, requires an educated workforce and individuals who are civically minded. All of these stakeholders maintain different requirements for higher educational outcomes.

As higher educational institutions confront resource shortages, they are faced with the question of how to meet all of their stakeholders needs. Central questions include:

- What student services to offer?
- What academic programs to offer?
- What student needs are most critical to address?

Key to answering these questions, is how resources should be focused to achieve the outcomes society requires, specifically which academic assignments will achieve these outcomes.

Kuh (2008) developed a set of "high impact" practices which all for students to engage and learning in an active setting. These activities are:

- First-Year Seminars and Experiences
- Common Intellectual Experiences
- Learning Communities
- Writing-Intensive Courses
- Collaborative Assignments and Projects

- ▶ Undergraduate Research
- ▶ Diversity/Global Learning
- ▶ Service Learning, Community-Based Learning
- ▶ Internships
- ▶ Capstone Courses and Projects

Kuh (2008) determined that these practices were central to learning since they provide "cross-cutting capacities" required in all jobs. As noted by Kuh (2016), students will have 10-14 jobs before they are 38 years old. Hence, students needs to build their capacities in critical thinking, communication, reasoning, etc.

Research Question

Based on the above needs from various stakeholders and the constraint of resources present in higher education, the research question for this study was:

Using the National Survey for Student Engagement (NSSE) survey items involving high impact practices, which activities should be prioritize since they are correlated to practical competence?

This research seeks to extend high impact practice literature to understand the impact upon one particular outcome--practical competence. Practical competency is defined by the Association of American Colleges and Universities (AACU) as 1) acquiring job or work-related knowledge and skills, 2) working effectively with others, 3) using computing and information technology, 4) analyzing quantitative problems, and 6) solving complex real-world problems (2013, p. 49).

The researchers reviewed the National Survey of Student Engagement (NSSE) to identify items which could be related to the above practical competencies outlined. These items are

noted in Table 1. For example, the NSSE Item: *Working with other students on course projects or assignments* is related to the High Impact Practice*: Collaborative Assignments and Projects*

The researchers chose this approach due to the relevance to the workplace and focus it brings to the research study.

METHOD

Data Source

Data Source. The National Survey of Student Engagement quesitonnaire (NSSE), a self-report measure, collects information from both freshmen and seniors about the quality of their undergraduate experience and particularly focuses on student engagement issues as an indicator for student learning (National Survey of Student Engagement 2011). The purpose of the NSSE is to "provide data to colleges and universities to assess and improve undergraduate education, inform accountability and accreditation efforts, and facilitate national and sector benchmarking efforts, among others" (National Survey of Student Engagement 2011, 7).

The NSSE survey has 28 major categories of questions, many of which have multiple subparts. The total number of all questions in the survey is 100, including demographic questions. The scaled response is a four-point scale – 4: Very often; 3: Often; 2: Sometimes; and 1: Never. For this research project, data from senior students who voluntarily completed a web-based NSSE survey during the spring semester of 2015 were used.

Table 1: NSSE Questions
Working with other students on course projects or assignments
Included diverse perspectives in course discussion or assignments
Tried to better understand someone else's views by imagining how an issue looks from his or her perspective

Number of courses at the institution included a community based project
Compete a culminating senior experience
Discussion with people from an economic background other than your own
Wrote papers, reports, etc 11 pages or more
Participated in a study abroad program
Worked with a faculty member on a research project
Discussions with people with religious beliefs other than your own
Attended an art exhibit, play or other arts performance
Held a formal leadership role in a student organization or group
Participated in a formal program where groups of students take two or more classes together
Discussion with people of a race or ethnicity other than our own
Discussion with people with political views other than our own.
Participated in an internship, co-op or field experience, student teaching or clinical placement

Participants

The research study utilized participants (traditional seniors) from a medium-sized public institution. The total participants for the study numbered 850, but the valid sample was about 635 due to missing observations. Of the roughly 635 respondents, 63 percent are female, over 47 percent identified as white, while 23 percent identified as black. The most popular major was Business, accounting for 21 percent of the respondents, the average age of those responding was just below 26, and 56 percent were the first in their family to attempt a college degree.

Data Summary

The four perceived gains that we focus on are summarized in the frequency tables below. These tables indicate that the number of students reporting “quite a bit” and “very much” are consistently approximately sixty percent of the valid sample size. We refer to these two

categories as high intensity, and the “very little” and “some” categories as low intensity, throughout this paper.

Table 2

Perceived gains: Analyzing numerical and statistical information

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very little	57	6.7	9.0	9.0
	Some	155	18.2	24.4	33.4
	Quite a bit	217	25.5	34.2	67.6
	Very much	206	24.2	32.4	100.0
	Total	635	74.7	100.0	
Missing	System	215	25.3		
Total		850	100.0		

Table 3

Perceived gains: Solving complex real-world problems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very little	89	10.5	14.0	14.0
	Some	167	19.6	26.2	40.2
	Quite a bit	218	25.6	34.2	74.4
	Very much	163	19.2	25.6	100.0
	Total	637	74.9	100.0	
Missing	System	213	25.1		
Total		850	100.0		

Table 4

Perceived gains: Developing or clarifying a personal code of values and ethics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very little	81	9.5	12.8	12.8
	Some	156	18.4	24.6	37.4
	Quite a bit	209	24.6	33.0	70.3

	Very much	188	22.1	29.7	100.0
	Total	634	74.6	100.0	
Missing	System	216	25.4		
Total		850	100.0		

Table 5

Perceived gains: Acquiring job- or work-related knowledge and skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very little	92	10.8	14.5	14.5
	Some	148	17.4	23.3	37.8
	Quite a bit	214	25.2	33.7	71.5
	Very much	181	21.3	28.5	100.0
	Total	635	74.7	100.0	
Missing	System	215	25.3		
Total		850	100.0		

Table 6

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Perceived gains: Analyzing numerical and statistical info.	635	.6661417	.4719616	0	1
Perceived gains: Working effectively with others	634	.7239748	.4473824	0	1
Perceived gains: Solving complex real-world problems	637	.5981162	.490664	0	1
Perceived gains: Acquiring job- or work-related knowledge and skills	635	.6220472	.485258	0	1

The next table shows summary statistics for our independent variables

Table 7

Variable	Obs	Mean	Std. Dev.	Min
Student Athlete	629	0.02	0.14	0
First-Generation Status (neither parent/guardian holds a bachelor's degree)	632	0.56	0.50	0
Gender (=Male)	632	0.35	0.48	0
Gender (=Female)	632	0.63	0.48	0
Gender(=Other)	632	0.00	0.04	0
Gender(=did not respond)	632	0.02	0.14	0
Major(=Arts and Humanities)	633	0.05	0.23	0
Major(=Biology, Agriculture, Natural Resources)	633	0.14	0.35	0
Major(=Physiscal Sciences, Math, Computer Science)	633	0.03	0.18	0
Major(=Social Sciences)	633	0.11	0.31	0
Major(=Business)	633	0.21	0.41	0
Major(=Communication, Media, PR)	633	0.01	0.10	0
Major(=Education)	633	0.11	0.31	0
Major(=Engineering)	633	0.03	0.16	0
Major(=Health Professions)	633	0.16	0.37	0
Major(=Social Service Professions)	633	0.05	0.21	0
Major(=All other)	633	0.08	0.27	0
Major(=Undeclared)	633	0.02	0.14	0
Age	627	25.79	9.52	17
Race(=white)	632	0.47	0.50	0
Race(=asian)	632	0.12	0.32	0
Race(=black)	632	0.23	0.42	0
Race(=latino)	632	0.15	0.35	0
Race(=other)	632	0.03	0.18	0
Reached conclusions based on your own analysis of numerical information (numbers, graphs, statistics, etc.)	774	0.61	0.49	0
Encouraging contact among students from different backgrounds (social, racial/ethnic, religious, etc.)	637	0.67	0.47	0
Used numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.)	772	0.48	0.50	0
Talked about career plans with a faculty member	786	0.39	0.49	0
Study Abroad Program	705	0.07	0.25	0
Culminating senior experience (capstone course, senior project or thesis, comprehensive exam, portfolio, etc.)	701	0.26	0.44	0
Worked with other students on course projects/assignments	814	0.68	0.47	0
Had discussions with people from an economic background other than your own	717	0.77	0.42	0
Work with a faculty member on a research project	697	0.15	0.36	0
Included diverse perspectives (political, religious, racial/ethnic, gender, etc.) in course discussions or assignments	794	0.55	0.50	0

Tried to better understand someone else's views by imagining how an issue looks from his or her perspective	788	0.73	0.45	0
About how many of your courses at this institution have included a community-based project (service-learning)?	687	0.13	0.33	0
Number of written papers or reports: 11 pages or more	659	0.13	0.34	0
Attended an art exhibit, play or other arts performance (dance, music, etc.)	826	0.17	0.37	0
Internship, co-op, field experience, student teaching, or clinical placement	707	0.21	0.41	0
Formal leadership role in a student organization or group	708	0.16	0.37	0
Learning community or some other formal program where groups of students take two or more classes together	704	0.15	0.36	0

Methodology

Approach 1: Multivariate Probit Regression

We perform a multivariate probit regression model of the form:

$$P[y_1 = 1, y_2 = 1, y_3 = 1, y_4 = 1 | x_1, x_2, x_3, x_4] = \boldsymbol{\phi_4}\ (\boldsymbol{\beta_1 X_1}, \boldsymbol{\beta_2 X_2}, \boldsymbol{\beta_3 X_3}, \boldsymbol{\beta_4 X_4}, \rho)$$

where $\boldsymbol{\phi_4}$ is the cdf of the multivariate normal distribution.

The dependent variables are:

Y1: Perceived gains - Analyzing numerical and statistical information (0 if very little or some, and 1 if quite a bit or very much)

Y2: Perceived gains - Working effectively with others (0 if very little or some, and 1 if quite a bit or very much)

Y3: Perceived gains: Solving complex real-world problems (0 if very little or some, and 1 if quite a bit or very much)

Y4: Perceived gains: Acquiring job- or work-related knowledge and skills (0 if very little or some, and 1 if quite a bit or very much)

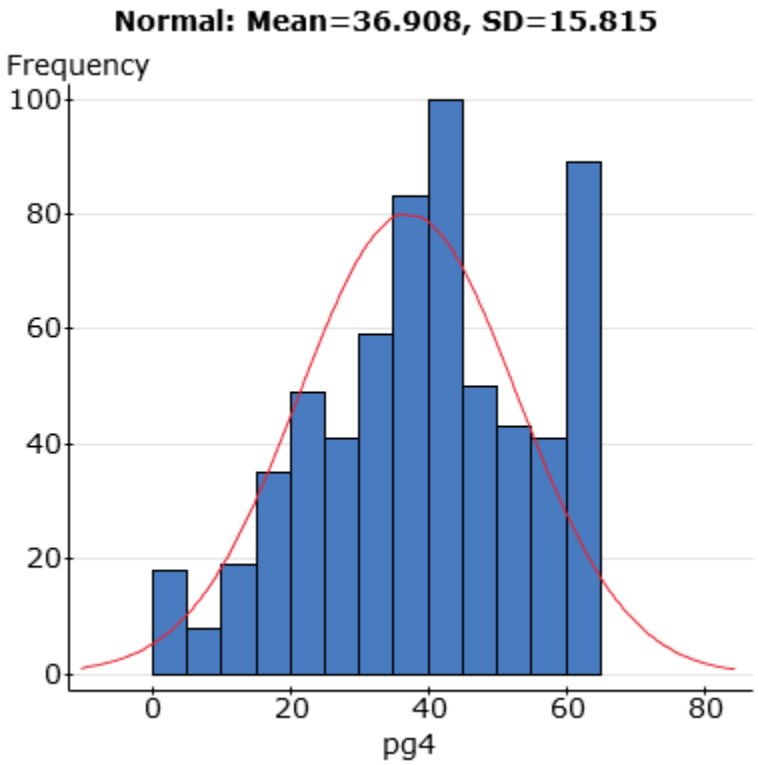
Approach 2: Ordinary Least Squares Estimation

In the ordinary least squares (OLS) model, the dependent variable is the National Survey of Student Engagement (NSSE) Perceived Gain Index.[1] The PG Index has a maximum value of 60 and a minimum of 0. As we show in Figure 1, the histogram of PG index is slightly skewed to the left,

[1] http://nsse.indiana.edu/html/creating_other_scales.cfm as at 2/2/17. The SPSS syntax used to create these scales are in the appendix.

however, it was still less skewed than its logged, square root, or inverse transformations. The residual from the OLS regression are still symmetric and show no relationship with the predicted values.

Figure 1



The independent variables are:

Reached conclusions based on your own analysis of numerical information (numbers, graphs, statistics, etc.) (0 if very little or some, and 1 if quite a bit or very much)

Study abroad program (0 if student did not participate, 1 if they did)

Culminating senior experience (capstone course, senior project or thesis, comprehensive exam, portfolio, etc.) (0 if student did not participate, 1 if they did)

Worked with other students on course projects/assignments (0 if very little or some, and 1 if quite a bit or very much)

Had discussions with people from an economic background other than your own (0 if very little or some, and 1 if quite a bit or very much)

Work with a faculty member on a research project (0 if very little or some, and 1 if quite a bit or very much)

Included diverse perspectives (political, religious, racial/ethnic, gender, etc.) in course discussions or assignments (0 if very little or some, and 1 if quite a bit or very much)

Other control variables – Demographic

Are you a student-athlete on a team sponsored by your institution's athletics department? (0 if no, 1 if yes)

First-Generation Status (neither parent/guardian holds a bachelor's degree) (0 if no, 1 if yes)

Gender (=Female) (0 if no, 1 if yes)

Gender(=Other) (0 if no, 1 if yes)

Gender(=did not respond) (0 if no, 1 if yes)

RESULTS

Using NSSE's Perceived Gains Index

One approach that gives marginal effects directly is the ordinary least squares regression. In this case, the dependent variable is the perceived gains index, which is a quantitative variable, with a minimum of zero and a maximum of 60. The disadvantage here, compared to the multivariate approach, is that we are not able to isolate the effects on the individual competency measures.

The strongest effect we see, in Table #, is that of having the institution emphasizing contact among students from different backgrounds, be it social, racial/ethnic, religious, or other. Other practices that have the expected positive effect are: taking lots of courses that require drawing conclusions based on numerical analysis, taking courses that require real world problem solving, discussing a future career with faculty members, and taking lots of classes where collaboration with other students is encouraged. In addition, taking service-learning courses, taking lots of classes with community-based projects, completing a capston course, and writing papers that were 11 pages or more, all significantly improved perceived gains. Overall, compared to arts and humanities majors, business and social science professions reported more competence.

Table 8: Ordinary Least Squares Regression – using NSSE's Perceived Gains Index

Dependent Variable is PG MODIFIED INDEX		
	Coefficient	T-Stat
Reached conclusions based on your own analysis of numerical information (numbers, graphs, statistics, etc.)	2.532*	(1.81)
Encouraging contact among students from different backgrounds (social, racial/ethnic, religious, etc.)	9.003***	(6.20)
Used numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.)	5.395***	(3.55)
Talked about career plans with a faculty member	6.131***	(4.25)
Study abroad program	-2.145	(0.92)
Culminating senior experience (capstone course, senior project or thesis, comprehensive exam, portfolio, etc.)	3.381**	(2.23)
Worked with other students on course projects/assignments	4.261***	(2.98)
Had discussions with people from an economic background other than your own	1.014	(0.62)
Work with a faculty member on a research project	-0.558	(0.29)
Included diverse perspectives (political, religious, racial/ethnic, gender, etc.) in course discussions or assignments	-2.376*	(1.67)
Tried to better understand someone else's views by imagining how an issue looks from his or her perspective	2.038	(1.33)
About how many of your courses at this institution have included a community-based project (service-learning)?	4.955***	(2.88)
Number of written papers or reports: 11 pages or more	4.455**	(2.44)
Attended an art exhibit, play or other arts performance (dance, music, etc.)	-1.183	(0.68)
Internship, co-op, field experience, student teaching, or clinical placement	-2.188	(1.47)
Formal leadership role in a student organization or group	1.181	(0.70)
Learning community or some other formal program where groups of students take two or more classes together	0.311	(0.16)
Are you a student-athlete on a team sponsored by your institution's athletics department?	-1.423	(0.42)
First-Generation Status (neither parent/guardian holds a bachelor's degree)	1.414	(1.16)
Gender (=Female)	0.173	(0.13)
Gender(=Other)	5.558	(1.31)
Gender(=did not respond)	-5.440	(1.05)
Major(=Biology, Agriculture, Natural Resources)	3.979	(1.34)
Major(=Physiscal Sciences, Math, Computer Science)	0.147	(0.04)
Major(=Social Sciences)	4.283	(1.45)
Major(=Business)	4.802*	(1.68)

Major(=Communication, Media, PR)	0.518	(0.10)
Major(=Education)	0.698	(0.23)
Major(=Engineering)	1.146	(0.20)
Major(=Health Professions)	4.279	(1.44)
Major(=Social Service Professions)	9.186***	(2.69)
Major(=All other)	-1.252	(0.37)
Major(=Undeclared)	7.441*	(1.80)
age	-0.092	(1.40)
Race(=asian)	-3.323*	(1.76)
Race(=black)	0.000	(0.00)
Race(=latino)	-0.386	(0.21)
Race(=other)	-2.648	(1.03)
_cons	18.561***	(4.91)
R^2	0.38	
N	492	

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Using the Multivariate Probit Model

We report the results of the multivariate probit model in Table # below. Our first observation is that one key high impact practice, namely, "working with other students on course projects or assignments," seems to improve all four competency measures. This finding is interesting as it shows that students are benefitting when we allow them to collaborate on assignments. At this institution, 68 percent of seniors indicated that they often or very often took these collaborative courses. The other practices showed mixed results across the various equations. Next, we discuss each equation in greater detail.

The estimates in the first equation show,as expected, that students who often or very often took courses that required reaching conclusions based on their analysis of numerical information were more likely to report high analytical ability. Those who went on study abroad programs also seem to be more competent analytically. Not surprisingly, we observe stronger analytical competence among science majors when compared to art and humanities majors, and among males when compared to females.

When it comes to working effectively with others, 72 percent of students in the sample reported strong competence. The practices that improved this measure, in addition to taking lots of collaborative courses,

were: taking the capstone or a similar course, having lots of discussions with people from different economic backgrounds, and taking lots of courses that included a community-based project. We find that students who are first generation also report been better able to work with others, compared to other students. Greater competence in working with others is also observed among students majoring in health and social service professions, compared to those in arts and humanities. Somewhat surprisingly, we see a negative association between studying abroad and working with others.

When compared to the other three competence measures, their problem-solving ability is what students are least confident about, and also has the most variation. Practices that encourage problem-solving include: taking lots of courses that require using numerical information to examine real world problems, completing capstone, taking lots of courses requiring collaboration, having discussions with people from different economic backgrounds, and frequently trying to understand issues from other peoples' perspective. Older students reported less competence in solving real-world problems, a finding that we may attribute to mature students' having a better understanding of the harsh reality of the outside world.

In the fourth equation identify the practices that affect the ability of students to acquire job-related knowledge and skills. These practices include: talking to faculty members about career plan, taking the capstone class, taking lots of collaborative classes, and having lots of discussions with people from different backgrounds. Additionally, trying to understand issues from someone else' perspective, and being in lots of learning community courses – where groups of students take two or more classes together led to job-related knowledge gains. Somewhat surprisingly, we again see a negative effect of age on this competence measure.

Table 9: Multivariate Probit Model

	Equation 1			**Equation 2**			**Equation 3**			**Equation 4**		
Dependent variables	Perceived gains: Analyzing numerical and statistical info.			Perceived gains: Working effectively with others			Perceived gains: Solving complex real-world problems			Perceived gains: Acquiring job- related skills		
Independent Variables	Reached conclusions based on your own analysis of numerical info.	0.775***	(5.69)	Encouraging contact among students	0.414***	(3.03)	Used numerical info. examine a real-world problem	0.422***	(3.34)	Talked about career plans with a faculty member	0.442***	(3.17)
	Study abroad program	0.934**	(2.34)	Study abroad program	-0.541*	(1.96)	Study abroad program	0.067	(0.24)	Study abroad program	-0.183	(0.68)
	Capstone	0.159	(0.79)	Capstone	0.510**	(2.52)	Capstone	0.316*	(1.74)	Capstone	0.501***	(2.69)
	Worked with other students	0.341**	(2.26)	Worked with other students	0.479***	(3.18)	Worked with other students	0.288**	(2.02)	Worked with other students	0.335**	(2.36)
	Discussions with people from an economic background	0.140	(0.84)	Discussions with people from an economic background	0.295*	(1.74)	Discussions with people from an economic background	0.265*	(1.69)	Discussions with people from an economic background	0.293*	(1.85)
	Work with a faculty member	-0.174	(0.78)	Work with a faculty member	-0.072	(0.32)	Work with a faculty member	-0.094	(0.46)	Work with a faculty member	-0.199	(0.96)
	Included diverse perspectives	-0.056	(0.35)	Included diverse perspectives	-0.126	(0.77)	Included diverse perspectives	0.006	(0.04)	Included diverse perspectives	-0.221	(1.49)
	Tried to better understand someone else's views	0.310*	(1.85)	Tried to better understand someone else's views	0.201	(1.15)	Tried to better understand someone else's views	0.332**	(2.12)	Tried to better understand someone else's views	0.329**	(2.06)
	community-based project (service-learning)?	0.613**	(2.32)	community-based project (service-	0.446*	(1.67)	community-based project (service-	0.360	(1.59)	community-based project	0.356	(1.55)

				learning)?			learning)?			(service-learning)?		
	Number of papers ≥ 11 pages	0.265	(1.11)	Number of papers ≥ 11 pages	0.152	(0.62)	Number of papers ≥ 11 pages	0.352	(1.61)	Number of papers ≥ 11 pages	0.323	(1.45)
	Arts	0.233	(1.06)	Arts	-0.261	(1.28)	Arts	0.103	(0.53)	Arts	-0.199	(1.02)
	Internship	-0.133	(0.66)	Internship	-0.216	(1.09)	Internship	-0.032	(0.17)	Internship	0.098	(0.52)
	Formal leadership role	0.143	(0.66)	Formal leadership role	0.360	(1.64)	Formal leadership role	0.147	(0.74)	Formal leadership role	-0.014	(0.07)
	Learning community	0.028	(0.13)	Learning community	-0.021	(0.10)	Learning community	0.112	(0.56)	Learning community	0.428**	(2.02)
	Student-athlete	-0.736	(1.24)	Student-athlete	-0.611	(1.10)	Student-athlete	-0.185	(0.33)	Student-athlete	-0.100	(0.19)
	First-Generation Status	0.037	(0.26)	First-Generation Status	0.254*	(1.76)	First-Generation Status	0.030	(0.23)	First-Generation Status	0.201	(1.53)
	Gender (=Female)	-0.467***	(2.91)	Gender (=Female)	0.049	(0.32)	Gender (=Female)	0.058	(0.40)	Gender (=Female)	-0.207	(1.44)
	Gender(=Other)	2.742	(0.00)	Gender(=Other)	3.947	(0.01)	Gender(=Other)	3.175	(0.00)	Gender(=Other)	2.854	(0.00)
	Gender(=did not respond)	-0.982*	(1.88)	Gender(=did not respond)	-1.058*	(1.94)	Gender(=did not respond)	-0.738	(1.33)	Gender(=did not respond)	-0.710	(1.23)
	Major(=Biology, Agriculture, Natural Resources)	0.763**	(2.20)	Major(=Biology, Agriculture, Natural Resources)	0.281	(0.82)	Major(=Biology, Agriculture, Natural Resources)	0.017	(0.05)	Major(=Biology, Agriculture, Natural Resources)	0.430	(1.29)
	Major(=Physical Sciences, Math, Computer Science)	1.036**	(2.01)	Major(=Physical Sciences, Math, Computer Science)	0.403	(0.86)	Major(=Physical Sciences, Math, Computer Science)	-0.141	(0.33)	Major(=Physical Sciences, Math, Computer Science)	-0.448	(1.02)
	Major(=Social Sciences)	0.738**	(2.14)	Major(=Social Sciences)	0.324	(0.94)	Major(=Social Sciences)	0.201	(0.60)	Major(=Social Sciences)	0.329	(0.98)
	Major(=Business)	0.161	(0.50)	Major(=Business)	0.376	(1.15)	Major(=Business)	-0.191	(0.61)	Major(=Business)	0.095	(0.30)
	Major(=Communicatio	-0.417	(0.59)	Major(=Com	-0.615	(1.02)	Major(=Com	-1.031	(1.46)	Major(=Co	0.818	(1.27)

	n, Media, PR)			munication, Media, PR)			munication, Media, PR)			mmunicatio n, Media, PR)		
	Major(=Education)	-0.069	(0.20)	Major(=Educ ation)	0.322	(0.91)	Major(=Educ ation)	-0.171	(0.51)	Major(=Edu cation)	0.087	(0.26)
	Major(=Engineering)	-0.099	(0.20)	Major(=Engi neering)	-0.117	(0.24)	Major(=Engi neering)	-0.307	(0.63)	Major(=Eng ineering)	0.205	(0.41)
	Major(=Health Professions)	0.682**	(2.03)	Major(=Healt h Professions)	0.582*	(1.71)	Major(=Healt h Professions)	0.219	(0.67)	Major(=Hea lth Professions)	0.322	(0.99)
	Major(=Social Service Professions)	0.798*	(1.87)	Major(=Socia l Service Professions)	0.959*	(1.94)	Major(=Socia l Service Professions)	0.582	(1.38)	Major(=Soci al Service Professions)	0.617	(1.47)
	Major(=All other)	-0.213	(0.55)	Major(=All other)	0.087	(0.22)	Major(=All other)	-0.448	(1.18)	Major(=All other)	-0.134	(0.36)
	Major(=Undeclared)	1.156**	(2.18)	Major(=Unde clared)	0.335	(0.66)	Major(=Unde clared)	0.502	(1.02)	Major(=Und eclared)	0.283	(0.58)
	age	0.002	(0.25)	age	-0.008	(1.06)	age	-0.015**	(2.08)	age	-0.015**	(2.11)
	Race(=asian)	-0.274	(1.25)	Race(=asian)	-0.057	(0.26)	Race(=asian)	-0.300	(1.48)	Race(=asian)	-0.174	(0.89)
	Race(=black)	0.026	(0.15)	Race(=black)	-0.193	(1.14)	Race(=black)	0.008	(0.05)	Race(=black)	0.211	(1.30)
	Race(=latino)	0.193	(0.95)	Race(=latino)	-0.053	(0.26)	Race(=latino)	-0.050	(0.27)	Race(=latino)	-0.014	(0.07)
	Race(=other)	0.400	(1.17)	Race(=other)	-0.257	(0.83)	Race(=other)	-0.268	(0.95)	Race(=other)	-0.666**	(2.29)
	_cons	-0.779*	(1.86)	_cons	-0.480	(1.16)	_cons	-0.350	(0.89)	_cons	-0.367	(0.93)
	atrho21	0.480***	(4.89)									
	atrho31	0.541***	(6.00)									
	atrho41	0.613***	(6.35)									
	atrho32	0.725***	(7.24)									
	atrho42	0.604***	(6.57)									
	atrho43	0.683***	(7.46)									
	N	489										

$p<0.1$; ** $p<0.05$; *** $p<0.01$, t-statistics are in parenthesis

Likelihood ratio test of the residual correlations

The null hypothesis that rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0, is soundly rejected. The Chi-squared statistic is 205.164 and the associated p-value is zero. This offers confirmation that a system equation regression was needed to improve efficiency of the

estimates.

Shortcomings

For the multivariate model, no available method exist to derive the marginal effects. The counterfactual method sometimes used to evaluate marginal effects is not available in our case due to a large number of categorical variables. For instance, setting capstone to all ones would simply drop it from the model, due to collinearity. Thus, the multivariate equation coefficients while useful in showing us the direction of the effects, should be used with caution as they do not tell us the magnitude of these effects. This shortcoming, however, is mitigated by fact that we report OLS estimates in our first approach, which gives us an idea of the magnitudes.

Conclusion

We have explored four key measures of practical competence that we hope graduating seniors will possess. In this paper, we identify key high impact practices that affect the achievement of the various competencies. Based on the evidence we find in this research, it seems the components of certain courses are what drives perceived gain, rather than demographics and other student characteristics, except for gains in analytical competency, where we see gender and student major having significant effects. Also, it is for this measure only that we observe gains from going on a study abroad program.

For the other three competencies, namely, working effectively with others, solving real world problems, and acquiring job-related skills, we see that taking certain types of courses seem to be the key. In all three cases taking capstone leads to perceived gains, while demographics do not

appear to contribute significantly. Offering more collaborative courses, where students get to do projects together, has a strong impact on practice competency. This find is robust to model specifications and is true for all the competency measures we considered. Other findings were not as robust, showing effects on the four individual competencies, but not overall competence, and vice versa.

References

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Appendix

Table A1

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**************************************************************************************************************************
SYNTAX TO CREATE MODIFIED PERCEIVED GAINS SCALE
**************************************************************************************************************************.


COMPUTE pganalyzeX4=(pganalyze-1)*20.
COMPUTE pgworkX4=(pgwork-1)*20.
COMPUTE pgothersX4=(pgothers-1)*20.
```

```
COMPUTE pgprobsolveX4=(pgprobsolve-1)*20.
EXECUTE.

***Take the mean of the 4 items when a respondent has at least 3 of the 4 items.
COMPUTE pg4=mean.3(pganalyzeX4, pgworkX4, pgothersX4,
pgprobsolveX4).
EXECUTE.
```