Five- and Ten-Year Alumni Ratings of Competence and UW Impact

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REPORT OVERVIEW

The Office of Educational Assessment surveyed all University of Washington alumni who received their bachelor degree five years and ten years earlier (see OEA Report 98-8 for the specific methodology). Included in the survey were seventeen abilities (Table 1). Respondents were asked to rate each ability in terms of their current competence, its importance to their current primary activity, and the impact of the UW experience on their development. A previous report (Report 98-11) dealt with *Importance* ratings and the effects of years from graduation, advanced degrees, current primary activity, and especially the area of major. The focus of the current report is on the interrelationship among *Competence*, *UW Impact* and *Importance* ratings as well as the effects of area of major on the latter two.

Competence and Importance

Generally, there was considerable congruence between the rankings of *Competence* and *Importance* averaged across all respondents, with alumni tending to think they are most competent at what is most important. Abilities showing considerably higher rankings on *Importance* than on *Competence* were *Speaking*, *Technology*, and *Quantitative*.

Importance and UW Impact

Greater discrepancy was seen when comparing the average ratings of *Importance* with *UW Impact*. The abilities for which *Importance* was much more highly ranked than *UW Impact* were *Technology*, *Speaking*, *Management* and *Locating information*. Areas in which *UW Impact* was more highly ranked than *Importance* were the *Major*, *Science*, *Reading*, and *Quantitative*.

Competence and UW Impact

The agreement between *Competence* and *UW Impact* rankings was moderate. Areas in which alumni rated their competence as considerably higher than *UW Impact* were *Technology*, *Group*, and *Management*. Areas in which alumni ranked the *UW Impact* as considerably higher than their corresponding *Competence* were *Quantitative*, *Science*, and *Outside of major*.

Differences in Competence Across Majors

Six major areas were studied: Business, Engineering, Natural Science, Social Science, Humanities, and Arts. The means of twelve of the seventeen abilities differed significantly, with the differences among the averages for *Science*, *Art*, and *Quantitative* each accounting for over 19% of the total variance. For these abilities and most others, the differences were in predicable directions based on the major's curriculum.

Yet, the highest rank for *Major* was only eighth in Business, and the lowest was thirteenth in Social Science.

Differences in Impact of UW Education Across Majors

On this question, all items showed significanct differences except *Working and/or learning independently*. The major made a much greater difference in regard to *UW Impact* ratings - both directly in terms of high ratings for *Learning the concepts of the major* and indirectly on many other abilities - than it did for *Competence* and *Importance* ratings The largest differences in terms of variance explained were for Science, Quantitative, Arts, and Technology

Comparison of Variance Components for the Three Variables

Variance components were computed for all analysis of variance effects. Their relative magnitudes indicated that there was more variability in *Importance* ratings across all students, while *UW Impact* showed the largest interaction of abilities with majors.

Discussion of Competence and Importance

To explain the strong relationship between *Importance* and *Competence*, we hypothesized that while students graduate with certain competencies, they continue to gain competency in those abilities that are important in their jobs and further education, and gain less or no competency in those areas that are not important.

Discussion of Curricular Implications

In using these results to suggest curriculum change, the obvious first place to look is to those abilities for which *Importance* is ranked higher than *Competence*. Furthermore, abilities which are more highly ranked for *Importance* than for *UW Impact* suggest areas that alumni had to learn more on their own after college and may benefit from more instruction. However, the task of higher education surely should not be limited to giving students the skills directly needed in their early post graduate jobs. Clearly, there are some aspects of education that are important in terms of being a happy and productive citizen. Finding the right balance is the Herculean task that faces higher education faculty.

METHOD AND PURPOSE

The Office of Educational Assessment surveyed alumni of the University of Washington (UW) who had received baccalaureate degrees five years and ten years previously. A description of the population, methods, response rates, and frequencies for this study is found in OEA Report 98-8.

In the survey, alumni were asked to rate each of seventeen abilities in terms of their own competence, the importance of the ability to their current primary activity, the impact of the UW on their development that ability, and their satisfaction with the UW's contribution to their development. Report 98-11 focused on the second question: *How important are each of these abilities to your current primary activity?* Two major findings from that research were that surprising consistency was evident when the items were ranked by their averages within six major areas of study, and for no area was the item: *Using the knowledge, ideas or perspectives gained from your major field* ranked above tenth. We concluded that these results underline the importance of education in general intellectual skills, that courses in the major may be best considered as a context for teaching these skills, and that the results argue strongly against the conceptualization of higher education as training for specific occupations.

The purpose of this report is to extend that research by looking at the alumni's self-ratings of their competence and the impact of the UW on their development in regard to the seventeen abilities. The results for these two dimensions will be compared to those previously found for ratings of importance.

In studying the *Importance* ratings, differences between average ratings by five- and ten-year graduates were found to be quite small, and, hence, the data from the two groups were combined for all additional analyses. We also have combined the data from the two sets of graduates for this study of *Competence* and *UW Impact* because the differences tended to be negligible. Across the seventeen abilities, only two showed statistically significant differences for *Competence*, and the percent of the variance explained by the differences, as indexed by *eta squared*, was less than one-half of a percent for all abilities. The differences for *UW Impact* tended to be larger, and were significant for nine of the seventeen items. Yet, the percent of variance explained by the differences exceeded 1% for only one item: *Using a foreign language*. The five-year alumni gave higher average ratings on all items for which significant differences were found. This trend may be because, with more time, the relative impact on the college education diminishes in relation to the impact of job experience or further education.

RESULTS

Alumni rated the seventeen abilities using five-point, ordered scales. The full text of each item, the item's abbreviation used in subsequent tables, and the averages across all respondents are found in Table 1. Items are ordered in this table based on the average *Importance* ratings. However, each of these scales utilized different response labels,[1] hence, direct comparisons of means across scales are hazardous. Rather, we have chosen to view the comparisons using the relative ranks of the abilities. The order of the averages across the entire set of respondents for each dimension is found in Table 2.

Comparing the higher ranked items, *Working and/or learning independently* shows the best match, ranking first in *Competence*, third in *Importance*, and second in *UW Impact*. *Defining and solving problems* is also ranked highly on all dimensions (second, first, and fourth, respectively). This result suggests that the UW curriculum effectively addresses these abilities which are relatively important for future success. In contrast, *Using a foreign language* ranked lowest on all dimensions. Alumni ranked it as the least important ability, the one in which they have the least competence, and that on which the UW had the least impact.

Competence and Importance

Generally, there is considerable congruence between average *Competence* and *Importance* ratings. The rank correlation between the two is .85. Alumni tend to think they are most competent at what is most important. The areas that show greatest discrepancy in favor of *Importance* (at least a four step difference) are:

- *Speaking effectively,*
- *Working effectively with modern technology, especially computers, and*
- *Understanding and applying quantitative principles and methods.*

These are areas that may need more instructional effort and improvement. The University is already making a significant push toward better technology instruction.

There were no areas in which *Competence* was rated as four or more steps greater than *Importance*.

Importance and UW Impact

Greater discrepancy can be seen when comparing the average ratings of *Importance* with *UW Impact*. The rank correlation between the two sets of rankings is only .39. The areas where *Importance* is much more highly ranked than *UW Impact* are:

- *Working effectively with modern technology, especially computers,*
- *Speaking effectively,*
- *Using management or leadership capabilities, and*
- *Locating information needed to help make decisions or solve problems.*

These are areas that probably need shoring up in the curriculum, unless alumni are able to develop the requisite ability outside of their college experiences.

Areas in which *UW Impact* is more highly ranked than *Importance* are:

- *Using the knowledge, ideas or perspectives gained from your major field,*
- *Understanding and applying scientific principles and methods,*
- *Critically analyzing written information, and*
- *Understanding and applying quantitative principles and methods.*

The implications of this list are hard to specify. They appear to represent abilities of appreciable gain in college, but of less average importance in post college endeavors.

Competence and UW Impact

The agreement between ability and *UW impact* rankings was not great (r = .41). Areas in which alumni rated their *Competence* as considerably higher than *UW Impact* were:

- *Working effectively with modern technology, especially computers,*
- *Working cooperatively in a group, and*
- *Using management or leadership capabilities.*

These are areas in which presumably the alumni have had to learn "on the job." Insofar as the UW wishes to prepare students for life after graduation, these abilities might be targeted for increased emphasis.

Areas in which alumni ranked the *UW Impact* as considerably higher than their corresponding *Competence* were:

- *Understanding and applying quantitative principles and methods,*
- *Understanding and applying scientific principles and methods, and*
- *Using knowledge gained from outside of your major field.*

The differences in ranks for these three items were particularly large. These are apparently areas in which alumni attribute much of their competence to their UW education but since the abilities are being used less than others, they have not gained as much after graduation.

Differences in Competence Across Majors

In the previous report on ratings of *Importance*, six majors were compared. As in that report, analyses presented in this and subsequent sections are restricted to alumni who have not received an advanced degree since leaving UW and who cited their primary activity when completing the survey as "working." By employing these same restrictions, the analyses reported below are comparable to the analyses of *Importance* ratings by major (Report 98-11), and the three will be compared. The major areas compared are:

Arts (A&S)	*Business*	*Engineering*
Humanities (A&S)	*Natural Sciences (A&S)*	*Social Sciences (A&S)*

The specific majors that defined each area can be found in Report 98-11.

Table 3 reports the average rating of *Competence* for each major on each of the abilities. One-way analyses of variance were applied to these data to determine the significance of the difference among the means, and the percentage of the total variance explained by the differences is indexed by *eta squared*.

One can see from Table 3 that the means of twelve of the seventeen abilities differed significantly. Some of the differences are quite large. Most notably, the differences among the averages for *Science*, *Arts*, and *Quantitative skills* all account for over 19% of the total variance. For these abilities and most others, the differences are in predicable directions. For example, it is the Engineering and Natural Science majors who rate their competence in *Science* and *Quantitative* highest, and Humanities and Arts majors rate them as the lowest. Equally predictably, Arts majors rated *Using and appreciating the arts* higher than any other group. Items with no significant differences were the top four rated items over all because they were highly rated by every group (*Working independently*, *Working with groups*, *Solving problems* and *Locating information*), and *Using a foreign language* which all groups tended to rate low.

That the alumni's major had an impact on competence ratings can also be seen in Table 4, in which the ability averages are rank-ordered for each group. While *Working independently* is the highest ranked ability for three majors and highly ranked for the others, the top ranked item was *Use of technology* for Engineering majors, *Writing* for Humanities majors, and *Art* for Arts majors. It is interesting to note that *Working cooperatively in a group* was ranked fifth by Business majors, but third by Social Science and Arts majors.

At the other end of the spectrum, alumni ratings of their own *Quantitative ability* ranked sixteenth for Social science, Arts, and Humanities majors, and *Science* ranked fifteenth for these majors and for Business majors as well. These low rankings seem particularly disappointing as quantitative skills and scientific understanding are generally considered important for functioning in our society. *Understanding and appreciating the arts* was rated quite low by all groups except Arts majors.

The undergraduate curriculum can be viewed as promoting proficiencies in a number of areas (e.g., writing), breath of knowledge (i.e., the distribution requirements), depth of knowledge (i.e., the major), and personal interest (electives). Since much of the course work is concentrated in a major, one might suspect that ratings of competence in *Using the knowledge, ideas or perspectives gained from your major field* would be relatively high, on average. Yet, its highest relative rating was eighth in Business, the lowest was thirteenth in Social sciences. In the two professional schools, the major was rated higher than the non-major; in the four Arts and Sciences area, the opposite was true. The gap for Social science

majors was particularly pronounced - sixth vs. thirteenth. Clearly, *Using the knowledge, ideas or perspectives gained from your major field* is not the area in which alumni feel most competent.

Differences in Impact of UW Education Across Majors

In Table 5, the same six majors are compared on *UW Impact*. One can see that on this question, the area of major had a large effect on alumni responses. All items showed significant differences except *Working and/or learning independently*. The largest differences in terms of variance explained were for *Science*, *Quantitative skills*, *Arts*, and *Technology*. Clearly, when the question focuses specifically on *UW Impact*, the content of the major makes a much greater difference on other abilities than it does for *Competence* and *Importance* ratings.

In Table 6, the average *UW Impact* ratings are rank-ordered for each major. One can see great variability in these rankings. Even though *Major* was the top ranked item overall, alumni in only one area,Business, gave it the highest average rating. Engineering alumni ranked *Science*, *Quantitative skills*, and *Problem solving* ahead of *Major*. Natural Science majors ranked these three items plus *Learning/Working Independently* ahead of *Major*. For Social Science majors, the average ratings for *Reading*, *Writing*, and *Learning/Working Independently* exceeded the average for *Major*. For Humanities majors, *Writing*, *Reading*, and *Learning/working independently* were ranked higher, and for Arts majors, *Arts* and *Learning/working independently* were ranked higher.

It is also interesting to look at abilities whose ranking show great discrepancies across majors. For example, the average for *Science* is highest for Engineering and Natural Science alumni, and near the bottom for Business, Humanities, and Arts alumni. Technology is at or near the bottom for Arts, Humanities, and Social Science, but around the middle for the other majors. *Diversity* is relatively high for Social Science and Arts majors and relatively low for the other majors.

Comparison of Variance Components for the Three Variables

One can view the design under which the data were collected for each of the three variables, *Importance*, *Competence*, and *UW Impact*, as a repeated measures experimental design. Since each alumnus responded to all items, Alumni (S) are crossed with Abilities (A). Since each alumnus occupies only one major, Alumni (S) are nested within Majors (M). The overall design is (S:M) x A, and the five effects are diagrammed in Figure 1. The percentage of variance attributable to each source is found in Table 7.

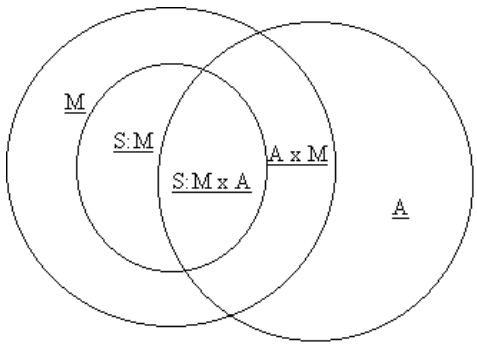

Figure 1. Design under which the data were collected

How we can interpret these effects and their corresponding variance components? First, one can see that the variance component estimate associated with Major (M) is equal to zero for all three variables. This means that alumni within each major tended to use the scale similarly across all abilities. That is, the average rating across all abilities was essentially equal for each major on all three variables.

The variance component estimate associated with the main effect for Abilities (A) indicates how much variability there was in the average abilities rating, summing across all alumni. One can see there was considerably more variability for *Importance* than *Competence* and especially more than for *Impact*. What this means is that, averaging across all alumni, the abilities were more strongly differentiated (more spread out) in terms of *Importance* for current primary activity than for either *Competence* or *UW Impact*. Perhaps this result is due to the relatively high variability in what the alumni do after graduation compared to what they do while at the UW. The intermediate position of *Competence* probably reflects differences in curricula among majors.

The Ability by Major interaction (A x M) views the differences in rankings of abilities among majors. It indexes the extent to which average ratings differ as a function of the major. As was evident in the presentation of rankings, *Importance* shows the most agreement, *Competence* is intermediate, and *UW Impact* shows least agreement. The choice of major appears to have a relatively large effect on how alumni feel their UW education has contributed to their various abilities. The choice of major appears to have much less effect on how important these abilities are in their occupations. The intermediate position of *Competence* might suggest that competency evolves as a combination of UW education and post-graduate work experience.

The Alumni within Majors effect (S:M) indexes variation of alumni ratings when averaged across abilities. As such, it may be considered part of individual differences or a source of "error" in the classical analysis of variance terminology. Similarly, the last effect, Alumni within Majors by Abilities (S:M x A), is also a measure of individual differences or error.

DISCUSSION

The data displayed in this report and Report 98-11 are rich and the perspective of the viewer will dictate what is seen as important and interesting. I offer my observations in two areas.

Competence and Importance

Considerable congruence was found between the rankings of the average ratings of *Competence* and *Importance* across all respondents.[2] Alumni tend to feel that they are most competent at what is most important. One might speculate that interest and competence lead one to a major, that the major leads one to certain post-graduate activities that, in turn, place importance on the skills learned in that major. However, we know from Report 98-11 and from Table 7 in this report that area of major does not appear to have much of an effect on *Importance* ratings. Nor does area of major have a very large effect on *Competence* ratings. A more likely hypothesis is that while students graduate with certain competencies, they continue to gain competency in those abilities that are important in their jobs and further education, and gain less or no competency in those areas that are not important. The lower relationship between *Competence* and *UW Impact* would appear to bear this out.

Curricular Implications

What decisions might be made, based on these data, for curriculum revision? In what areas might we try to change the curriculum to strengthen student ability and potential? It would seem that the first place to look would be those abilities for which *Importance* is ranked higher than *Competence*. Three abilities are most prominent in their discrepancy: *Speaking effectively*, *Working effectively with modern technology, especially computers*, and *Understanding and applying quantitative principles and methods*. Based on *Importance* ratings, quantitative ability would seem to be the least important. More on that later. It might be said that modern technology kind of sneaked up on faculty - consider that workers of today are expected to do things with technology that were not even known ten years ago. Significant improvements have been made in technological education, but perhaps higher education will always be behind the curve given the rapid changes. For *Speaking effectively* offering students instruction on oral presentations and more speaking opportunities, such as delivering in-class reports and debating issues, would seem to be a reasonable improvement in the curriculum.

Abilities for which the average ratings of *Importance* were ranked higher than the average ratings for *UW Impact* suggest areas that alumni had to learn more on their own after college. Along with *Technology* and *Speaking*, this list included *Using management or leadership capabilities* and *Locating information needed to help make decisions or solve problems*. Both of these latter abilities seem to be such that with curricular change students could leave UW better equipped.

The average ratings of two abilities led to considerably higher rankings on *UW Impact* than on *Competence* or *Importance*. These abilities were: *Understanding and applying quantitative principles and methods* and *Understanding and applying scientific principles and methods*. The major mediates both of these abilities. However, across all respondents, the averages indicate that although UW is given credit for much of what is learned, these two areas are not very important within the alumni's primary

activities, and alumni do not feel very competent. One conclusion may be that although students are "taught" quantitative and scientific understanding and application, they do not come away feeling as though they learned it well. This result suggests that greater emphasis should be placed on studying the scientific and quantitative across the curriculum.

On the other hand, if these areas are not very important subsequently, should we bother with instruction in these areas for other than the majors who we know will need it? One can ask the same question of *Understanding and appreciating the arts*. The question is too simple in its implication. Clearly, there are some aspects of education that are important in terms of being a happy and productive citizen. The task of higher education surely should not be limited to giving students the skills directly needed in their early post graduate jobs. Finding the right balance is the Herculean task that faces higher education faculty.

Finally, it would appear from the data that foreign language instruction, a year of which is required for all UW Arts and Sciences majors and some others, is failing to provide much direct value. Using a foreign language was consistently the lowest ranked ability in terms of *Competence*, *Importance*, and *UW Impact*. There may be important outcomes from this instruction, but for most alumni, using the foreign language studied after graduation was not one of them.

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[1] The response scales are as follows:

Competence:	*Excellent=5, Very Good=4, Good=3, Fair=2, Poor=1*
Importance:	*Essential=5, Very important=4, Important=3, Somewhat important=2, Not important=1*
Impact:	*Major contribution=5, Strong contribution=4, Moderate contribution=3, Small contribution=2, No contribution=1*

[2] The correlation across all respondents between the Importance rating and the Competence rating for the same ability, averaged across the seventeen abilities was .46.

TABLES

Table 1. Ability item text and overall means for *Competence*, *Importance*, and *UW Impact* (*1=Not important; 5=Essential*)

Item	Abbreviation	Comp	Import	Impact
Defining and solving problems	ProbSolv	4.09	4.34	3.52
Locating information needed to help make decisions or solve problems	Information	4.06	4.19	3.31
Working and/or learning independently	Independ	4.30	4.15	3.64
Speaking effectively	Speaking	3.67	4.09	2.85
Working effectively with modern technology, especially computers	Techno	3.73	4.00	2.60
Writing effectively	Writing	3.96	3.92	3.46
Working cooperatively in a group	Group	3.95	3.90	3.54
Critically analyzing written information	Reading	4.01	3.90	3.13
Using management or leadership capabilities	Mgmt	3.61	3.76	2.50
Using knowledge gained from outside of your major field	NonMajor	3.77	3.51	3.12
Using the knowledge, ideas or perspectives gained from your major field	Major	3.76	3.39	3.68
Understanding and applying quantitative principles and methods	Quant	3.13	2.91	3.19
Understanding and appreciating diverse philosophies and cultures	Diverse	3.62	2.90	3.11
Understanding the interaction of society and the environment	Environ	3.59	2.75	2.95
Understanding and applying scientific principles and methods	Science	3.16	2.72	3.20
Understanding and appreciating the arts	Arts	3.14	1.83	2.67
Using a foreign language	ForLang	1.88	1.60	1.94

Return

Table 2. Ranks by Overall Mean Rating
(1=highest rank)

Rank	Competence	Importance	Impact
1	Independ	ProbSolv	Major
2	ProbSolv	Information	Independ
3	Information	Independ	Reading
4	Group	Speaking	ProbSolv
5	Writing	Techno	Writing
6	Reading	Writing	Information
7	NonMajor	Group	Science
8	Major	Reading	Quant
9	Techno	Mgmt	Group
10	Speaking	NonMajor	NonMajor
11	Diverse	Major	Diverse
12	Mgmt	Quant	Environ
13	Environ	Diverse	Speaking
14	Science	Environ	Arts
15	Arts	Science	Techno
16	Quant	Arts	Mgmt
17	ForLang	ForLang	ForLang

Return

Table 3. Average Competence Ratings with Six Majors and Analysis of Variance Results

	Busi (n=286)	Engr (n=184)	SocSci (n=284)	NatSci (n=107)	Humn (n=169)	Arts (n=77)	F	Sig.	Eta^2
Independ	4.37	4.17	4.28	4.35	4.25	4.25	2.07	ns	0.9%
ProbSolv	4.08	4.16	3.99	4.15	4.04	4.08	1.53	ns	0.7%
Information	4.05	4.04	4.09	4.10	4.05	3.99	0.32	ns	0.1%
Group	4.03	3.96	4.05	3.86	4.08	4.06	1.37	ns	0.6%
Writing	3.90	3.64	3.88	3.64	4.27	3.78	12.99	p<.001	5.6%
Reading	4.00	3.78	3.82	3.90	4.08	3.69	5.38	p<.001	2.4%
NonMajor	3.65	3.64	3.85	3.72	3.87	3.92	4.10	p<.001	1.8%
Major	3.73	3.70	3.47	3.51	3.73	3.86	4.43	p<.001	2.0%
Techno	4.02	4.24	3.64	4.06	3.79	3.64	13.26	p<.001	5.7%
Speaking	3.57	3.36	3.71	3.37	3.86	3.84	9.33	p<.001	4.1%
Diverse	3.31	3.16	3.80	3.42	3.79	3.91	19.84	p<.001	8.3%
Mgmt	3.66	3.49	3.73	3.45	3.67	3.58	2.53	p<.05	1.1%
Environ	3.25	3.28	3.84	3.45	3.61	3.66	17.08	p<.001	7.2%
Science	2.75	3.91	2.84	3.87	2.47	2.73	70.14	p<.001	24.3%
Arts	2.70	2.58	3.13	3.00	3.38	4.51	51.61	p<.001	19.1%
Quant	3.31	3.86	2.74	3.75	2.41	2.57	65.45	p<.001	23.0%
ForLang	1.73	1.63	1.72	1.79	1.64	1.99	1.47	ns	0.7%

Return

Table 4. Competence Rankings within Major

Rank	Business	Engineering	Social Sci	Natural Sci	Humanities	Arts
1	Independ	Techno	Independ	Independ	Writing	Arts
2	ProbSolv	Independ	Information	ProbSolv	Independ	Independ
3	Information	ProbSolv	Group	Information	Reading	ProbSolv
4	Group	Information	ProbSolv	Techno	Group	Group
5	Techno	Group	Writing	Reading	Information	Information
6	Reading	Science	NonMajor	Science	ProbSolv	NonMajor
7	Writing	Quant	Environ	Group	NonMajor	Diverse
8	Major	Reading	Reading	Quant	Speaking	Major
9	Mgmt	Major	Diverse	NonMajor	Diverse	Speaking
10	NonMajor	NonMajor	Mgmt	Writing	Techno	Writing
11	Speaking	Writing	Speaking	Major	Major	Reading
12	Diverse	Mgmt	Techno	Mgmt	Mgmt	Environ
13	Quant	Speaking	Major	Environ	Environ	Techno
14	Environ	Environ	Arts	Diverse	Arts	Mgmt
15	Science	Diverse	Science	Speaking	Science	Science
16	Arts	Arts	Quant	Arts	Quant	Quant
17	ForLang	ForLang	ForLang	ForLang	ForLang	ForLang

Return

Table 5. Average UW Impact Ratings with Six Majors and Analysis of Variance Results

	Busi (n=286)	Engr (n=184)	SocSci (n=284)	NatSci (n=107)	Humn (n=169)	Arts (n=77)	F	Sig	Eta^2
Major	3.69	3.75	3.56	3.47	3.55	3.58	1.72	ns	0.8%
Independ	3.47	3.65	3.64	3.77	3.58	3.72	2.08	ns	0.9%
Reading	3.48	3.40	3.71	3.34	3.70	3.17	8.02	p<.001	3.6%
ProbSolv	3.53	3.95	3.52	3.68	3.19	3.42	14.57	p<.001	6.3%
Writing	3.42	3.08	3.70	2.93	3.99	3.15	30.82	p<.001	12.4%
Information	3.17	3.31	3.46	3.07	3.03	3.06	5.83	p<.001	2.6%
Science	2.73	4.12	3.12	3.97	2.30	2.74	88.84	p<.001	29.2%
Quant	3.42	4.07	2.98	3.91	2.31	2.42	80.77	p<.001	27.2%
Group	3.63	3.29	3.03	2.65	2.98	3.27	20.73	p<.001	8.8%
NonMajor	3.01	2.85	3.30	2.86	3.11	3.23	6.74	p<.001	3.0%
Diverse	2.80	2.34	3.55	2.71	3.12	3.46	37.44	p<.001	14.8%
Environ	2.76	2.39	3.51	2.61	2.76	3.04	32.59	p<.001	13.1%
Speaking	3.05	2.47	3.02	2.16	3.32	2.92	25.21	p<.001	10.4%
Arts	2.14	2.09	2.80	2.47	2.86	4.35	61.99	p<.001	22.3%
Techno	3.12	3.45	2.25	2.91	2.09	2.16	49.67	p<.001	18.7%
Mgmt	3.05	2.10	2.47	1.95	2.36	2.38	29.51	p<.001	12.0%
ForLang	1.68	1.33	1.98	2.06	1.94	2.10	12.51	p<.001	5.5%

Return

Table 6. UW Impact Rankings within Major

Rank	Business	Engineering	Social Sci	Natural Sci	Humanities	Arts
1	Major	Science	Reading	Science	Writing	Arts
2	Group	Quant	Writing	Quant	Reading	Independ
3	ProbSolv	ProbSolv	Independ	Independ	Independ	Major
4	Reading	Major	Major	ProbSolv	Major	Diverse
5	Independ	Independ	Diverse	Major	Speaking	ProbSolv
6	Writing	Techno	ProbSolv	Reading	ProbSolv	Group
7	Quant	Reading	Environ	Information	Diverse	NonMajor
8	Information	Information	Information	Writing	NonMajor	Reading
9	Techno	Group	NonMajor	Techno	Information	Writing
10	Mgmt	Writing	Science	NonMajor	Group	Information
11	Speaking	NonMajor	Group	Diverse	Arts	Environ
12	NonMajor	Speaking	Speaking	Group	Environ	Speaking
13	Diverse	Environ	Quant	Environ	Mgmt	Science
14	Environ	Diverse	Arts	Arts	Quant	Quant
15	Science	Mgmt	Mgmt	Speaking	Science	Mgmt
16	Arts	Arts	Techno	ForLang	Techno	Techno
17	ForLang	ForLang	ForLang	Mgmt	ForLang	ForLang

Return

Table 7. Variance Component Estimates (Percentage) for Each Effect

Effect	Symbol	Competence	Importance	Impact
Major (M)	M	0.0%	0.0%	0.0%
Ability (A)	A	23.4%	32.3%	11.2%
Subjects (S) within M	S:M	14.6%	14.0%	20.0%
A by M	A x M	7.3%	5.2%	13.5%
S within M by A	(S:M) x A	54.7%	48.5%	55.3%

Return