

A Thesis Presented to  
The Faculty of Alfred University

ENGINEERING RETENTION DATA BASED ON QUALITATIVE ANALYSIS OF FIRST-  
YEAR SEMINAR (ENGR 160) REFLECTION ONE PAPERS

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In Partial Fulfillment of  
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## ABSTRACT

The research displayed in this thesis assesses whether there are any statistically significant reasons why perspective students have chose to attend Alfred University to study engineering in the year they did. Three questions were asked of 331 students in Reflection One essays that were written in ENGR 160; First-Year Seminar. The students were asked “why they chose Alfred University”, “why they chose engineering” and “why they were seeking this education now”. Through qualitative analysis, each type of response to one of the questions was given its own category. “Why they chose Alfred University” has 31 categories; “why they chose engineering” has 42 categories; “why they are seeking this education now” has 24 categories. An inter rater reliability of 90.1%, based on two independent coders, was achieved from a sample of the first 50 students from the entering class in 2015. The results are split into three types of groups: students that stayed at Alfred University, students that chose to leave Alfred University, and students that were asked to leave Alfred University. Each of the groups’ answers are compared against each other to see if there are any predictors in an individual’s response to the three questions that may indicate that specific group performance. The top five categories that Alfred University has control over that were answers to the question “*Why Alfred University*” are: Financial Benefit, Good Engineering School, Sports, Niche Major, and Networking Opportunities. Two of the top three categories that were answers to the question “*Why Engineering*” are enjoyed or exceled in the subjects of Mathematics, Science; Chemistry or Biology, Technology, and Physics or enjoyed the engineering classes offered at their high school. The highest responded category for answering the question “*Why Now*” suggests that this question lacks assessment value, i.e. should be discontinued. Student flow from declared major choices will also be assessed through a visual representation of data using Sankey diagrams.

## **BACKGROUND**

Throughout the past four years at Alfred University, as at nearly all institutions, student retention has been a concern in the Inamori School of Engineering. The university tries to meet with every student that is leaving the university to see why they are leaving, but in the past not every student attended or could be contacted after the fact. In the two entering classes of 2015 and 2016, Alfred University lost 30 students just from within the Inamori School of Engineering with a projected loss of 15 students from the entering class of 2017. The demographics of the state and region apply additional pressure on enrollment, and enhanced retention would greatly benefit future students as well as the institutions financial strength.

## **INTRODUCTION**

The methods below show how the 263 students that wrote Reflection Paper One were coded and analyzed. The analysis seeks to assess whether there are any statistically significant reasons why perspective students have chosen to come to Alfred University to study engineering in the year they did. Three questions were asked of students in Reflection One essays that were written in ENGR 160; First-Year Seminar. The students were asked “why they chose Alfred University”, “why they chose engineering” and “why they were seeking this education now”. If the student responded, they became a responder and their responses were coded into different categories for each question. All 331 students that have enrolled in First-Year Seminar were used to analyze the flow patterns of students declared major choice. Sankey diagrams helped make the flow data easily viewable and quick to understand where and how many students were moving.

## **METHODS**

Each essay was cleared of all responder data and given an anonymized number of FAXXYYY where XX is the year the student entered First-Year Seminar at Alfred University and YYY is the numerical order of the responder as found in that specific year’s binder.

The responder's essays from the binder of 2015 were then read and each new response to one of the three questions, "*Why Alfred University*", "*Why Engineering*", and "*Why Now*", were recorded. After the first binder was completed, accounting for about 39% of the total responses, there were over 50 different categories. Those initial categories correlating to "*Why Alfred University*" were combined to give a coarser grain overview of type of responses.

Categories that were combined were Financial Benefit, Location, Size, Atmosphere, and Niche Major. Financial Benefit was comprised of sub-categories such as 'cheap for a private school', 'gave a good scholarship', 'got a nice financial aid package', and 'could afford the school without taking out loans'. Location included sub-categories such as 'wooded area where one could hike', 'away from the city', and 'enjoys being in the middle of nowhere'. Size included sub-categories relating to class sizes, campus population and distance from one end of campus to the other. Atmosphere was created by combining a mixture of friendly students, professors, and staff specifying that the smiling faces and feeling that students would not be just a number in a classroom. Niche Major resulted from responses that said Ceramic Engineering, Renewable Energy Engineering, and Glass Science and Engineering. The categories for "*Why Engineering*" and "*Why Now*" were left without combining categories, i.e., leaving a fine grain response list. The Coding Rubric for each of the three questions can be found in **APPENDIX A**.

Each responder was not restricted on number of categories, so any and all responses were recorded, making the total number of responses for any of the three questions larger than the population of the study.

As reported in the introduction, an inter rater reliability was achieved at 90.1%. Inter rater reliability is when another person does qualitative analysis with the same study and the same rubric that was initially created as seen in **APPENDIX A**. Amanda L. Clark was the inter rater for this study. Clark is a senior psychology major in her 8th semester of statistics. She has completed 4 qualitative studies as a lead and a few others as secondary opinion. Clark was given the 2015 responses binder and the Coding Rubrics for each of the three questions and completed anonymized responses FA15001 to FA15050 giving a sample size of 50.

An Excel and a C++ program written by Justin C. Fossum were used to determine the inter rater reliability. Fossum's data collection for FA15001 to FA15050 was put in a new sheet

of “Analysis Spreadsheet – Final” labeled ‘Correl’ and listed as ones or zeros, where the ones indicated a response that listed a category. Clark’s Data was put into the same sheet as Fossum’s data, but twos and zeros were listed where the twos indicated a response that listed a category. A new table was made that would calculate the difference between Clark’s data and Fossum’s data as seen in equation 1.

$$C - F = A \quad (1)$$

Where C is Clark’s data, F is Fossum’s data and A is the corresponding answer.

The new table of data was then filled with twos, ones, zeros, and negative ones. The twos were representative of data that Clark had coded data and Fossum had not, the ones were representative of data that both coded by, the zeros showed where neither Clark nor Fossum coded data, and the negative ones were representative of where Fossum had coded data and Clark had not. To quickly analyze the new table data and calculate an inter rater reliability, a C++ program was created that inputted the tabulated data and transmitted the necessary data on screen for the user to see. The code and output for the C++ program can be found in **APPENDIX B**. The output example found in **APPENDIX B** is the third of four runs. Clark and Fossum met to discuss the large discrepancies in the way things were coded until greater consistency was achieved. Once consistency was achieved Fossum recoded the rest of the 2015 binder and then coded the 2016 and 2017 binders.

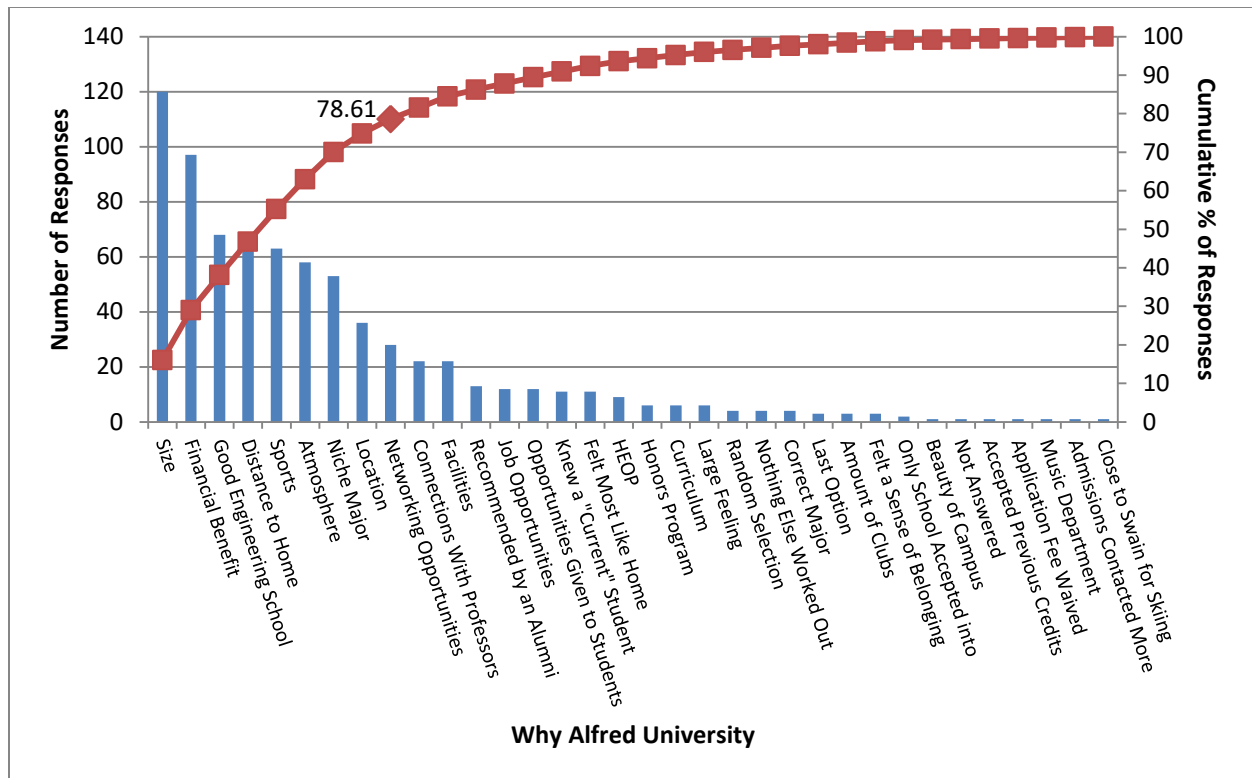
Once all the data was coded from every binder and all 268 responders were recorded, the total number of responses in each category was calculated. These totals were calculated for each year and for all three years combined. The data was also disaggregated to show trends by initial major as declared by the responders when they entered Alfred University. Those majors were defined as undefined/academic exploration, mechanical engineering, renewable energy engineering, glass science and engineering, bio-materials engineering, materials science and engineering, ceramic engineering, and any major in the college of Liberal Arts and Sciences. Three other main groups were made to try and detect if there are any predictors in the Reflection One essays. Group One were the students that decided to study a different major outside of engineering, but stay at Alfred University, Group Two were the students that chose to leave Alfred University, and Group Three were the students that were asked to leave Alfred University.

## RESULTS AND DISCUSSIONS

The sorted and coded data showed that there were some responses that had statistical significance in “*Why Alfred University*”, “*Why Engineering*”, and “*Why Now*”. These responses were used to provide feedback to First-Year Seminar as well as suggestions to point the Inamori School of Engineering at Alfred University and admissions at Alfred University in the perceived correct direction to help attract and maintain students. It was also found that there are no predictors in any of the three groups that were created for students that stay at Alfred University but change majors out of engineering, students that chose to leave Alfred University, or students that were asked to leave Alfred University.

### *“Why Alfred University”*

The top 26% of responses account for “*Why Alfred University*” accounted for 78.61% of the responses for the total data coded from the entering class of 2015, 2016, and 2017 and can be seen in **Figure 1** as following the approach of Pareto<sup>[1]</sup>. Other figures relating to responses relating to “*Why Alfred University*” separated by entering class year can be found in **APPENDIX C**.



**Figure 1: All Coded Data from Responses answering the Question of "Why Alfred University"**

As seen in **Figure 1**, the top nine categories account for 26% of responses. They are Size, Financial Benefit, Good Engineering School, Distance to Home, Sports, Atmosphere, Niche Major, Location, and Networking Opportunities. Of these nine, there are only five that are in the control of the university in any way: Financial Benefit, Good Engineering School, Sports, Niche Major, and Networking Opportunities.

Starting at the beginning of the list is Financial Benefit. Students are coming to this small, centrally isolated, private/statutory college in Western New York because they can receive an education for a great price. Note that Alfred University has three distinct tuition rates that apply to respondents. The highest is for the college of Liberal Arts and Sciences; the middle is Undecided, Mechanical Engineering, Renewable Energy Engineering and non-in-state other Inamori School of Engineering; the lowest is in-state Bio-Materials Engineering, Ceramic Engineering, Glass Sciences Engineering and Material Science and Engineering. Many responders compared Alfred University's tuition to that of other SUNY schools throughout New York State. Advertising to potential students that Alfred University provides generous financial

aid packages can be a huge draw. The IPEDS Data Feedback Report of 2017 shows that the average award amount of Alfred University undergraduates was \$17,976 as shown in **Figure E-11**. The full report is the entirety of **APPENDIX E**.

Although it is understood that the university cannot provide aid in excess of income as that is not a sustainable business model, it is suggested that Alfred University give as much financial aid help as they can to help acquire new students.

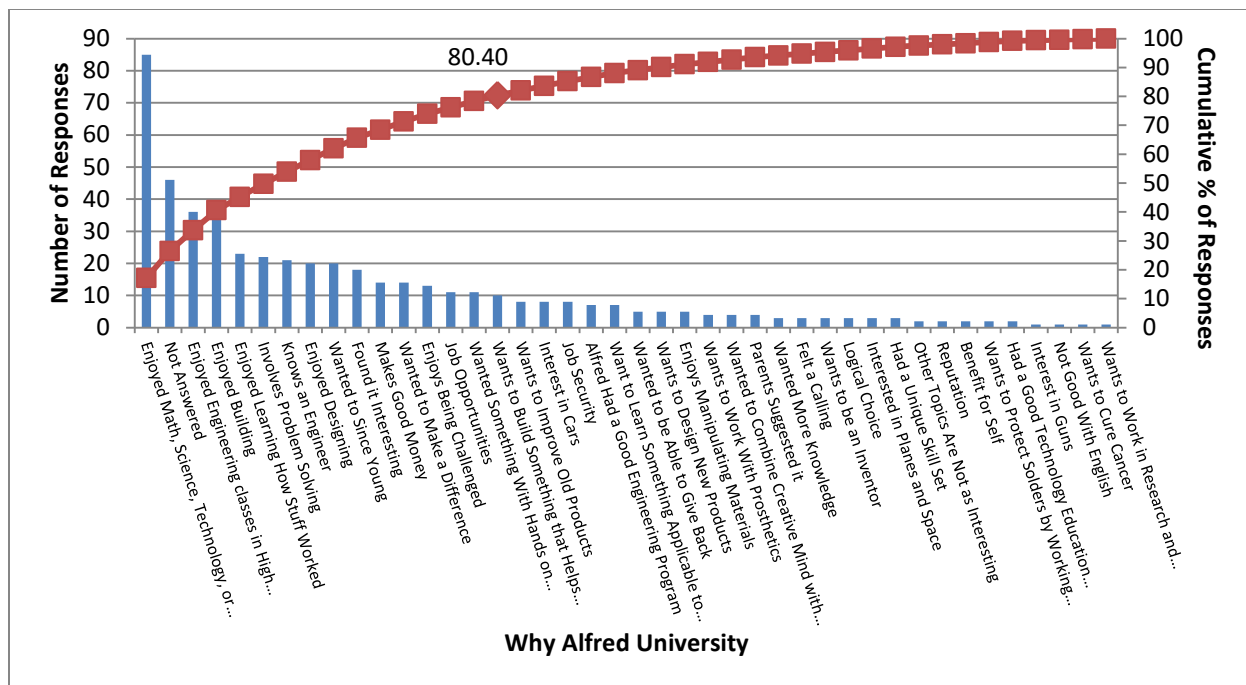
The second category that responders indicated was a reason for coming to Alfred University is the fact that the Inamori School of Engineering has good programs. The Ceramics Engineering program is known around the world. As for the Glass Engineering program, it is the only program of its kind in the nation. The Glass Engineering program along with the Renewable Energy Engineering program fit into the Niche Major. Nowhere else can students go and learn this material. The university needs to put time and money back into the programs that help put and help keep Alfred University on the map.

Sports play a large role in students' lives. Many prospective students aspire to play their sport while continuing in higher education. Maintaining a good sports program is an essential part of retaining students. Many football players in the entering class of 2017 that wrote Reflection One Paper mentioned that part of the reason they came to Alfred University was because the football program did so well in the 2016 - 2017 academic year.

The last category that was mentioned frequently was Networking Opportunities. The Career Development Center (CDC) does a wonderful job promoting events on-and-off campus that involves any companies or alumni. Verbal feedback from students talks about the different times that Alfred University has connected them to a job or internship/co-op. The CDC should maintain this involvement and continue to promote their services.

### *“Why Engineering”*

The top 38% of responses account for “*Why Engineering*” accounted for 80.40% of the responses for the total data coded from the entering class of 2015, 2016, and 2017 and can be seen in **Figure 2** as following the approach of Pareto<sup>[1]</sup>. Other figures relating to responses relating to “*Why Engineering*” separated by entering class year can be found in **APPENDIX C**.



**Figure 2: All Coded Data from Responses answering the Question of "Why Engineering"**

Two of the top three categories as to why students chose engineering are because they enjoyed or excelled in the subjects of Mathematics, Science; Chemistry or Biology, Technology, and Physics or they enjoyed the engineering classes offered at their high school. These two responses account for a total of 121 responses out of 495 which is just shy of 25%. The third of the top three categories has 46 out of 495 responses and was an absence of response. This is a very substantial non-response rate and suggests that modification of the evaluation instrument should be considered.

**Figure 2** data shows explicit support as to why it is so important to show young students the STEM field and get them involved in engineering topics as early as possible. This is less in the control of the university, but if funds were available, Alfred University could help sponsor engineering programs in high schools. Alfred University could also revive prior externally funded STEM outreach if funds were limited. By sponsoring engineering classes or programs it not only introduces the students to the concepts of engineering it puts the name of Alfred University in the forefront of their minds.

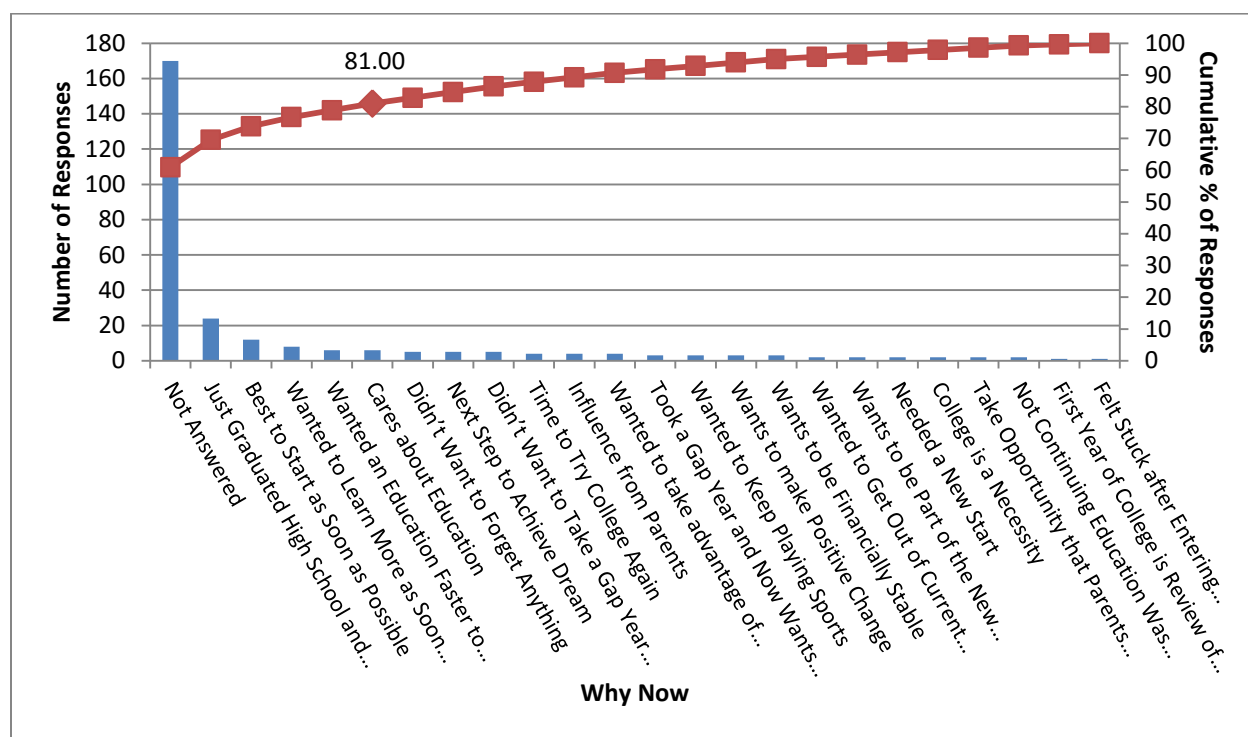
Other categories as to why responders chose to enter engineering may also indicate what the incoming students already know and still need to learn. The cumulative knowledge of



students has been changing and to produce good engineers, therefore maintaining the schools reputation, Alfred University needs to be aware of the shift in knowledge incoming students have. One means to do this is greater STEM outreach and contacts with 1-12 educators.

### “Why Now”

The top 25% of responses of “Why Now” accounted for 81.00% of the responses for the total data coded from the entering class of 2015, 2016, and 2017 and can be seen in **Figure 3** as following the approach of Pareto<sup>[1]</sup>. Other figures relating to responses relating to “Why Now” disaggregated by entering class year can be found in **APPENDIX C**.



**Figure 3: All Coded Data from Responses answering the Question of "Why Now"**

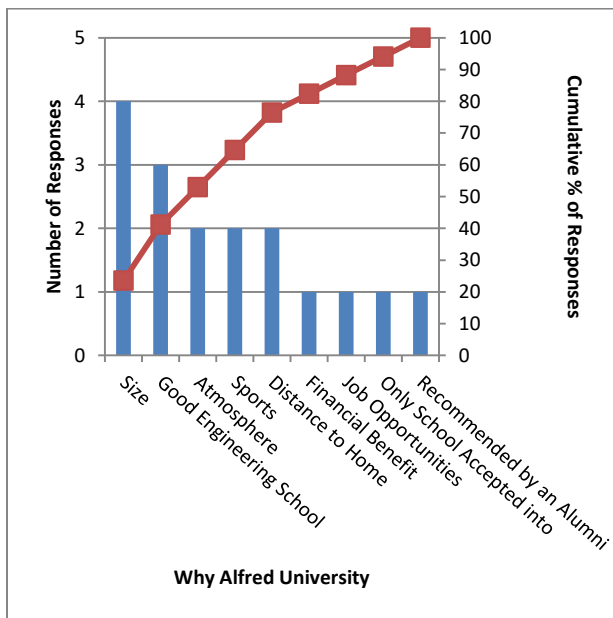
The first category, which is that responders did not answer the question, accounts for almost 60.93% of the responses. Of the remaining 23 categories, each one only accounts for an average of 1.69% of the responses and it can be seen in the graph that most of that is weighted in the next handful of categories.

This data suggests that continuing to ask the question of “Why Now” in Reflection One Papers would not be beneficial. There is a possibility that the order of which the three questions

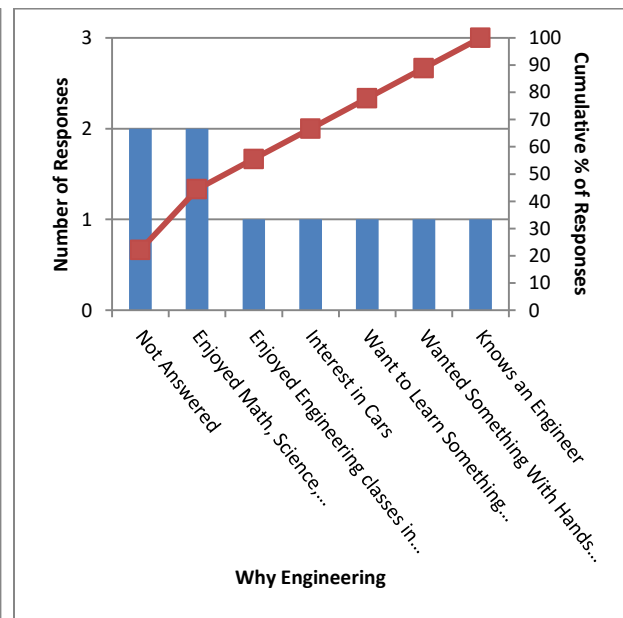
are asked has an influence as to how many responders answer the last question. This curiosity can be reviewed more in future work, but it is the primary suggestion to remove the question “*Why Now*” from the Reflection One Papers. Alternatively, respondents could be asked a guided version of “*Why Now*”; however, there are well-documented self-confirmatory issues with guided questions.

#### Students that Left Engineering but Stayed at Alfred University

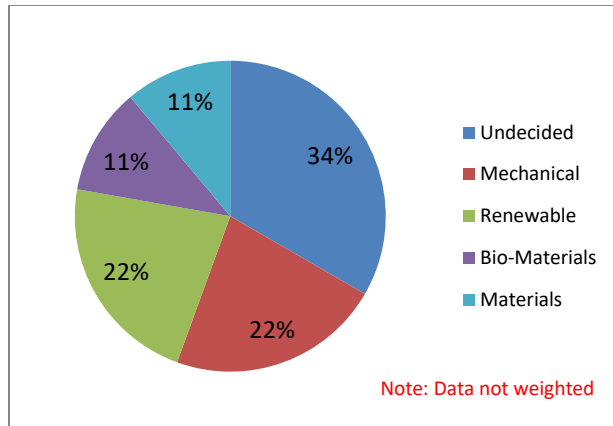
The first group that was created was to determine if there was one declared major over the others that were more likely to stay at Alfred University, but transfer out of engineering. It was also used to determine if there were any predictors in the Reflection One Papers from this group that would suggest a responder would be more likely fall into this group in their Alfred University career. There were a total of nine students that fit this category. As seen in **Figure 4**, the top four categories that answer the question “*Why Alfred University*” overlaps with the top nine categories in **Figure 1**.



**Figure 4: All Data Coded from all Students who Left Engineering, but Stayed at Alfred University answering the Question "Why Alfred University" from cohorts of 2015 and 2016.**



**Figure 5: All Data Coded from all Students who Left Engineering, but Stayed at Alfred University answering the Question "Why Engineering" from cohorts of 2015 and 2016.**



**Figure 6: Original major of all Students that Left Engineering, but Stayed at Alfred University Separated by Major from cohorts of 2015 and 2016; n=9**

There is no graph for Responses of Why Now for Students who Left the Engineering as every responder failed to answer that question.

The data above reveals that there is no reliable predictor as to why students left the Inamori School of Engineering but stayed at Alfred University. Future work in this category should be normalizing the data to see if the mass numbers of students that were undecided, mechanical engineers, or renewable energy engineers influenced the results. It is important to note that the major data seen in **Figure 6** is not weighted.

#### Students that Chose to Leave Alfred University

The second of the three groups aggregated data was to determine if there was one major over the others that was more likely to choose to leave Alfred University and to see if there were any predictors in the Reflection One Papers. There were a total of 21 students that fit this category.

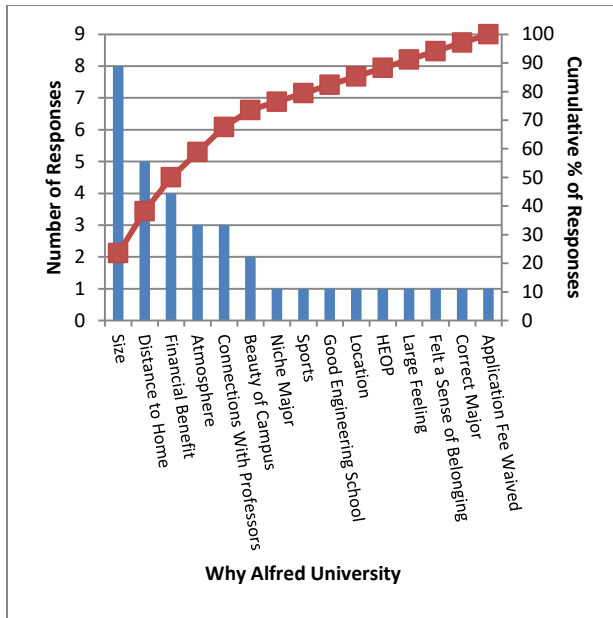


Figure 7: All Data Coded from all Students that Left Alfred University by Choice answering the Question "Why Alfred University" from cohorts of 2015 and 2016.

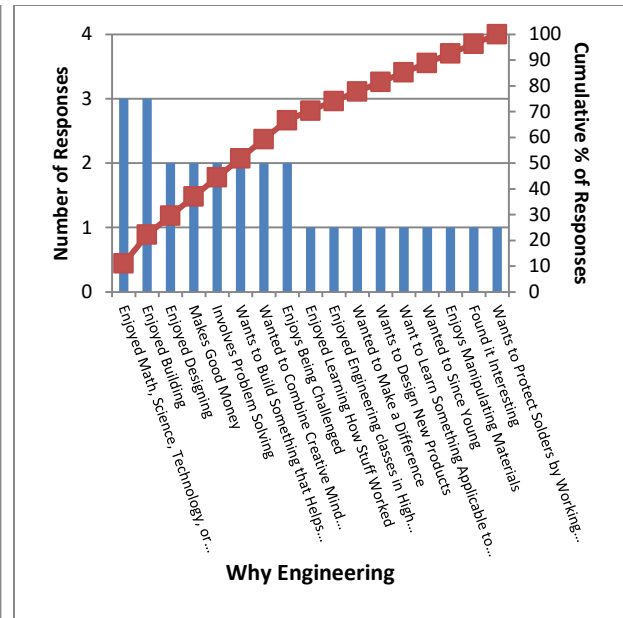


Figure 8: All Data Coded from all Students that Left Alfred University by Choice answering the Question "Why Engineering" from cohorts of 2015 and 2016.

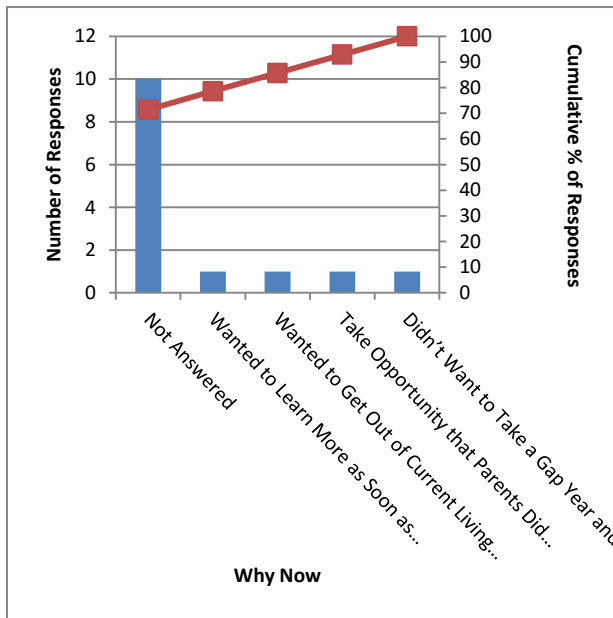


Figure 9: All Data Coded from all Students that Left Alfred University by Choice answering the Question "Why Now" from cohorts of 2015 and 2016.

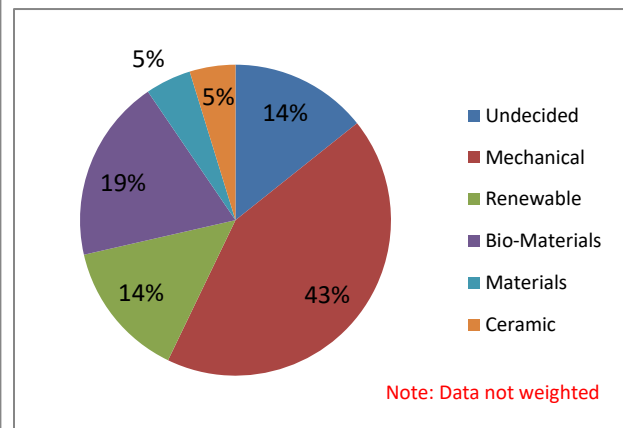
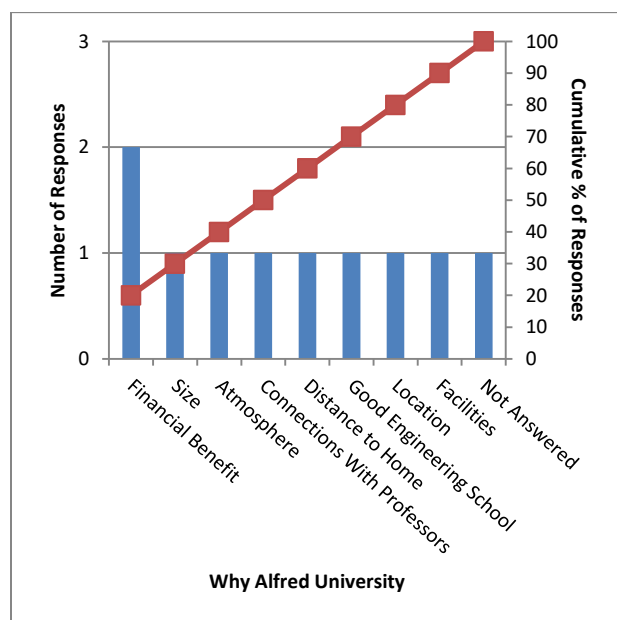


Figure 10: Original major of all Data Coded from all Students that Left Alfred University by Choice Separated by Major from cohorts of 2015 and 2016; n=21

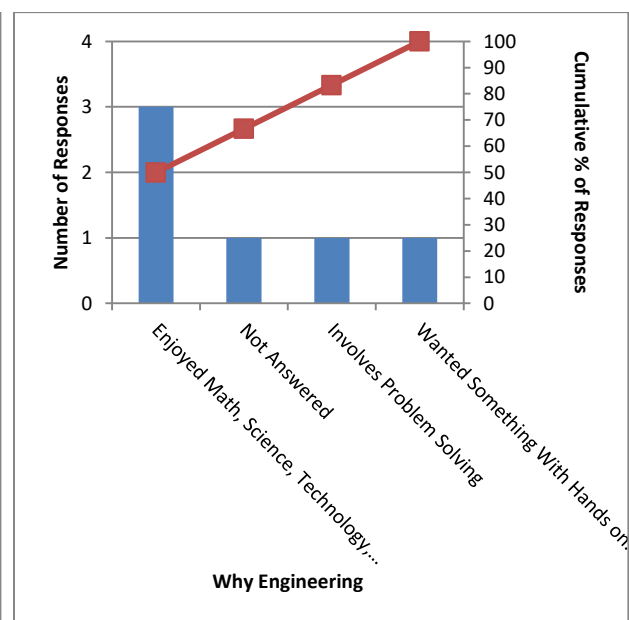
The data above reveals that there is no reasonable predictor as to why students chose to leave Alfred University. Future work in this category should be normalizing the data to see if the mass numbers of students that were mechanical engineers influenced the results. Anecdotal information suggests that Mechanical Engineering, as the most general engineering program at the university, enrolls the least committed students. This is consistent, but not necessarily casual. It is important to note that the major data seen in **Figure 10** is not weighted.

#### Students that Were Asked to Leave Alfred University

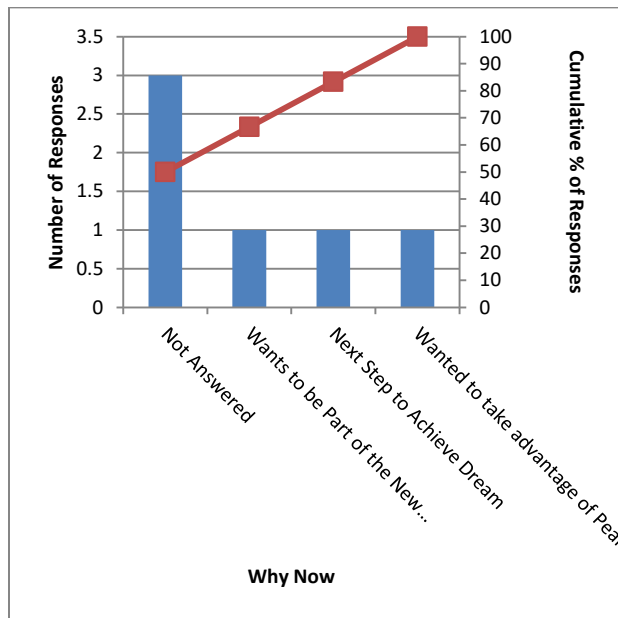
The last of the three groups that were created was to determine if there was one major over the others that were more likely to be asked to leave Alfred University and to see if there were any predictors in the Reflection One Papers. There were a total of ten students that fit this category.



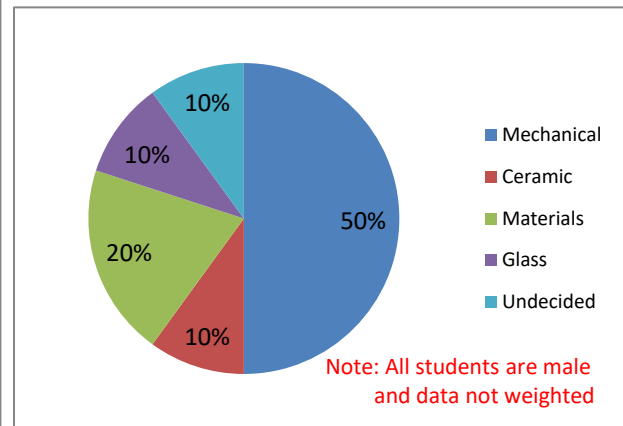
**Figure 11: All Data Coded from all Students that Were Asked to Leave Alfred University by answering the Question "Why Alfred University" from cohorts of 2015 and 2016.**



**Figure 12: All Data Coded from all Students that Were Asked to Leave Alfred University answering the Question "Why Engineering" from cohorts of 2015 and 2016.**



**Figure 13: All Data Coded from all Students that Were Asked to Leave Alfred University answering the Question "Why Now" from cohorts of 2015 and 2016.**



**Figure 14: Original major of all Data Coded from all Students that Were Asked to Leave Alfred University Separated by Major from cohorts of 2015 and 2016; n=10**

The data above reveals that there is no reasonable predictor as to why students chose to leave Alfred University. Future work in this category should be normalizing the data to see if the mass numbers of students that were mechanical engineers influenced the results. For the years coded, all students involuntarily separated were male. Whether this is results from greater immaturity, self-selectors, or other causes is unknown. It is important to note that the major data seen in **Figure 14** is not weighted.

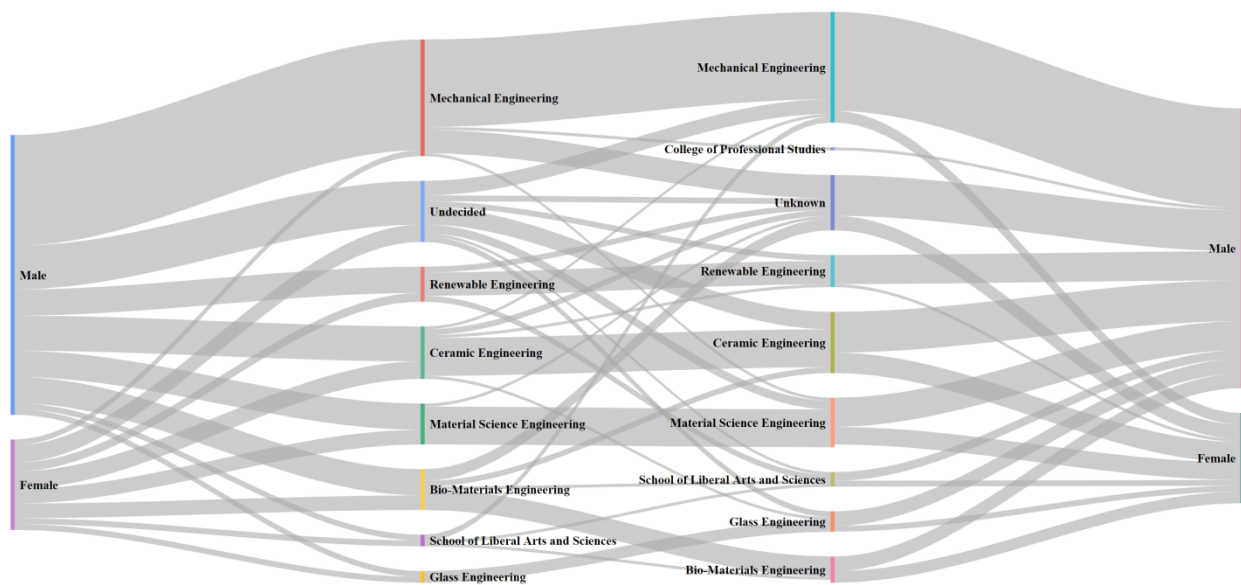
### Flow of Majors

Sankey charts are descriptive diagrams designed specifically to show flow<sup>[2]</sup>. They clearly represent how objects, or people in this case, move because the width of the connecting line is directly proportional to the flow quantity.

The Sankey charts below show the students' sex, as registered by Alfred University, in the first node and show the flow into what the students initial major was during their first semester. The second node flows into the third node which is the declared major of that student

as of January 2018. The flow from the third node to the fourth node shows the separation out into the students' sex from their currently declared major. Note that all students mix at each node, i.e., the incoming width of “female” to “renewable” is merely coincidentally the same as the outgoing width to college of Liberal Arts and Sciences in **Figure 15**.

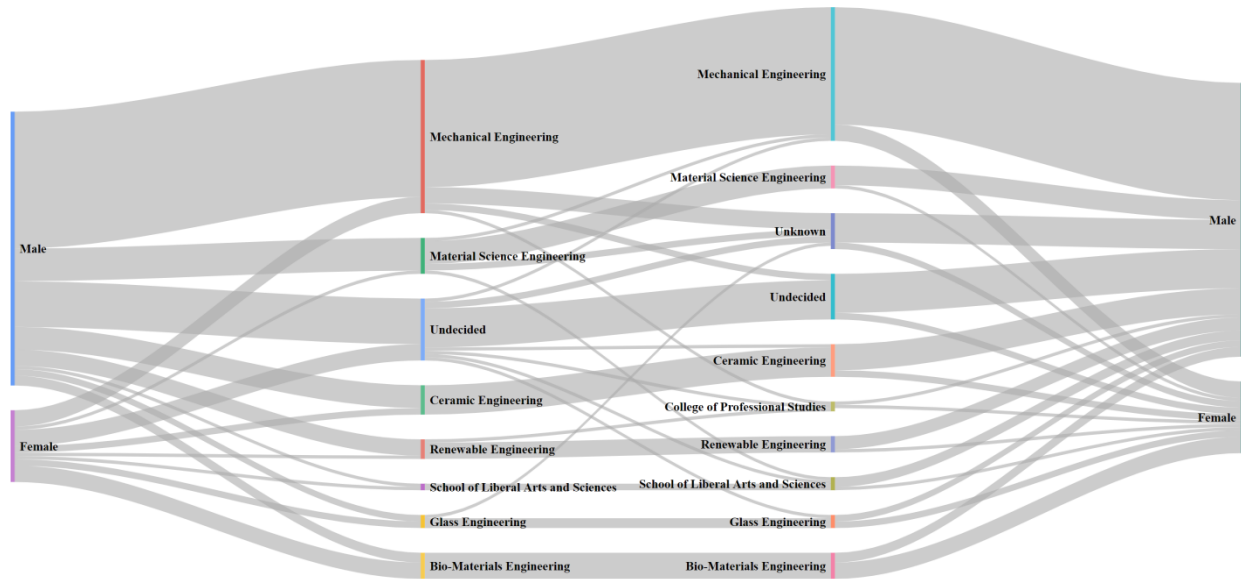
The data collected to generate the Sankey diagrams seen in **Figure 15**, **Figure 16**, and **Figure 17** was collected from the Major Change Data Program found in **APPENDIX B**.



**Figure 15: Major Flow for the entering class of 2015. The second node is as of Fall 2015 and the third node as of January 2018. n=127**

The data collected in **Figure 15** show the tendencies of students from the entering class of 2015 over a two-and-a-half year period.

The largest percentage ‘leak’ of students into the unknown node, which comprises all the students that left Alfred University and that there was no more data on, comes from bio-materials engineering. From **Figure 15**, the largest numerical ‘leak’ is mechanical engineering. Future work should normalize the data to determine the largest ‘leak’ as seen in **Figure 15**.

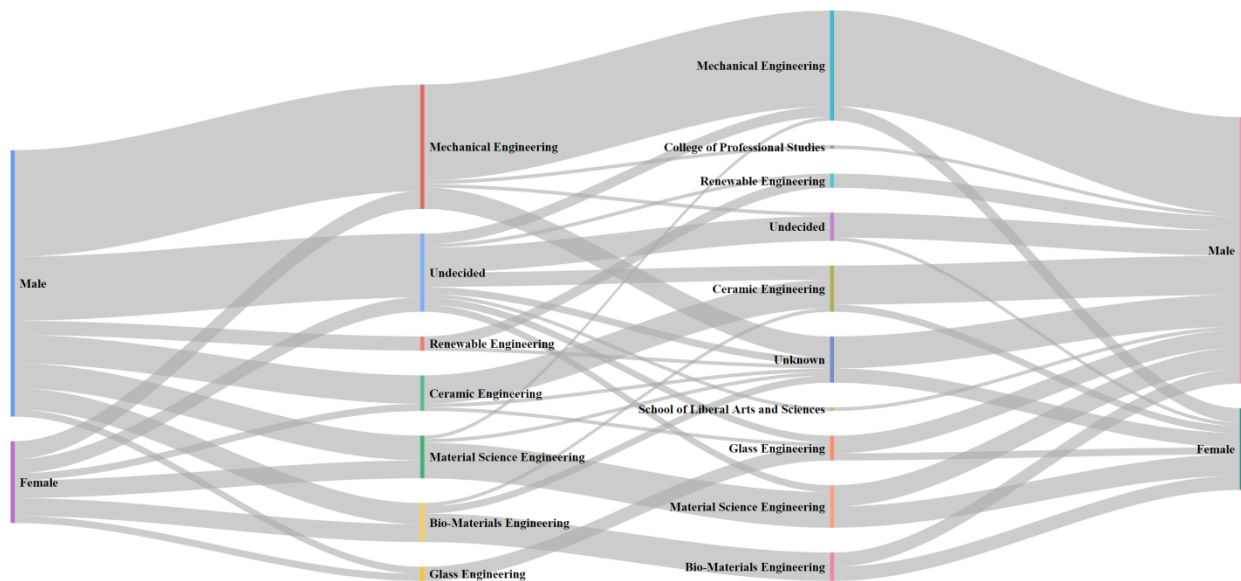


**Figure 16: Major Flow for the entering class of 2016. The second node is as of Fall 2016 and the third node as of January 2018. n=106**

The data collected in **Figure 16** show the tendencies of students from the entering class of 2016 over a one-and-a-half year period.

The largest percentage ‘leak’ of students into the unknown node comes from materials science engineering. By looking at **Figure 16** mechanical engineering yields the largest numerical ‘leak’. The differing behavior of 2015 Bio-Materials Engineering and 2016 Bio-Materials Engineering is striking. In 2016 overall, and Bio-Materials especially, there is much less differing making for a cleaner diagram than that of 2015. Future work should normalize the data to determine the largest ‘leak’ as seen in **Figure 16**.





**Figure 17: Projected Major Flow for the entering class of 2017. The second node is as of Fall 2017 and the third node is Fall 2019. n=98**

**Figure 17** was created using the data collected from the flow patterns of the entering classes of 2015 and 2016. The data sets were combined and averaged to project the outcome of the entering class of 2017 two years in the future.

The largest numerical ‘leak’ of students into the unknown node at **Figure 17** is mechanical engineering but this may be the ‘leak’ percentage.

Additional Sankey diagrams can be found in **APPENDIX C**.

## CONCLUSION

In conclusion, the assessment of the Reflection Paper One Essays written in ENGR 160 showed that the top five categories that Alfred University has control over were answers to the question “*Why Alfred University*” are Financial Benefit, Good Engineering School, Sports, Niche Major, and Networking Opportunities. It also showed that two of the top three categories that were answers to the question “*Why Engineering*” are enjoyed or excelled in the subjects of Mathematics, Science; Chemistry or Biology, Technology, and Physics or they enjoyed the engineering classes offered at their high school. Additionally it showed that the highest

responded category for answering the question “*Why Now*” suggests that continuing to ask students why they came to school provides no benefit. Lastly is showed that there are no predictors in an individual’s response to the three questions that may indicate specific group affiliation (Students that Left Engineering but Stayed at Alfred University, Students that Chose to Leave Alfred University, or Students that Were Asked to Leave Alfred University). The groups were students that stayed at Alfred University, students that chose to leave Alfred University and students that were asked to leave Alfred University.

Future work on this data would be to normalize the information and graph the information again to see if mechanical engineering students influenced the category responses for all three questions “*Why Alfred University*”, “*Why Engineering*”, and “*Why Now*”. Mechanical Engineering students accounted for 122 of the 331 students used in this study. Data should also be collected and graphed for each semester to better understand and watch the flow of student majors throughout their time at Alfred University. This flow information was done in a Sankey diagram and it is a suggested method because it provides substantial insight. The data collected in the switch of students major from semester to semester does not have to be limited to the Inamori School of Engineering, and it could be applied to view data from the whole university with nodes at each semester or year. Sankey diagrams with improved nodes would provide the university visual information to see and track key decision points in each major, i.e., where students chose to leave that major or the university.

## REFERENCES

1. “Pareto Chart.” *American Society for Quality*. <http://asq.org/learn-about-quality/cause-analysis-tools/overview/pareto.html>, 1 Jan. 2018. Web. 30 Apr. 2018.
2. “Sankey Diagram.” *Google*.  
<https://developers.google.com/chart/interactive/docs/gallery/sankey>, 23 Feb. 2017. Web. 30 Apr. 2018.

## APPENDIX A

### Coding Rubric for “*Why Alfred University*”

|                                |                                     |
|--------------------------------|-------------------------------------|
| 1. Financial Benefit           | 18. Opportunities Given to Students |
| 2. Size                        | 19. Honors Program                  |
| 3. Atmosphere                  | 20. Amount of Clubs                 |
| 4. Connections with Professors | 21. HEOP                            |
| 5. Job Opportunities           | 22. Curriculum                      |
| 6. Niche Major                 | 23. Facilities                      |
| 7. Sports                      | 24. Beauty of Campus                |
| 8. Distance to Home            | 25. Large Feeling                   |
| 9. Good Engineering School     | 26. Felt a Sense of Belonging       |
| 10. Location                   | 27. Networking Opportunities        |
| 11. Knew a “Current” Student   | 28. Correct Major                   |
| 12. Random Selection           | 29. Not Answered                    |
| 13. Only School Accepted into  | 30. Accepted Previous Credits       |
| 14. Recommended by an Alumni   | 31. Application Fee Waived          |
| 15. Felt Most Like Home        | 32. Music Department                |
| 16. Last Option                | 33. Admissions Contacted More       |
| 17. Nothing else Worked Out    | 34. Close to Swain for Skiing       |

## Coding Rubric for “Why Engineering”

|                                                          |                                                                               |
|----------------------------------------------------------|-------------------------------------------------------------------------------|
| 1. Not Answered                                          | 22. Want to Learn Something Applicable to Future                              |
| 2. Enjoyed Learning How Stuff Worked                     | 23. Job Opportunities                                                         |
| 3. Enjoyed Math, Science, Technology, or Physics Classes | 24. Wanted Something With Hands on Experience                                 |
| 4. Wanted More Knowledge                                 | 25. Wanted to Since Young                                                     |
| 5. Wanted to be Able to Give Back                        | 26. Reputation                                                                |
| 6. Enjoyed Building                                      | 27. Wants to Build Something that Helps People                                |
| 7. Enjoyed Designing                                     | 28. Benefit for Self                                                          |
| 8. Felt a Calling                                        | 29. Job Security                                                              |
| 9. Enjoyed Engineering classes in High School            | 30. Wants to Work With Prosthetics                                            |
| 10. Makes Good Money                                     | 31. Enjoys Manipulating Materials                                             |
| 11. Wanted to Make a Difference                          | 32. Knows an Engineer                                                         |
| 12. Wants to Design New Products                         | 33. Wanted to Combine Creative Mind with Intellectual Mind                    |
| 13. Wants to Improve Old Products                        | 34. Enjoys Being Challenged                                                   |
| 14. Other Topics Are Not as Interesting                  | 35. Wants to Protect Solders by Working for Military                          |
| 15. Wants to be an Inventor                              | 36. Parents Suggested it                                                      |
| 16. Logical Choice                                       | 37. Found it Interesting                                                      |
| 17. Interest in Cars                                     | 38. Wants to Cure Cancer                                                      |
| 18. Interest in Guns                                     | 39. Wants to Work in Research and Development while still getting hands Dirty |
| 19. Alfred Had a Good Engineering Program                | 40. Interested in Planes and Space                                            |
| 20. Involves Problem Solving                             | 41. Had a Good Technology Education Teacher                                   |
| 21. Not Good With English                                | 42. Had a Unique Skill Set                                                    |

## Coding Rubric for “Why Now”

|                                                                  |                                                                              |
|------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1. Just Graduated High School and College Was The Next Step      | 12. Wanted to Keep Playing Sports                                            |
| 2. First Year of College is Review of Senior Year of High School | 13. Needed a New Start                                                       |
| 3. Didn't Want to Forget Anything                                | 14. College is a Necessity                                                   |
| 4. Not Answered                                                  | 15. Time to Try College Again                                                |
| 5. Wanted to Learn More as Soon as Possible                      | 16. Take Opportunity that Parents Did Not Have                               |
| 6. Wanted an Education Faster to Enter Workforce Faster          | 17. Felt Stuck after Entering Workforce so Wanted a Higher Education         |
| 7. Wanted to Get Out of Current Living Arrangements              | 18. Not Continuing Education Was Not an Option                               |
| 8. Wants to be Part of the New Technology Development            | 19. Wants to make Positive Change                                            |
| 9. Best to Start as Soon as Possible                             | 20. Wants to be Financially Stable                                           |
| 10. Took a Gap Year and Now Wants an Education                   | 21. Cares about Education                                                    |
| 11. Next Step to Achieve Dream                                   | 22. Influence from Parents                                                   |
|                                                                  | 23. Wanted to take advantage of Peak Learning Opportunity                    |
|                                                                  | 24. Didn't Want to Take a Gap Year and Lose Motivation to Continue Education |

### Coding Rubric for *Anonymized*

This will be FAYYXXX where YY is the start year (15,16 or 17), and XXX is the sequential number of which the papers are ordered.

Ex: FA15098 – Belongs in the 2015 binder in the 98<sup>th</sup> spot.

### Coding Rubric for *Starting Cohort*

- |         |         |
|---------|---------|
| 0. 2015 | 2. 2017 |
| 1. 2016 |         |

### Coding Rubric for *Sex*

- |           |         |
|-----------|---------|
| 0. Female | 1. Male |
|-----------|---------|

### Coding Rubric for *Major*

- |                                          |                                        |
|------------------------------------------|----------------------------------------|
| 0. Undecided/Academic Exploration        | 6. Ceramic Engineering                 |
| 1. Mechanical Engineering                | 7. School of Liberal Arts and Sciences |
| 2. Renewable Energy Engineering          | 8. College of Professional Studies     |
| 3. Glass Science and Engineering         | 9. School of Art and Design            |
| 4. Bio-Materials Science and Engineering | 10. School of Business                 |
| 5. Materials Science and Engineering     | 11. Unknown                            |

### Coding Rubric for *Change in Major*

- |       |        |
|-------|--------|
| 0. No | 1. Yes |
|-------|--------|

### Coding Rubric for *Status*

|                                                           |                                                                                             |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 0. Still in Engineering at Alfred University              | 2. Left Alfred University (No more Data)                                                    |
| 1. Transferred to another school within Alfred University | Note: Coded two's marked in yellow were students that were asked to leave Alfred University |

### Coding Rubric for *Pass Fall of First Year*

|                 |                                                                      |
|-----------------|----------------------------------------------------------------------|
| 0. Did not Pass | Note: Any student that was listed as incomplete was coded as a zero. |
| 1. Passed       |                                                                      |

### Coding Rubric for *Wrote/Turned in 'Reflection One'*

|       |        |
|-------|--------|
| 0. No | 1. Yes |
|-------|--------|



## APPENDIX B

### C++ Code

#### ➤ Correlation Program (Coded in Microsoft Developer 95)

```
//      This is a C++ file to figure out my current correlation of my Inter Rater Data

#include <iostream.h>
#include <iomanip.h>
#include <fstream.h>

void main() {

    int agreed=0,ir_dis=0,me_dis=0,i,test,total_dis,total;

    double percent;

    ifstream f_in("Correlation.txt", ios::in);

    for(i=0; i<4800; i++) {

        f_in>>test;

        if(test==0) {

            continue;

        } else if(test==1) {

            agreed++;

        } else if(test==-1) {

            me_dis++;

        } else if(test==2) {

            ir_dis++;

        }

    }

    total_dis=ir_dis+me_dis;

    total=total_dis+agreed;

    percent=(agreed/double(total))*100;

    cout<<"The agreed percentage is: "<<percent<<endl;

    cout<<"The total number of entries is: "<<total<<endl;

    cout<<"The total number of Inter Rater Disagreements is: "<<ir_dis<<endl;

    cout<<"The total number of My Disagreements is: "<<me_dis<<endl;

    cout<<"The total number of agreed entries is: "<<agreed<<endl;

}
```

### ➤ Example Output from Correlation

```
C:\Users\fosu\Debug>Correlation.exe
The agreed percentage is: 65
The total number of entries is: 301
The total number of Inter Rater Disagreements is: 85
The total number of My Disagreements is: 20
The total number of agreed entries is: 196
```

### Python Code (Coded in PyCharm Community Edition 2017.2.3)

#### ➤ Major Change Data Program

- The 2015, 2016 and 2017 Major Change Data Programs were the same with the exception of saying the corresponding year in the “with open” statement. The code shown is from 2015 Major Change Data Program.

```
__author__ = 'fossum'

with open('2015 major Data With Sex Separation.txt', 'r+', encoding='utf-8') as a:
    print(a.name)
    female_undecided = 0
    female_undecided_to_undecided = 0
    female_undecided_to_mechanical = 0
    female_undecided_to_renewable = 0
    female_undecided_to_glass = 0
    female_undecided_to_bio = 0
    female_undecided_to_materials = 0
    female_undecided_to_ceramic = 0
    female_undecided_to_las = 0
    female_undecided_to_cps = 0
    female_undecided_to_soal = 0
    female_undecided_to_sob = 0
    female_undecided_to_unknown = 0
    male_undecided = 0
    male_undecided_to_undecided = 0
    male_undecided_to_mechanical = 0
    male_undecided_to_renewable = 0
    male_undecided_to_glass = 0
    male_undecided_to_bio = 0
    male_undecided_to_materials = 0
    male_undecided_to_ceramic = 0
    male_undecided_to_las = 0
    male_undecided_to_cps = 0
    male_undecided_to_soal = 0
    male_undecided_to_sob = 0
    male_undecided_to_unknown = 0
    female_mechanical = 0
    female_mechanical_to_undecided = 0
    female_mechanical_to_mechanical = 0
    female_mechanical_to_renewable = 0
    female_mechanical_to_glass = 0
    female_mechanical_to_bio = 0
    female_mechanical_to_materials = 0
```

```
female_mechanical_to_ceramic = 0
female_mechanical_to_las = 0
female_mechanical_to_cps = 0
female_mechanical_to_soal = 0
female_mechanical_to_sob = 0
female_mechanical_to_unknown = 0
male_mechanical = 0
male_mechanical_to_undecided = 0
male_mechanical_to_mechanical = 0
male_mechanical_to_renewable = 0
male_mechanical_to_glass = 0
male_mechanical_to_bio = 0
male_mechanical_to_materials = 0
male_mechanical_to_ceramic = 0
male_mechanical_to_las = 0
male_mechanical_to_cps = 0
male_mechanical_to_soal = 0
male_mechanical_to_sob = 0
male_mechanical_to_unknown = 0
female_renewable = 0
female_renewable_to_undecided = 0
female_renewable_to_mechanical = 0
female_renewable_to_renewable = 0
female_renewable_to_glass = 0
female_renewable_to_bio = 0
female_renewable_to_materials = 0
female_renewable_to_ceramic = 0
female_renewable_to_las = 0
female_renewable_to_cps = 0
female_renewable_to_soal = 0
female_renewable_to_sob = 0
female_renewable_to_unknown = 0
male_renewable = 0
male_renewable_to_undecided = 0
male_renewable_to_mechanical = 0
male_renewable_to_renewable = 0
male_renewable_to_glass = 0
male_renewable_to_bio = 0
male_renewable_to_materials = 0
male_renewable_to_ceramic = 0
male_renewable_to_las = 0
male_renewable_to_cps = 0
male_renewable_to_soal = 0
male_renewable_to_sob = 0
male_renewable_to_unknown = 0
female_glass = 0
female_glass_to_undecided = 0
female_glass_to_mechanical = 0
female_glass_to_renewable = 0
female_glass_to_glass = 0
female_glass_to_bio = 0
female_glass_to_materials = 0
female_glass_to_ceramic = 0
female_glass_to_las = 0
female_glass_to_cps = 0
female_glass_to_soal = 0
female_glass_to_sob = 0
female_glass_to_unknown = 0
male_glass = 0
male_glass_to_undecided = 0
male_glass_to_mechanical = 0
male_glass_to_renewable = 0
male_glass_to_glass = 0
```

```
male_glass_to_bio = 0
male_glass_to_materials = 0
male_glass_to_ceramic = 0
male_glass_to_las = 0
male_glass_to_cps = 0
male_glass_to_soad = 0
male_glass_to_sob = 0
male_glass_to_unknown = 0
female_bio = 0
female_bio_to_undecided = 0
female_bio_to_mechanical = 0
female_bio_to_renewable = 0
female_bio_to_glass = 0
female_bio_to_bio = 0
female_bio_to_materials = 0
female_bio_to_ceramic = 0
female_bio_to_las = 0
female_bio_to_cps = 0
female_bio_to_soad = 0
female_bio_to_sob = 0
female_bio_to_unknown = 0
male_bio = 0
male_bio_to_undecided = 0
male_bio_to_mechanical = 0
male_bio_to_renewable = 0
male_bio_to_glass = 0
male_bio_to_bio = 0
male_bio_to_materials = 0
male_bio_to_ceramic = 0
male_bio_to_las = 0
male_bio_to_cps = 0
male_bio_to_soad = 0
male_bio_to_sob = 0
male_bio_to_unknown = 0
female_materials = 0
female_materials_to_undecided = 0
female_materials_to_mechanical = 0
female_materials_to_renewable = 0
female_materials_to_glass = 0
female_materials_to_bio = 0
female_materials_to_materials = 0
female_materials_to_ceramic = 0
female_materials_to_las = 0
female_materials_to_cps = 0
female_materials_to_soad = 0
female_materials_to_sob = 0
female_materials_to_unknown = 0
male_materials = 0
male_materials_to_undecided = 0
male_materials_to_mechanical = 0
male_materials_to_renewable = 0
male_materials_to_glass = 0
male_materials_to_bio = 0
male_materials_to_materials = 0
male_materials_to_ceramic = 0
male_materials_to_las = 0
male_materials_to_cps = 0
male_materials_to_soad = 0
male_materials_to_sob = 0
male_materials_to_unknown = 0
female_ceramic = 0
female_ceramic_to_undecided = 0
female_ceramic_to_mechanical = 0
```

```
female_ceramic_to_renewable = 0
female_ceramic_to_glass = 0
female_ceramic_to_bio = 0
female_ceramic_to_materials = 0
female_ceramic_to_ceramic = 0
female_ceramic_to_las = 0
female_ceramic_to_cps = 0
female_ceramic_to_soal = 0
female_ceramic_to_sob = 0
female_ceramic_to_unknown = 0
male_ceramic = 0
male_ceramic_to_undecided = 0
male_ceramic_to_mechanical = 0
male_ceramic_to_renewable = 0
male_ceramic_to_glass = 0
male_ceramic_to_bio = 0
male_ceramic_to_materials = 0
male_ceramic_to_ceramic = 0
male_ceramic_to_las = 0
male_ceramic_to_cps = 0
male_ceramic_to_soal = 0
male_ceramic_to_sob = 0
male_ceramic_to_unknown = 0
female_las = 0
female_las_to_undecided = 0
female_las_to_mechanical = 0
female_las_to_renewable = 0
female_las_to_glass = 0
female_las_to_bio = 0
female_las_to_materials = 0
female_las_to_ceramic = 0
female_las_to_las = 0
female_las_to_cps = 0
female_las_to_soal = 0
female_las_to_sob = 0
female_las_to_unknown = 0
male_las = 0
male_las_to_undecided = 0
male_las_to_mechanical = 0
male_las_to_renewable = 0
male_las_to_glass = 0
male_las_to_bio = 0
male_las_to_materials = 0
male_las_to_ceramic = 0
male_las_to_las = 0
male_las_to_cps = 0
male_las_to_soal = 0
male_las_to_sob = 0
male_las_to_unknown = 0
female_cps = 0
female_cps_to_undecided = 0
female_cps_to_mechanical = 0
female_cps_to_renewable = 0
female_cps_to_glass = 0
female_cps_to_bio = 0
female_cps_to_materials = 0
female_cps_to_ceramic = 0
female_cps_to_las = 0
female_cps_to_cps = 0
female_cps_to_soal = 0
female_cps_to_sob = 0
female_cps_to_unknown = 0
male_cps = 0
```

```
male_cps_to_undecided = 0
male_cps_to_mechanical = 0
male_cps_to_renewable = 0
male_cps_to_glass = 0
male_cps_to_bio = 0
male_cps_to_materials = 0
male_cps_to_ceramic = 0
male_cps_to_las = 0
male_cps_to_cps = 0
male_cps_to_soal = 0
male_cps_to_sob = 0
male_cps_to_unknown = 0
female_soal = 0
female_soal_to_undecided = 0
female_soal_to_mechanical = 0
female_soal_to_renewable = 0
female_soal_to_glass = 0
female_soal_to_bio = 0
female_soal_to_materials = 0
female_soal_to_ceramic = 0
female_soal_to_las = 0
female_soal_to_cps = 0
female_soal_to_soal = 0
female_soal_to_sob = 0
female_soal_to_unknown = 0
male_soal = 0
male_soal_to_undecided = 0
male_soal_to_mechanical = 0
male_soal_to_renewable = 0
male_soal_to_glass = 0
male_soal_to_bio = 0
male_soal_to_materials = 0
male_soal_to_ceramic = 0
male_soal_to_las = 0
male_soal_to_cps = 0
male_soal_to_soal = 0
male_soal_to_sob = 0
male_soal_to_unknown = 0
female_sob = 0
female_sob_to_undecided = 0
female_sob_to_mechanical = 0
female_sob_to_renewable = 0
female_sob_to_glass = 0
female_sob_to_bio = 0
female_sob_to_materials = 0
female_sob_to_ceramic = 0
female_sob_to_las = 0
female_sob_to_cps = 0
female_sob_to_soal = 0
female_sob_to_sob = 0
female_sob_to_unknown = 0
male_sob = 0
male_sob_to_undecided = 0
male_sob_to_mechanical = 0
male_sob_to_renewable = 0
male_sob_to_glass = 0
male_sob_to_bio = 0
male_sob_to_materials = 0
male_sob_to_ceramic = 0
male_sob_to_las = 0
male_sob_to_cps = 0
male_sob_to_soal = 0
male_sob_to_sob = 0
```

```

male_sob_to_unknown = 0
female_unknown = 0
female_unknown_to_undecided = 0
female_unknown_to_mechanical = 0
female_unknown_to_renewable = 0
female_unknown_to_glass = 0
female_unknown_to_bio = 0
female_unknown_to_materials = 0
female_unknown_to_ceramic = 0
female_unknown_to_las = 0
female_unknown_to_cps = 0
female_unknown_to_soad = 0
female_unknown_to_sob = 0
female_unknown_to_unknown = 0
male_unknown = 0
male_unknown_to_undecided = 0
male_unknown_to_mechanical = 0
male_unknown_to_renewable = 0
male_unknown_to_glass = 0
male_unknown_to_bio = 0
male_unknown_to_materials = 0
male_unknown_to_ceramic = 0
male_unknown_to_las = 0
male_unknown_to_cps = 0
male_unknown_to_soad = 0
male_unknown_to_sob = 0
male_unknown_to_unknown = 0
count = 1
a.seek(0)
for line in a:
    sex = line.strip('\r\n').split('\t')
    if sex[0] == "0":
        if sex[1] == "0":
            female_undecided += 1
            if sex[2] == "0":
                female_undecided_to_undecided += 1
            elif sex[2] == "1":
                female_undecided_to_mechanical += 1
            elif sex[2] == "2":
                female_undecided_to_renewable += 1
            elif sex[2] == "3":
                female_undecided_to_glass += 1
            elif sex[2] == "4":
                female_undecided_to_bio += 1
            elif sex[2] == "5":
                female_undecided_to_materials += 1
            elif sex[2] == "6":
                female_undecided_to_ceramic += 1
            elif sex[2] == "7":
                female_undecided_to_las += 1
            elif sex[2] == "8":
                female_undecided_to_cps += 1
            elif sex[2] == "9":
                female_undecided_to_soad += 1
            elif sex[2] == "10":
                female_undecided_to_sob += 1
            elif sex[2] == "11":
                female_undecided_to_unknown += 1
        elif sex[1] == "1":
            female_mechanical += 1
            if sex[2] == "0":
                female_mechanical_to_undecided += 1
            elif sex[2] == "1":

```

```

        female_mechanical_to_mechanical += 1
    elif sex[2] == "2":
        female_mechanical_to_renewable += 1
    elif sex[2] == "3":
        female_mechanical_to_glass += 1
    elif sex[2] == "4":
        female_mechanical_to_bio += 1
    elif sex[2] == "5":
        female_mechanical_to_materials += 1
    elif sex[2] == "6":
        female_mechanical_to_ceramic += 1
    elif sex[2] == "7":
        female_mechanical_to_las += 1
    elif sex[2] == "8":
        female_mechanical_to_cps += 1
    elif sex[2] == "9":
        female_mechanical_to_soal += 1
    elif sex[2] == "10":
        female_mechanical_to_sob += 1
    elif sex[2] == "11":
        female_mechanical_to_unknown += 1
elif sex[1] == "2":
    female_renewable += 1
    if sex[2] == "0":
        female_renewable_to_undecided += 1
    elif sex[2] == "1":
        female_renewable_to_mechanical += 1
    elif sex[2] == "2":
        female_renewable_to_renewable += 1
    elif sex[2] == "3":
        female_renewable_to_glass += 1
    elif sex[2] == "4":
        female_renewable_to_bio += 1
    elif sex[2] == "5":
        female_renewable_to_materials += 1
    elif sex[2] == "6":
        female_renewable_to_ceramic += 1
    elif sex[2] == "7":
        female_renewable_to_las += 1
    elif sex[2] == "8":
        female_renewable_to_cps += 1
    elif sex[2] == "9":
        female_renewable_to_soal += 1
    elif sex[2] == "10":
        female_renewable_to_sob += 1
    elif sex[2] == "11":
        female_renewable_to_unknown += 1
elif sex[1] == "3":
    female_glass += 1
    if sex[2] == "0":
        female_glass_to_undecided += 1
    elif sex[2] == "1":
        female_glass_to_mechanical += 1
    elif sex[2] == "2":
        female_glass_to_renewable += 1
    elif sex[2] == "3":
        female_glass_to_glass += 1
    elif sex[2] == "4":
        female_glass_to_bio += 1
    elif sex[2] == "5":
        female_glass_to_materials += 1
    elif sex[2] == "6":
        female_glass_to_ceramic += 1

```



```

        elif sex[2] == "7":
            female_glass_to_las += 1
        elif sex[2] == "8":
            female_glass_to_cps += 1
        elif sex[2] == "9":
            female_glass_to_soal += 1
        elif sex[2] == "10":
            female_glass_to_sob += 1
        elif sex[2] == "11":
            female_glass_to_unknown += 1
    elif sex[1] == "4":
        female_bio += 1
        if sex[2] == "0":
            female_bio_to_undecided += 1
        elif sex[2] == "1":
            female_bio_to_mechanical += 1
        elif sex[2] == "2":
            female_bio_to_renewable += 1
        elif sex[2] == "3":
            female_bio_to_glass += 1
        elif sex[2] == "4":
            female_bio_to_bio += 1
        elif sex[2] == "5":
            female_bio_to_materials += 1
        elif sex[2] == "6":
            female_bio_to_ceramic += 1
        elif sex[2] == "7":
            female_bio_to_las += 1
        elif sex[2] == "8":
            female_bio_to_cps += 1
        elif sex[2] == "9":
            female_bio_to_soal += 1
        elif sex[2] == "10":
            female_bio_to_sob += 1
        elif sex[2] == "11":
            female_bio_to_unknown += 1
    elif sex[1] == "5":
        female_materials += 1
        if sex[2] == "0":
            female_materials_to_undecided += 1
        elif sex[2] == "1":
            female_materials_to_mechanical += 1
        elif sex[2] == "2":
            female_materials_to_renewable += 1
        elif sex[2] == "3":
            female_materials_to_glass += 1
        elif sex[2] == "4":
            female_materials_to_bio += 1
        elif sex[2] == "5":
            female_materials_to_materials += 1
        elif sex[2] == "6":
            female_materials_to_ceramic += 1
        elif sex[2] == "7":
            female_materials_to_las += 1
        elif sex[2] == "8":
            female_materials_to_cps += 1
        elif sex[2] == "9":
            female_materials_to_soal += 1
        elif sex[2] == "10":
            female_materials_to_sob += 1
        elif sex[2] == "11":
            female_materials_to_unknown += 1
    elif sex[1] == "6":

```

```

female_ceramic += 1
if sex[2] == "0":
    female_ceramic_to_undecided += 1
elif sex[2] == "1":
    female_ceramic_to_mechanical += 1
elif sex[2] == "2":
    female_ceramic_to_renewable += 1
elif sex[2] == "3":
    female_ceramic_to_glass += 1
elif sex[2] == "4":
    female_ceramic_to_bio += 1
elif sex[2] == "5":
    female_ceramic_to_materials += 1
elif sex[2] == "6":
    female_ceramic_to_ceramic += 1
elif sex[2] == "7":
    female_ceramic_to_las += 1
elif sex[2] == "8":
    female_ceramic_to_cps += 1
elif sex[2] == "9":
    female_ceramic_to_soad += 1
elif sex[2] == "10":
    female_ceramic_to_sob += 1
elif sex[2] == "11":
    female_ceramic_to_unknown += 1
elif sex[1] == "7":
    female_las += 1
    if sex[2] == "0":
        female_las_to_undecided += 1
    elif sex[2] == "1":
        female_las_to_mechanical += 1
    elif sex[2] == "2":
        female_las_to_renewable += 1
    elif sex[2] == "3":
        female_las_to_glass += 1
    elif sex[2] == "4":
        female_las_to_bio += 1
    elif sex[2] == "5":
        female_las_to_materials += 1
    elif sex[2] == "6":
        female_las_to_ceramic += 1
    elif sex[2] == "7":
        female_las_to_las += 1
    elif sex[2] == "8":
        female_las_to_cps += 1
    elif sex[2] == "9":
        female_las_to_soad += 1
    elif sex[2] == "10":
        female_las_to_sob += 1
    elif sex[2] == "11":
        female_las_to_unknown += 1
elif sex[1] == "8":
    female_cps += 1
    if sex[2] == "0":
        female_cps_to_undecided += 1
    elif sex[2] == "1":
        female_cps_to_mechanical += 1
    elif sex[2] == "2":
        female_cps_to_renewable += 1
    elif sex[2] == "3":
        female_cps_to_glass += 1
    elif sex[2] == "4":
        female_cps_to_bio += 1

```

```

elif sex[2] == "5":
    female_cps_to_materials += 1
elif sex[2] == "6":
    female_cps_to_ceramic += 1
elif sex[2] == "7":
    female_cps_to_las += 1
elif sex[2] == "8":
    female_cps_to_cps += 1
elif sex[2] == "9":
    female_cps_to_soal += 1
elif sex[2] == "10":
    female_cps_to_sob += 1
elif sex[2] == "11":
    female_cps_to_unknown += 1
elif sex[1] == "9":
    female_soal += 1
    if sex[2] == "0":
        female_soal_to_undecided += 1
    elif sex[2] == "1":
        female_soal_to_mechanical += 1
    elif sex[2] == "2":
        female_soal_to_renewable += 1
    elif sex[2] == "3":
        female_soal_to_glass += 1
    elif sex[2] == "4":
        female_soal_to_bio += 1
    elif sex[2] == "5":
        female_soal_to_materials += 1
    elif sex[2] == "6":
        female_soal_to_ceramic += 1
    elif sex[2] == "7":
        female_soal_to_las += 1
    elif sex[2] == "8":
        female_soal_to_cps += 1
    elif sex[2] == "9":
        female_soal_to_soal += 1
    elif sex[2] == "10":
        female_soal_to_sob += 1
    elif sex[2] == "11":
        female_soal_to_unknown += 1
elif sex[1] == "10":
    female_sob += 1
    if sex[2] == "0":
        female_sob_to_undecided += 1
    elif sex[2] == "1":
        female_sob_to_mechanical += 1
    elif sex[2] == "2":
        female_sob_to_renewable += 1
    elif sex[2] == "3":
        female_sob_to_glass += 1
    elif sex[2] == "4":
        female_sob_to_bio += 1
    elif sex[2] == "5":
        female_sob_to_materials += 1
    elif sex[2] == "6":
        female_sob_to_ceramic += 1
    elif sex[2] == "7":
        female_sob_to_las += 1
    elif sex[2] == "8":
        female_sob_to_cps += 1
    elif sex[2] == "9":
        female_sob_to_soal += 1
    elif sex[2] == "10":

```

```

        female_sob_to_sob += 1
    elif sex[2] == "11":
        female_sob_to_unknown += 1
elif sex[1] == "11":
    female_unknown += 1
    if sex[2] == "0":
        female_unknown_to_undecided += 1
    elif sex[2] == "1":
        female_unknown_to_mechanical += 1
    elif sex[2] == "2":
        female_unknown_to_renewable += 1
    elif sex[2] == "3":
        female_unknown_to_glass += 1
    elif sex[2] == "4":
        female_unknown_to_bio += 1
    elif sex[2] == "5":
        female_unknown_to_materials += 1
    elif sex[2] == "6":
        female_unknown_to_ceramic += 1
    elif sex[2] == "7":
        female_unknown_to_las += 1
    elif sex[2] == "8":
        female_unknown_to_cps += 1
    elif sex[2] == "9":
        female_unknown_to_soap += 1
    elif sex[2] == "10":
        female_unknown_to_sob += 1
    elif sex[2] == "11":
        female_unknown_to_unknown += 1
else:
    print("Error on line ", count)
elif sex[0] == "1":
    if sex[1] == "0":
        male_undecided += 1
        if sex[2] == "0":
            male_undecided_to_undecided += 1
        elif sex[2] == "1":
            male_undecided_to_mechanical += 1
        elif sex[2] == "2":
            male_undecided_to_renewable += 1
        elif sex[2] == "3":
            male_undecided_to_glass += 1
        elif sex[2] == "4":
            male_undecided_to_bio += 1
        elif sex[2] == "5":
            male_undecided_to_materials += 1
        elif sex[2] == "6":
            male_undecided_to_ceramic += 1
        elif sex[2] == "7":
            male_undecided_to_las += 1
        elif sex[2] == "8":
            male_undecided_to_cps += 1
        elif sex[2] == "9":
            male_undecided_to_soap += 1
        elif sex[2] == "10":
            male_undecided_to_sob += 1
        elif sex[2] == "11":
            male_undecided_to_unknown += 1
    elif sex[1] == "1":
        male_mechanical += 1
        if sex[2] == "0":
            male_mechanical_to_undecided += 1
        elif sex[2] == "1":

```

```

        male_mechanical_to_mechanical += 1
    elif sex[2] == "2":
        male_mechanical_to_renewable += 1
    elif sex[2] == "3":
        male_mechanical_to_glass += 1
    elif sex[2] == "4":
        male_mechanical_to_bio += 1
    elif sex[2] == "5":
        male_mechanical_to_materials += 1
    elif sex[2] == "6":
        male_mechanical_to_ceramic += 1
    elif sex[2] == "7":
        male_mechanical_to_las += 1
    elif sex[2] == "8":
        male_mechanical_to_cps += 1
    elif sex[2] == "9":
        male_mechanical_to_soal += 1
    elif sex[2] == "10":
        male_mechanical_to_sob += 1
    elif sex[2] == "11":
        male_mechanical_to_unknown += 1
elif sex[1] == "2":
    male_renewable += 1
    if sex[2] == "0":
        male_renewable_to_undecided += 1
    elif sex[2] == "1":
        male_renewable_to_mechanical += 1
    elif sex[2] == "2":
        male_renewable_to_renewable += 1
    elif sex[2] == "3":
        male_renewable_to_glass += 1
    elif sex[2] == "4":
        male_renewable_to_bio += 1
    elif sex[2] == "5":
        male_renewable_to_materials += 1
    elif sex[2] == "6":
        male_renewable_to_ceramic += 1
    elif sex[2] == "7":
        male_renewable_to_las += 1
    elif sex[2] == "8":
        male_renewable_to_cps += 1
    elif sex[2] == "9":
        male_renewable_to_soal += 1
    elif sex[2] == "10":
        male_renewable_to_sob += 1
    elif sex[2] == "11":
        male_renewable_to_unknown += 1
elif sex[1] == "3":
    male_glass += 1
    if sex[2] == "0":
        male_glass_to_undecided += 1
    elif sex[2] == "1":
        male_glass_to_mechanical += 1
    elif sex[2] == "2":
        male_glass_to_renewable += 1
    elif sex[2] == "3":
        male_glass_to_glass += 1
    elif sex[2] == "4":
        male_glass_to_bio += 1
    elif sex[2] == "5":
        male_glass_to_materials += 1
    elif sex[2] == "6":
        male_glass_to_ceramic += 1

```

```

        elif sex[2] == "7":
            male_glass_to_las += 1
        elif sex[2] == "8":
            male_glass_to_cps += 1
        elif sex[2] == "9":
            male_glass_to_soad += 1
        elif sex[2] == "10":
            male_glass_to_sob += 1
        elif sex[2] == "11":
            male_glass_to_unknown += 1
    elif sex[1] == "4":
        male_bio += 1
        if sex[2] == "0":
            male_bio_to_undecided += 1
        elif sex[2] == "1":
            male_bio_to_mechanical += 1
        elif sex[2] == "2":
            male_bio_to_renewable += 1
        elif sex[2] == "3":
            male_bio_to_glass += 1
        elif sex[2] == "4":
            male_bio_to_bio += 1
        elif sex[2] == "5":
            male_bio_to_materials += 1
        elif sex[2] == "6":
            male_bio_to_ceramic += 1
        elif sex[2] == "7":
            male_bio_to_las += 1
        elif sex[2] == "8":
            male_bio_to_cps += 1
        elif sex[2] == "9":
            male_bio_to_soad += 1
        elif sex[2] == "10":
            male_bio_to_sob += 1
        elif sex[2] == "11":
            male_bio_to_unknown += 1
    elif sex[1] == "5":
        male_materials += 1
        if sex[2] == "0":
            male_materials_to_undecided += 1
        elif sex[2] == "1":
            male_materials_to_mechanical += 1
        elif sex[2] == "2":
            male_materials_to_renewable += 1
        elif sex[2] == "3":
            male_materials_to_glass += 1
        elif sex[2] == "4":
            male_materials_to_bio += 1
        elif sex[2] == "5":
            male_materials_to_materials += 1
        elif sex[2] == "6":
            male_materials_to_ceramic += 1
        elif sex[2] == "7":
            male_materials_to_las += 1
        elif sex[2] == "8":
            male_materials_to_cps += 1
        elif sex[2] == "9":
            male_materials_to_soad += 1
        elif sex[2] == "10":
            male_materials_to_sob += 1
        elif sex[2] == "11":
            male_materials_to_unknown += 1
    elif sex[1] == "6":

```

```

male_ceramic += 1
if sex[2] == "0":
    male_ceramic_to_undecided += 1
elif sex[2] == "1":
    male_ceramic_to_mechanical += 1
elif sex[2] == "2":
    male_ceramic_to_renewable += 1
elif sex[2] == "3":
    male_ceramic_to_glass += 1
elif sex[2] == "4":
    male_ceramic_to_bio += 1
elif sex[2] == "5":
    male_ceramic_to_materials += 1
elif sex[2] == "6":
    male_ceramic_to_ceramic += 1
elif sex[2] == "7":
    male_ceramic_to_las += 1
elif sex[2] == "8":
    male_ceramic_to_cps += 1
elif sex[2] == "9":
    male_ceramic_to_soad += 1
elif sex[2] == "10":
    male_ceramic_to_sob += 1
elif sex[2] == "11":
    male_ceramic_to_unknown += 1
elif sex[1] == "7":
    male_las += 1
    if sex[2] == "0":
        male_las_to_undecided += 1
    elif sex[2] == "1":
        male_las_to_mechanical += 1
    elif sex[2] == "2":
        male_las_to_renewable += 1
    elif sex[2] == "3":
        male_las_to_glass += 1
    elif sex[2] == "4":
        male_las_to_bio += 1
    elif sex[2] == "5":
        male_las_to_materials += 1
    elif sex[2] == "6":
        male_las_to_ceramic += 1
    elif sex[2] == "7":
        male_las_to_las += 1
    elif sex[2] == "8":
        male_las_to_cps += 1
    elif sex[2] == "9":
        male_las_to_soad += 1
    elif sex[2] == "10":
        male_las_to_sob += 1
    elif sex[2] == "11":
        male_las_to_unknown += 1
elif sex[1] == "8":
    male_cps += 1
    if sex[2] == "0":
        male_cps_to_undecided += 1
    elif sex[2] == "1":
        male_cps_to_mechanical += 1
    elif sex[2] == "2":
        male_cps_to_renewable += 1
    elif sex[2] == "3":
        male_cps_to_glass += 1
    elif sex[2] == "4":
        male_cps_to_bio += 1

```

```

elif sex[2] == "5":
    male_cps_to_materials += 1
elif sex[2] == "6":
    male_cps_to_ceramic += 1
elif sex[2] == "7":
    male_cps_to_las += 1
elif sex[2] == "8":
    male_cps_to_cps += 1
elif sex[2] == "9":
    male_cps_to_soal += 1
elif sex[2] == "10":
    male_cps_to_sob += 1
elif sex[2] == "11":
    male_cps_to_unknown += 1
elif sex[1] == "9":
    male_soal += 1
    if sex[2] == "0":
        male_soal_to_undecided += 1
    elif sex[2] == "1":
        male_soal_to_mechanical += 1
    elif sex[2] == "2":
        male_soal_to_renewable += 1
    elif sex[2] == "3":
        male_soal_to_glass += 1
    elif sex[2] == "4":
        male_soal_to_bio += 1
    elif sex[2] == "5":
        male_soal_to_materials += 1
    elif sex[2] == "6":
        male_soal_to_ceramic += 1
    elif sex[2] == "7":
        male_soal_to_las += 1
    elif sex[2] == "8":
        male_soal_to_cps += 1
    elif sex[2] == "9":
        male_soal_to_soal += 1
    elif sex[2] == "10":
        male_soal_to_sob += 1
    elif sex[2] == "11":
        male_soal_to_unknown += 1
elif sex[1] == "10":
    male_sob += 1
    if sex[2] == "0":
        male_sob_to_undecided += 1
    elif sex[2] == "1":
        male_sob_to_mechanical += 1
    elif sex[2] == "2":
        male_sob_to_renewable += 1
    elif sex[2] == "3":
        male_sob_to_glass += 1
    elif sex[2] == "4":
        male_sob_to_bio += 1
    elif sex[2] == "5":
        male_sob_to_materials += 1
    elif sex[2] == "6":
        male_sob_to_ceramic += 1
    elif sex[2] == "7":
        male_sob_to_las += 1
    elif sex[2] == "8":
        male_sob_to_cps += 1
    elif sex[2] == "9":
        male_sob_to_soal += 1
    elif sex[2] == "10":

```



```

        male_sob_to_sob += 1
        elif sex[2] == "11":
            male_sob_to_unknown += 1
        elif sex[1] == "11":
            male_unknown += 1
        else:
            print("Error on line ", count)
    else:
        print("Error on line ", count)
    count += 1

print("female_undecided: ", female_undecided)
print("female_undecided_to_undecided: ", female_undecided_to_undecided)
print("female_undecided_to_mechanical: ", female_undecided_to_mechanical)
print("female_undecided_to_renewable: ", female_undecided_to_renewable)
print("female_undecided_to_glass: ", female_undecided_to_glass)
print("female_undecided_to_bio: ", female_undecided_to_bio)
print("female_undecided_to_materials: ", female_undecided_to_materials)
print("female_undecided_to_ceramic: ", female_undecided_to_ceramic)
print("female_undecided_to_las: ", female_undecided_to_las)
print("female_undecided_to_cps: ", female_undecided_to_cps)
print("female_undecided_to_soal: ", female_undecided_to_soal)
print("female_undecided_to_sob: ", female_undecided_to_sob)
print("female_undecided_to_unknown: ", female_undecided_to_unknown)
print("-----")
print("male_undecided: ", male_undecided)
print("male_undecided_to_undecided: ", male_undecided_to_undecided)
print("male_undecided_to_mechanical: ", male_undecided_to_mechanical)
print("male_undecided_to_renewable: ", male_undecided_to_renewable)
print("male_undecided_to_glass: ", male_undecided_to_glass)
print("male_undecided_to_bio: ", male_undecided_to_bio)
print("male_undecided_to_materials: ", male_undecided_to_materials)
print("male_undecided_to_ceramic: ", male_undecided_to_ceramic)
print("male_undecided_to_las: ", male_undecided_to_las)
print("male_undecided_to_cps: ", male_undecided_to_cps)
print("male_undecided_to_soal: ", male_undecided_to_soal)
print("male_undecided_to_sob: ", male_undecided_to_sob)
print("male_undecided_to_unknown: ", male_undecided_to_unknown)
print("-----")
print("female_mechanical: ", female_mechanical)
print("female_mechanical_to_undecided: ", female_mechanical_to_undecided)
print("female_mechanical_to_mechanical: ", female_mechanical_to_mechanical)
print("female_mechanical_to_renewable: ", female_mechanical_to_renewable)
print("female_mechanical_to_glass: ", female_mechanical_to_glass)
print("female_mechanical_to_bio: ", female_mechanical_to_bio)
print("female_mechanical_to_materials: ", female_mechanical_to_materials)
print("female_mechanical_to_ceramic: ", female_mechanical_to_ceramic)
print("female_mechanical_to_las: ", female_mechanical_to_las)
print("female_mechanical_to_cps: ", female_mechanical_to_cps)
print("female_mechanical_to_soal: ", female_mechanical_to_soal)
print("female_mechanical_to_sob: ", female_mechanical_to_sob)
print("female_mechanical_to_unknown: ", female_mechanical_to_unknown)
print("-----")
print("male_mechanical: ", male_mechanical)
print("male_mechanical_to_undecided: ", male_mechanical_to_undecided)
print("male_mechanical_to_mechanical: ", male_mechanical_to_mechanical)
print("male_mechanical_to_renewable: ", male_mechanical_to_renewable)
print("male_mechanical_to_glass: ", male_mechanical_to_glass)
print("male_mechanical_to_bio: ", male_mechanical_to_bio)
print("male_mechanical_to_materials: ", male_mechanical_to_materials)
print("male_mechanical_to_ceramic: ", male_mechanical_to_ceramic)
print("male_mechanical_to_las: ", male_mechanical_to_las)
print("male_mechanical_to_cps: ", male_mechanical_to_cps)

```

```

print("male_mechanical_to_soap: ", male_mechanical_to_soap)
print("male_mechanical_to_sob: ", male_mechanical_to_sob)
print("male_mechanical_to_unknown: ", male_mechanical_to_unknown)
print("-----")
print("female_renewable: ", female_renewable)
print("female_renewable_to_undecided: ", female_renewable_to_undecided)
print("female_renewable_to_mechanical: ", female_renewable_to_mechanical)
print("female_renewable_to_renewable: ", female_renewable_to_renewable)
print("female_renewable_to_glass: ", female_renewable_to_glass)
print("female_renewable_to_bio: ", female_renewable_to_bio)
print("female_renewable_to_materials: ", female_renewable_to_materials)
print("female_renewable_to_ceramic: ", female_renewable_to_ceramic)
print("female_renewable_to_las: ", female_renewable_to_las)
print("female_renewable_to_cps: ", female_renewable_to_cps)
print("female_renewable_to_soap: ", female_renewable_to_soap)
print("female_renewable_to_sob: ", female_renewable_to_sob)
print("female_renewable_to_unknown: ", female_renewable_to_unknown)
print("-----")
print("male_renewable: ", male_renewable)
print("male_renewable_to_undecided: ", male_renewable_to_undecided)
print("male_renewable_to_mechanical: ", male_renewable_to_mechanical)
print("male_renewable_to_renewable: ", male_renewable_to_renewable)
print("male_renewable_to_glass: ", male_renewable_to_glass)
print("male_renewable_to_bio: ", male_renewable_to_bio)
print("male_renewable_to_materials: ", male_renewable_to_materials)
print("male_renewable_to_ceramic: ", male_renewable_to_ceramic)
print("male_renewable_to_las: ", male_renewable_to_las)
print("male_renewable_to_cps: ", male_renewable_to_cps)
print("male_renewable_to_soap: ", male_renewable_to_soap)
print("male_renewable_to_sob: ", male_renewable_to_sob)
print("male_renewable_to_unknown: ", male_renewable_to_unknown)
print("-----")
print("female_glass: ", female_glass)
print("female_glass_to_undecided: ", female_glass_to_undecided)
print("female_glass_to_mechanical: ", female_glass_to_mechanical)
print("female_glass_to_renewable: ", female_glass_to_renewable)
print("female_glass_to_glass: ", female_glass_to_glass)
print("female_glass_to_bio: ", female_glass_to_bio)
print("female_glass_to_materials: ", female_glass_to_materials)
print("female_glass_to_las: ", female_glass_to_ceramic)
print("female_glass_to_cps: ", female_glass_to_cps)
print("female_glass_to_soap: ", female_glass_to_soap)
print("female_glass_to_sob: ", female_glass_to_sob)
print("female_glass_to_unknown: ", female_glass_to_unknown)
print("-----")
print("male_glass: ", male_glass)
print("male_glass_to_undecided: ", male_glass_to_undecided)
print("male_glass_to_mechanical: ", male_glass_to_mechanical)
print("male_glass_to_renewable: ", male_glass_to_renewable)
print("male_glass_to_glass: ", male_glass_to_glass)
print("male_glass_to_bio: ", male_glass_to_bio)
print("male_glass_to_materials: ", male_glass_to_materials)
print("male_glass_to_las: ", male_glass_to_ceramic)
print("male_glass_to_cps: ", male_glass_to_cps)
print("male_glass_to_soap: ", male_glass_to_soap)
print("male_glass_to_sob: ", male_glass_to_sob)
print("male_glass_to_unknown: ", male_glass_to_unknown)
print("-----")
print("female_bio: ", female_bio)
print("female_bio_to_undecided: ", female_bio_to_undecided)
print("female_bio_to_mechanical: ", female_bio_to_mechanical)
print("female_bio_to_renewable: ", female_bio_to_renewable)
print("female_bio_to_glass: ", female_bio_to_glass)

```

```

print("female_bio_to_bio: ", female_bio_to_bio)
print("female_bio_to_materials: ", female_bio_to_materials)
print("female_bio_to_ceramic: ", female_bio_to_ceramic)
print("female_bio_to_las: ", female_bio_to_las)
print("female_bio_to_cps: ", female_bio_to_cps)
print("female_bio_to_soal: ", female_bio_to_soal)
print("female_bio_to_sob: ", female_bio_to_sob)
print("female_bio_to_unknown: ", female_bio_to_unknown)
print("-----")
print("male_bio: ", male_bio)
print("male_bio_to_undecided: ", male_bio_to_undecided)
print("male_bio_to_mechanical: ", male_bio_to_mechanical)
print("male_bio_to_renewable: ", male_bio_to_renewable)
print("male_bio_to_glass: ", male_bio_to_glass)
print("male_bio_to_bio: ", male_bio_to_bio)
print("male_bio_to_materials: ", male_bio_to_materials)
print("male_bio_to_ceramic: ", male_bio_to_ceramic)
print("male_bio_to_las: ", male_bio_to_las)
print("male_bio_to_cps: ", male_bio_to_cps)
print("male_bio_to_soal: ", male_bio_to_soal)
print("male_bio_to_sob: ", male_bio_to_sob)
print("male_bio_to_unknown: ", male_bio_to_unknown)
print("-----")
print("female_materials: ", female_materials)
print("female_materials_to_undecided: ", female_materials_to_undecided)
print("female_materials_to_mechanical: ", female_materials_to_mechanical)
print("female_materials_to_renewable: ", female_materials_to_renewable)
print("female_materials_to_glass: ", female_materials_to_glass)
print("female_materials_to_bio: ", female_materials_to_bio)
print("female_materials_to_materials: ", female_materials_to_materials)
print("female_materials_to_ceramic: ", female_materials_to_ceramic)
print("female_materials_to_las: ", female_materials_to_las)
print("female_materials_to_cps: ", female_materials_to_cps)
print("female_materials_to_soal: ", female_materials_to_soal)
print("female_materials_to_sob: ", female_materials_to_sob)
print("female_materials_to_unknown: ", female_materials_to_unknown)
print("-----")
print("male_materials: ", male_materials)
print("male_materials_to_undecided: ", male_materials_to_undecided)
print("male_materials_to_mechanical: ", male_materials_to_mechanical)
print("male_materials_to_renewable: ", male_materials_to_renewable)
print("male_materials_to_glass: ", male_materials_to_glass)
print("male_materials_to_bio: ", male_materials_to_bio)
print("male_materials_to_materials: ", male_materials_to_materials)
print("male_materials_to_ceramic: ", male_materials_to_ceramic)
print("male_materials_to_las: ", male_materials_to_las)
print("male_materials_to_cps: ", male_materials_to_cps)
print("male_materials_to_soal: ", male_materials_to_soal)
print("male_materials_to_sob: ", male_materials_to_sob)
print("male_materials_to_unknown: ", male_materials_to_unknown)
print("-----")
print("female_ceramic: ", female_ceramic)
print("female_ceramic_to_undecided: ", female_ceramic_to_undecided)
print("female_ceramic_to_mechanical: ", female_ceramic_to_mechanical)
print("female_ceramic_to_renewable: ", female_ceramic_to_renewable)
print("female_ceramic_to_glass: ", female_ceramic_to_glass)
print("female_ceramic_to_bio: ", female_ceramic_to_bio)
print("female_ceramic_to_materials: ", female_ceramic_to_materials)
print("female_ceramic_to_ceramic: ", female_ceramic_to_ceramic)
print("female_ceramic_to_las: ", female_ceramic_to_las)
print("female_ceramic_to_cps: ", female_ceramic_to_cps)
print("female_ceramic_to_soal: ", female_ceramic_to_soal)
print("female_ceramic_to_sob: ", female_ceramic_to_sob)

```

```

print("female_ceramic_to_unknown: ", female_ceramic_to_unknown)
print("-----")
print("male_ceramic: ", male_ceramic)
print("male_ceramic_to_undecided: ", male_ceramic_to_undecided)
print("male_ceramic_to_mechanical: ", male_ceramic_to_mechanical)
print("male_ceramic_to_renewable: ", male_ceramic_to_renewable)
print("male_ceramic_to_glass: ", male_ceramic_to_glass)
print("male_ceramic_to_bio: ", male_ceramic_to_bio)
print("male_ceramic_to_materials: ", male_ceramic_to_materials)
print("male_ceramic_to_ceramic: ", male_ceramic_to_ceramic)
print("male_ceramic_to_las: ", male_ceramic_to_las)
print("male_ceramic_to_cps: ", male_ceramic_to_cps)
print("male_ceramic_to_soal: ", male_ceramic_to_soal)
print("male_ceramic_to_sob: ", male_ceramic_to_sob)
print("male_ceramic_to_unknown: ", male_ceramic_to_unknown)
print("-----")
print("female_las: ", female_las)
print("female_las_to_undecided: ", female_las_to_undecided)
print("female_las_to_mechanical: ", female_las_to_mechanical)
print("female_las_to_renewable: ", female_las_to_renewable)
print("female_las_to_glass: ", female_las_to_glass)
print("female_las_to_bio: ", female_las_to_bio)
print("female_las_to_materials: ", female_las_to_materials)
print("female_las_to_ceramic: ", female_las_to_ceramic)
print("female_las_to_las: ", female_las_to_las)
print("female_las_to_cps: ", female_las_to_cps)
print("female_las_to_soal: ", female_las_to_soal)
print("female_las_to_sob: ", female_las_to_sob)
print("female_las_to_unknown: ", female_las_to_unknown)
print("-----")
print("male_las ", male_las)
print("male_las_to_undecided: ", male_las_to_undecided)
print("male_las_to_mechanical: ", male_las_to_mechanical)
print("male_las_to_renewable: ", male_las_to_renewable)
print("male_las_to_glass: ", male_las_to_glass)
print("male_las_to_bio: ", male_las_to_bio)
print("male_las_to_materials: ", male_las_to_materials)
print("male_las_to_ceramic: ", male_las_to_ceramic)
print("male_las_to_las: ", male_las_to_las)
print("male_las_to_cps: ", male_las_to_cps)
print("male_las_to_soal: ", male_las_to_soal)
print("male_las_to_sob: ", male_las_to_sob)
print("male_las_to_unknown: ", male_las_to_unknown)
print("-----")
print("female_cps: ", female_cps)
print("female_cps_to_undecided: ", female_cps_to_undecided)
print("female_cps_to_mechanical: ", female_cps_to_mechanical)
print("female_cps_to_renewable: ", female_cps_to_renewable)
print("female_cps_to_glass: ", female_cps_to_glass)
print("female_cps_to_bio: ", female_cps_to_bio)
print("female_cps_to_materials: ", female_cps_to_materials)
print("female_cps_to_ceramic: ", female_cps_to_ceramic)
print("female_cps_to_las: ", female_cps_to_las)
print("female_cps_to_cps: ", female_cps_to_cps)
print("female_cps_to_soal: ", female_cps_to_soal)
print("female_cps_to_sob: ", female_cps_to_sob)
print("female_cps_to_unknown: ", female_cps_to_unknown)
print("-----")
print("male_cps: ", male_cps)
print("male_cps_to_undecided: ", male_cps_to_undecided)
print("male_cps_to_mechanical: ", male_cps_to_mechanical)
print("male_cps_to_renewable: ", male_cps_to_renewable)
print("male_cps_to_glass: ", male_cps_to_glass)

```

```

print("male_cps_to_bio: ", male_cps_to_bio)
print("male_cps_to_materials: ", male_cps_to_materials)
print("male_cps_to_ceramic: ", male_cps_to_ceramic)
print("male_cps_to_las: ", male_cps_to_las)
print("male_cps_to_cps: ", male_cps_to_cps)
print("male_cps_to_soal: ", male_cps_to_soal)
print("male_cps_to_sob: ", male_cps_to_sob)
print("male_cps_to_unknown: ", male_cps_to_unknown)
print("-----")
print("female_soal: ", female_soal)
print("female_soal_to_undecided: ", female_soal_to_undecided)
print("female_soal_to_mechanical: ", female_soal_to_mechanical)
print("female_soal_to_renewable: ", female_soal_to_renewable)
print("female_soal_to_glass: ", female_soal_to_undecided)
print("female_soal_to_bio: ", female_soal_to_bio)
print("female_soal_to_materials: ", female_soal_to_materials)
print("female_soal_to_ceramic: ", female_soal_to_ceramic)
print("female_soal_to_las: ", female_soal_to_las)
print("female_soal_to_cps: ", female_soal_to_cps)
print("female_soal_to_soal: ", female_soal_to_soal)
print("female_soal_to_sob: ", female_soal_to_sob)
print("female_soal_to_unknown: ", female_soal_to_unknown)
print("-----")
print("male_soal: ", male_soal)
print("male_soal_to_undecided: ", male_soal_to_undecided)
print("male_soal_to_mechanical: ", male_soal_to_mechanical)
print("male_soal_to_renewable: ", male_soal_to_renewable)
print("male_soal_to_glass: ", male_soal_to_glass)
print("male_soal_to_bio: ", male_soal_to_bio)
print("male_soal_to_materials: ", male_soal_to_materials)
print("male_soal_to_ceramic: ", male_soal_to_ceramic)
print("male_soal_to_las: ", male_soal_to_las)
print("male_soal_to_cps: ", male_soal_to_cps)
print("male_soal_to_soal: ", male_soal_to_soal)
print("male_soal_to_sob: ", male_soal_to_sob)
print("male_soal_to_unknown: ", male_soal_to_unknown)
print("-----")
print("female_sob: ", female_sob)
print("female_sob_to_undecided: ", female_sob_to_undecided)
print("female_sob_to_mechanical: ", female_sob_to_mechanical)
print("female_sob_to_renewable: ", female_sob_to_renewable)
print("female_sob_to_glass: ", female_sob_to_glass)
print("female_sob_to_bio: ", female_sob_to_bio)
print("female_sob_to_materials: ", female_sob_to_materials)
print("female_sob_to_ceramic: ", female_sob_to_ceramic)
print("female_sob_to_las: ", female_sob_to_las)
print("female_sob_to_cps: ", female_sob_to_cps)
print("female_sob_to_soal: ", female_sob_to_soal)
print("female_sob_to_sob: ", female_sob_to_sob)
print("female_sob_to_unknown: ", female_sob_to_unknown)
print("-----")
print("male_sob: ", male_sob)
print("male_sob_to_undecided: ", male_sob_to_undecided)
print("male_sob_to_mechanical: ", male_sob_to_mechanical)
print("male_sob_to_renewable: ", male_sob_to_renewable)
print("male_sob_to_glass: ", male_sob_to_glass)
print("male_sob_to_bio: ", male_sob_to_bio)
print("male_sob_to_materials: ", male_sob_to_materials)
print("male_sob_to_ceramic: ", male_sob_to_ceramic)
print("male_sob_to_las: ", male_sob_to_las)
print("male_sob_to_cps: ", male_sob_to_cps)
print("male_sob_to_soal: ", male_sob_to_soal)
print("male_sob_to_sob: ", male_sob_to_sob)

```

```

print("male_sob_to_unknown: ", male_sob_to_unknown)
print("-----")
print("female_unknown: ", female_unknown)
print("female_unknown_to_undecided: ", female_unknown_to_undecided)
print("female_unknown_to_mechanical: ", female_unknown_to_mechanical)
print("female_unknown_to_renewable: ", female_unknown_to_renewable)
print("female_unknown_to_glass: ", female_unknown_to_glass)
print("female_unknown_to_bio: ", female_unknown_to_bio)
print("female_unknown_to_materials: ", female_unknown_to_materials)
print("female_unknown_to_ceramic: ", female_unknown_to_ceramic)
print("female_unknown_to_las: ", female_unknown_to_las)
print("female_unknown_to_cps: ", female_unknown_to_cps)
print("female_unknown_to_soal: ", female_unknown_to_soal)
print("female_unknown_to_sob: ", female_unknown_to_sob)
print("female_unknown_to_unknown: ", female_unknown_to_unknown)
print("-----")
print("male_unknown: ", male_unknown)
print("male_unknown_to_undecided: ", male_unknown_to_undecided)
print("male_unknown_to_mechanical: ", male_unknown_to_mechanical)
print("male_unknown_to_renewable: ", male_unknown_to_renewable)
print("male_unknown_to_glass: ", male_unknown_to_glass)
print("male_unknown_to_bio: ", male_unknown_to_bio)
print("male_unknown_to_materials: ", male_unknown_to_materials)
print("male_unknown_to_ceramic: ", male_unknown_to_ceramic)
print("male_unknown_to_las: ", male_unknown_to_las)
print("male_unknown_to_cps: ", male_unknown_to_cps)
print("male_unknown_to_soal: ", male_unknown_to_soal)
print("male_unknown_to_sob: ", male_unknown_to_sob)
print("male_unknown_to_unknown: ", male_unknown_to_unknown)

```

### ➤ Major Data Program

- Initial and Current Major Data Programs were the same with the exception of saying Initial or Current in the “with open” statement. The code shown is from the Initial Major Data Program.

```

__author__ = 'Fossum'

with open('Initial Major Data With Sex Separation.txt', 'r+', encoding='utf-8') as a:
    print(a.name)
    female_undecided = 0
    male_undecided = 0
    female_mechanical = 0
    male_mechanical = 0
    female_renewable = 0
    male_renewable = 0
    female_glass = 0
    male_glass = 0
    female_bio = 0
    male_bio = 0
    female_materials = 0
    male_materials = 0
    female_ceramic = 0
    male_ceramic = 0
    female_las = 0

```

```

male_las = 0
female_cps = 0
male_cps = 0
female_soal = 0
male_soal = 0
female_sob = 0
male_sob = 0
female_unknown = 0
male_unknown = 0
count = 1
a.seek(0)
for line in a:
    sex = line.strip('\r\n').split('\t')
    if sex[0] == "0":
        if sex[1] == "0":
            female_undecided += 1
        elif sex[1] == "1":
            female_mechanical += 1
        elif sex[1] == "2":
            female_renewable += 1
        elif sex[1] == "3":
            female_glass += 1
        elif sex[1] == "4":
            female_bio += 1
        elif sex[1] == "5":
            female_materials += 1
        elif sex[1] == "6":
            female_ceramic += 1
        elif sex[1] == "7":
            female_las += 1
        elif sex[1] == "8":
            female_cps += 1
        elif sex[1] == "9":
            female_soal += 1
        elif sex[1] == "10":
            female_sob += 1
        elif sex[1] == "11":
            female_unknown += 1
        else:
            print("Error on line ", count)
    elif sex[0] == "1":
        if sex[1] == "0":
            male_undecided += 1
        elif sex[1] == "1":
            male_mechanical += 1
        elif sex[1] == "2":
            male_renewable += 1
        elif sex[1] == "3":
            male_glass += 1
        elif sex[1] == "4":
            male_bio += 1
        elif sex[1] == "5":
            male_materials += 1
        elif sex[1] == "6":
            male_ceramic += 1
        elif sex[1] == "7":
            male_las += 1
        elif sex[1] == "8":
            male_cps += 1
        elif sex[1] == "9":
            male_soal += 1
        elif sex[1] == "10":
            male_sob += 1

```

```

        elif sex[1] == "11":
            male_unknown += 1
        else:
            print("Error on line ", count)
    else:
        print("Error on line ", count)
    count += 1
print("Female Undecided: ", female_undecided)
print("Female Mechanical: ", female_mechanical)
print("Female Renewable: ", female_renewable)
print("Female Glass: ", female_glass)
print("Female Bio-Materials: ", female_bio)
print("Female Materials: ", female_materials)
print("Female Ceramic: ", female_ceramic)
print("Female School of Liberal Arts and Sciences: ", female_las)
print("Female College of Professional Studies: ", female_cps)
print("Female School of Art and Design: ", female_soad)
print("Female School of Business: ", female_sob)
print("Female Unknown: ", female_unknown)
print("-----")
print("Male Undecided: ", male_undecided)
print("Male Mechanical: ", male_mechanical)
print("Male Renewable: ", male_renewable)
print("Male Glass: ", male_glass)
print("Male Bio-Materials: ", male_bio)
print("Male Materials: ", male_materials)
print("Male Ceramic: ", male_ceramic)
print("Male School of Liberal Arts and Sciences: ", male_las)
print("Male College of Professional Studies: ", male_cps)
print("Male School of Art and Design: ", male_soad)
print("Male School of Business: ", male_sob)
print("Male Unknown: ", male_unknown)
print("-----")
total_undecided = female_undecided + male_undecided
total_mechanical = female_mechanical + male_mechanical
total_renewable = female_renewable + male_renewable
total_glass = female_glass + male_glass
total_bio = female_bio + male_bio
total_materials = female_materials + male_materials
total_ceramic = female_ceramic + male_ceramic
total_las = female_las + male_las
total_cps = female_cps + male_cps
total_soad = female_soad + male_soad
total_sob = female_sob + male_sob
total_unknown = female_unknown + male_unknown
print("Total Undecided: ", total_undecided)
print("Total Mechanical: ", total_mechanical)
print("Total Renewable: ", total_renewable)
print("Total Glass: ", total_glass)
print("Total Bio-Materials: ", total_bio)
print("Total Materials: ", total_materials)
print("Total Ceramic: ", total_ceramic)
print("Total School of Liberal Arts and Sciences: ", total_las)
print("Total College of Professional Studies: ", total_cps)
print("Total School of Art and Design: ", total_soad)
print("Total School of Business: ", total_sob)
print("Total Unknown: ", total_unknown)

```



➤ Example Output from Major Change Data

- The 2015, 2016 and 2017 Major Change Data Program output was the same with the exception of saying the corresponding year. The output shown is from 2015 Major Change Data Program.
- Note: Only the first page is shown for the example below.

```
C:\Users\fosssu\AppData\Local\Programs\Python\Python36-32\python.exe "U:/AU 17-18/Honors/Python/2015 Major Change Data.py"
2015 major Data With Sex Separation.txt
female_undecided: 6
female_undecided_to_undecided: 0
female_undecided_to_mechanical: 2
female_undecided_to_renewable: 0
female_undecided_to_glass: 0
female_undecided_to_bio: 0
female_undecided_to_materials: 1
female_undecided_to_ceramic: 1
female_undecided_to_las: 1
female_undecided_to_cps: 0
female_undecided_to_soad: 0
female_undecided_to_sob: 0
female_undecided_to_unknown: 1
-----
male_undecided: 15
male_undecided_to_undecided: 0
male_undecided_to_mechanical: 3
male_undecided_to_renewable: 2
male_undecided_to_glass: 2
male_undecided_to_bio: 0
male_undecided_to_materials: 2
male_undecided_to_ceramic: 5
male_undecided_to_las: 0
male_undecided_to_cps: 0
male_undecided_to_soad: 0
male_undecided_to_sob: 0
male_undecided_to_unknown: 1
-----
female_mechanical: 2
female_mechanical_to_undecided: 0
female_mechanical_to_mechanical: 1
female_mechanical_to_renewable: 0
female_mechanical_to_glass: 0
female_mechanical_to_bio: 0
female_mechanical_to_materials: 0
female_mechanical_to_ceramic: 0
female_mechanical_to_las: 0
female_mechanical_to_cps: 0
female_mechanical_to_soad: 0
female_mechanical_to_sob: 0
female_mechanical_to_unknown: 1
-----
male_mechanical: 38
male_mechanical_to_undecided: 0
male_mechanical_to_mechanical: 29
```

➤ Example Output from Major Data

- Initial and Current Major Data Program Output was the same with the exception of saying Initial or Current. The output shown is from the Initial Major Data Program.

```
C:\Users\fossu\AppData\Local\Programs\Python\Python36-32\python.exe "U:/AU 17-18/Honors/Python/Initial Major Data.py"
Initial Major Data With Sex Separation.txt
Female Undecided: 15
Female Mechanical: 12
Female Renewable: 4
Female Glass: 6
Female Bio-Materials: 15
Female Materials: 11
Female Ceramic: 10
Female School of Liberal Arts and Sciences: 3
Female College of Professional Studies: 0
Female School of Art and Design: 0
Female School of Business: 0
Female Unknown: 0
-----
Male Undecided: 47
Male Mechanical: 110
Male Renewable: 18
Male Glass: 6
Male Bio-Materials: 18
Male Materials: 26
Male Ceramic: 27
Male School of Liberal Arts and Sciences: 3
Male College of Professional Studies: 0
Male School of Art and Design: 0
Male School of Business: 0
Male Unknown: 0
-----
Total Undecided: 62
Total Mechanical: 122
Total Renewable: 22
Total Glass: 12
Total Bio-Materials: 33
Total Materials: 37
Total Ceramic: 37
Total School of Liberal Arts and Sciences: 6
Total College of Professional Studies: 0
Total School of Art and Design: 0
Total School of Business: 0
Total Unknown: 0

Process finished with exit code 0
```

## Sankey Chart Code Example (Coded in Atom 1.26.1)

- This code was modified from an example given on <https://developers.google.com/chart/interactive/docs/gallery/sankey> that was accessed on March 4, 2018. This example is the code to generate Figure 15 (pg. \*\*) but similar code was used to generate all other sankey diagrams.

```
<!DOCTYPE html>

<html>
  <head>
    <title>Sankey Chart</title>
    <body>
      <h1>Male and Female Major Flow for Fall of 2015</h1>
    </body>
    <script type="text/javascript"
src="https://www.gstatic.com/charts/loader.js"></script>
    <script type="text/javascript">
      google.charts.load('current', {'packages':['sankey']});
      google.charts.setOnLoadCallback(drawChart);

      function drawChart() {
        var data = new google.visualization.DataTable();
        data.addColumn('string', 'From');
        data.addColumn('string', 'To');
        data.addColumn('number', 'Weight');
        data.addRows([
          [ 'Male', 'Undecided', 15],
          [ 'Male', 'Mechanical Engineering', 38],
          [ 'Male', 'Renewable Engineering', 9],
          [ 'Male', 'Glass Engineering', 2],
          [ 'Male', 'Bio-Materials Engineering', 9],
          [ 'Male', 'Material Science Engineering', 9],
          [ 'Male', 'Ceramic Engineering', 12],
          [ 'Male', 'School of Liberal Arts and Sciences', 2],

          [ 'Female', 'Undecided', 6],
          [ 'Female', 'Mechanical Engineering', 2],
          [ 'Female', 'Renewable Engineering', 3],
          [ 'Female', 'Glass Engineering', 2],
          [ 'Female', 'Bio-Materials Engineering', 5],
          [ 'Female', 'Material Science Engineering', 5],
          [ 'Female', 'Ceramic Engineering', 6],
          [ 'Female', 'School of Liberal Arts and Sciences', 2],

          [ 'Undecided', ' Mechanical Engineering', 5],
          [ 'Undecided', ' Renewable Engineering', 2],
          [ 'Undecided', ' Glass Engineering', 2],
          [ 'Undecided', ' Material Science Engineering', 3],
          [ 'Undecided', ' Ceramic Engineering', 6],
          [ 'Undecided', ' School of Liberal Arts and Sciences', 1],
          [ 'Undecided', 'Unknown', 2],

          [ 'Mechanical Engineering', ' Mechanical Engineering', 30],
          [ 'Mechanical Engineering', ' Material Science Engineering', 1],
          [ 'Mechanical Engineering', ' College of Professional Studies', 1],
          [ 'Mechanical Engineering', 'Unknown', 8],

          [ 'Renewable Engineering', ' Renewable Engineering', 8],
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[ 'Renewable Engineering', ' School of Liberal Arts and Sciences', 2],
[ 'Renewable Engineering', 'Unknown', 2],

[ 'Glass Engineering', ' Glass Engineering', 4],

[ 'Bio-Materials Engineering', ' Bio-Materials Engineering', 7],
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[ 'Bio-Materials Engineering', 'Unknown', 4],

[ 'Material Science Engineering', ' Material Science Engineering', 13],
[ 'Material Science Engineering', 'Unknown', 1],

[ 'Ceramic Engineering', ' Mechanical Engineering', 1],
[ 'Ceramic Engineering', ' Renewable Engineering', 1],
[ 'Ceramic Engineering', ' Glass Engineering', 1],
[ 'Ceramic Engineering', ' Ceramic Engineering', 13],
[ 'Ceramic Engineering', 'Unknown', 2],

[ 'School of Liberal Arts and Sciences', ' Mechanical Engineering', 2],
[ 'School of Liberal Arts and Sciences', ' Bio-Materials Engineering', 1],
[ 'School of Liberal Arts and Sciences', ' School of Liberal Arts and
Sciences', 1],

[ ' Mechanical Engineering', ' Male', 34],
[ ' Renewable Engineering', ' Male', 10],
[ ' Glass Engineering', ' Male', 5],
[ ' Bio-Materials Engineering', ' Male', 5],
[ ' Material Science Engineering', ' Male', 10],
[ ' Ceramic Engineering', ' Male', 14],
[ ' School of Liberal Arts and Sciences', ' Male', 3],
[ ' College of Professional Studies', ' Male', 1],
[ 'Unknown', ' Male', 14],

[ ' Mechanical Engineering', ' Female', 4],
[ ' Renewable Engineering', ' Female', 1],
[ ' Glass Engineering', ' Female', 2],
[ ' Bio-Materials Engineering', ' Female', 4],
[ ' Material Science Engineering', ' Female', 6],
[ ' Ceramic Engineering', ' Female', 7],
[ ' School of Liberal Arts and Sciences', ' Female', 2],
[ 'Unknown', ' Female', 5]
]);

// Sets chart options.
var options = {
  width: 1500,
  height: 700,
  sankey: {
    node: { label: { fontName: 'Times-Roman',
                    fontSize: 15,
                    bold: true},
            nodePadding: 30,
            width: 5
          }
    },
};

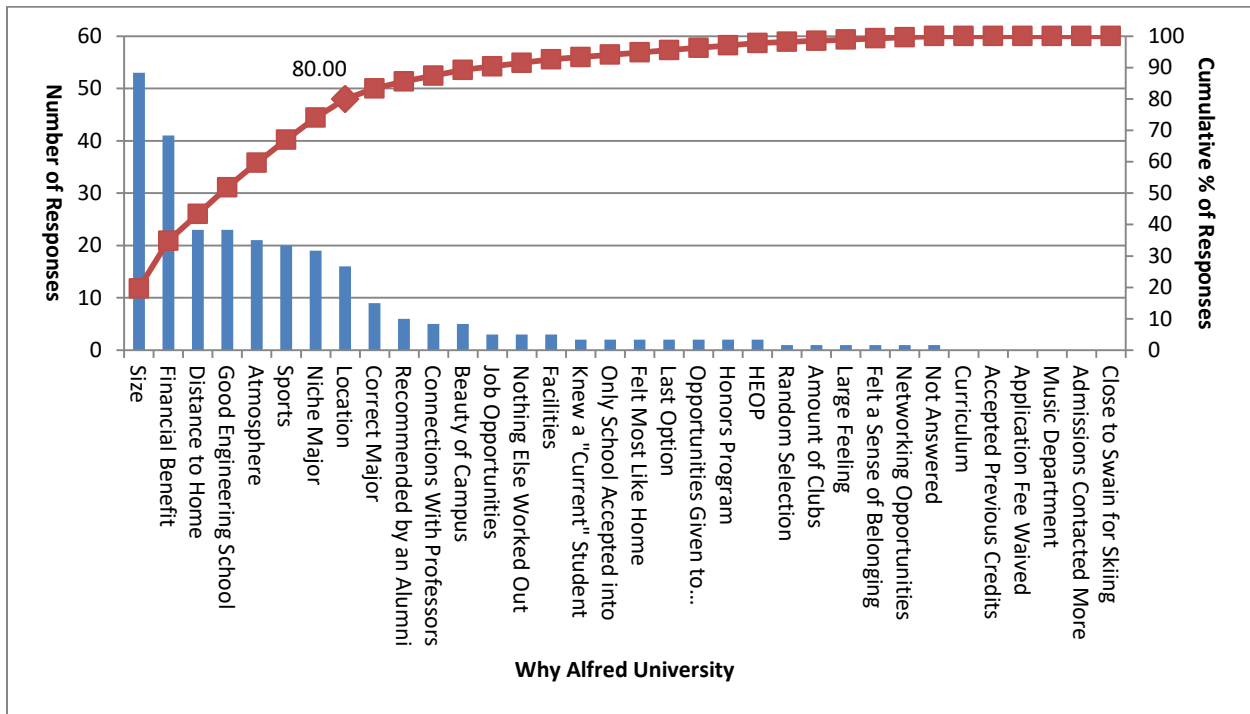
// Instantiates and draws our chart, passing in some options.
var chart = new
google.visualization.Sankey(document.getElementById('sankey_basic'));
chart.draw(data, options);
}

```

```
    </script>
  </head>
  <body>
    <div id="sankey_basic" style="width: 1500px; height: 700px;"></div>
    <div>
      <p>
        If you hover over any of the chart it will give you more detail
      </p>
    </div>
  </body>
</html>
```

## APPENDIX C

### Additional “Why Alfred University” Figures



**Figure C- 18: Entering Class of 2015 Coded Data from Responses answering the Question of " Why Alfred University"; n=127**

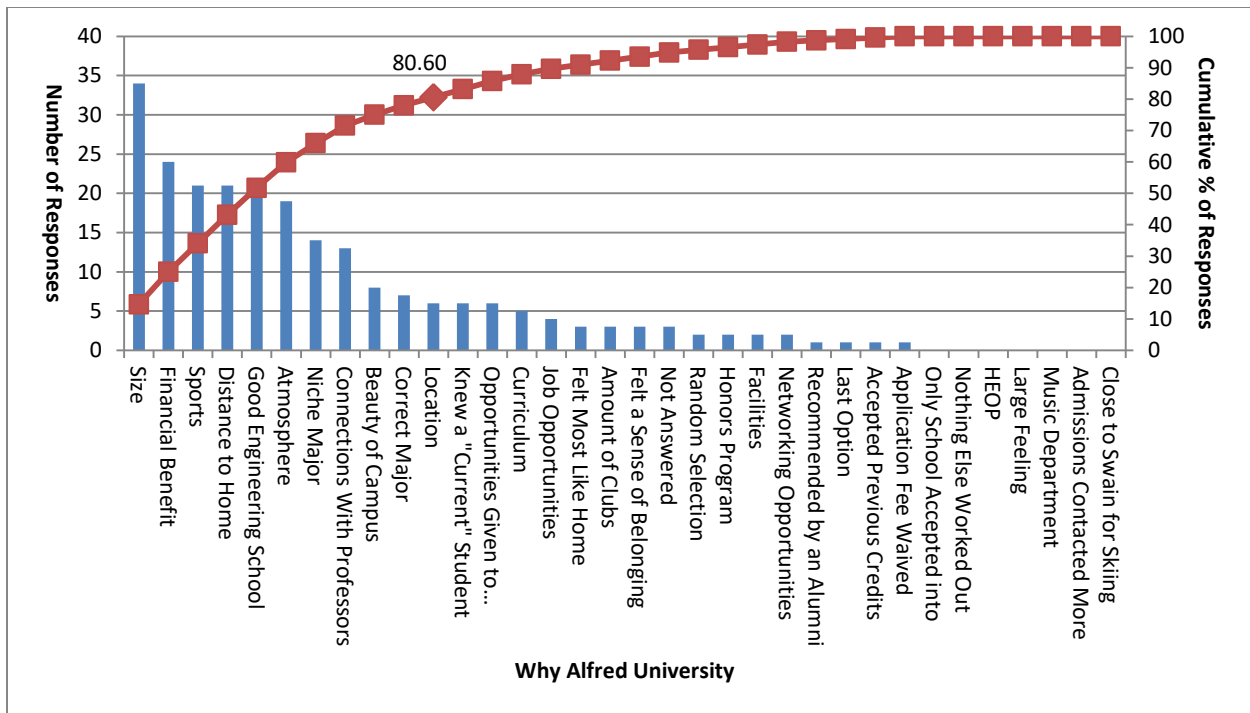


Figure C- 19: Entering Class of 2016 Coded Data from Responses answering the Question of "Why Alfred University"; n=106

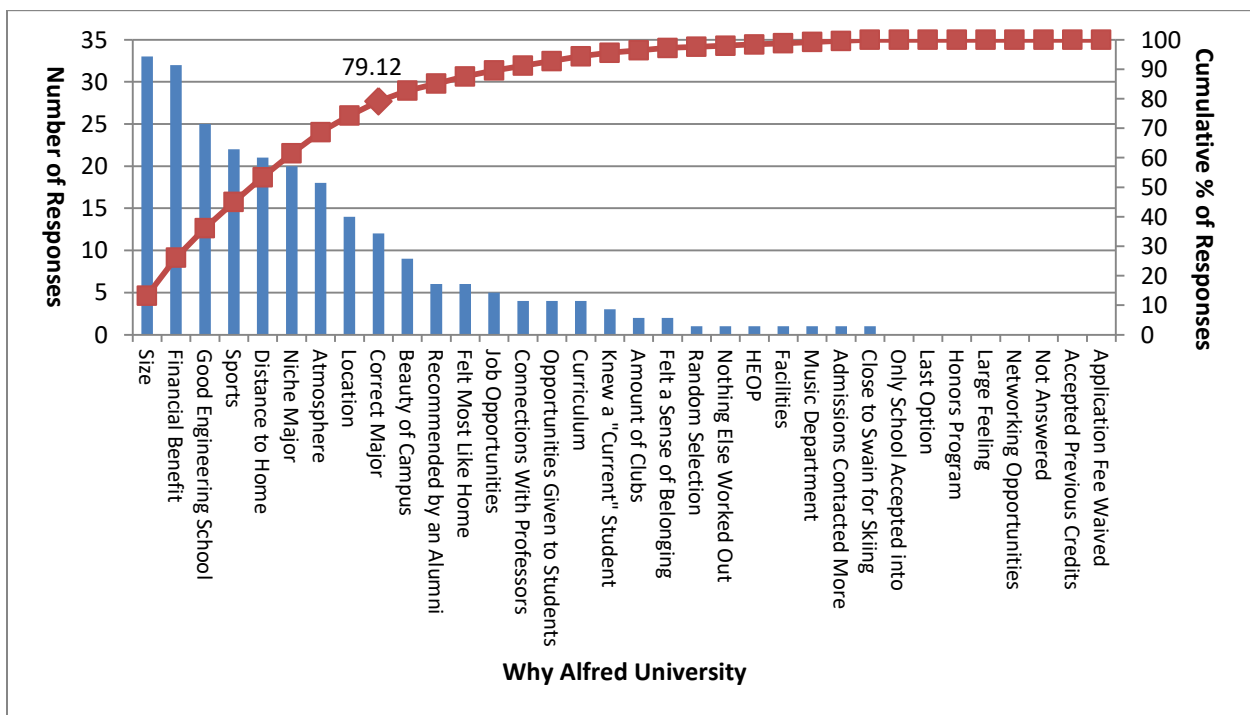


Figure C- 20: Entering Class of 2017 Coded Data from Responses answering the Question of "Why Alfred University"; n=98

## Additional “Why Engineering” Figures

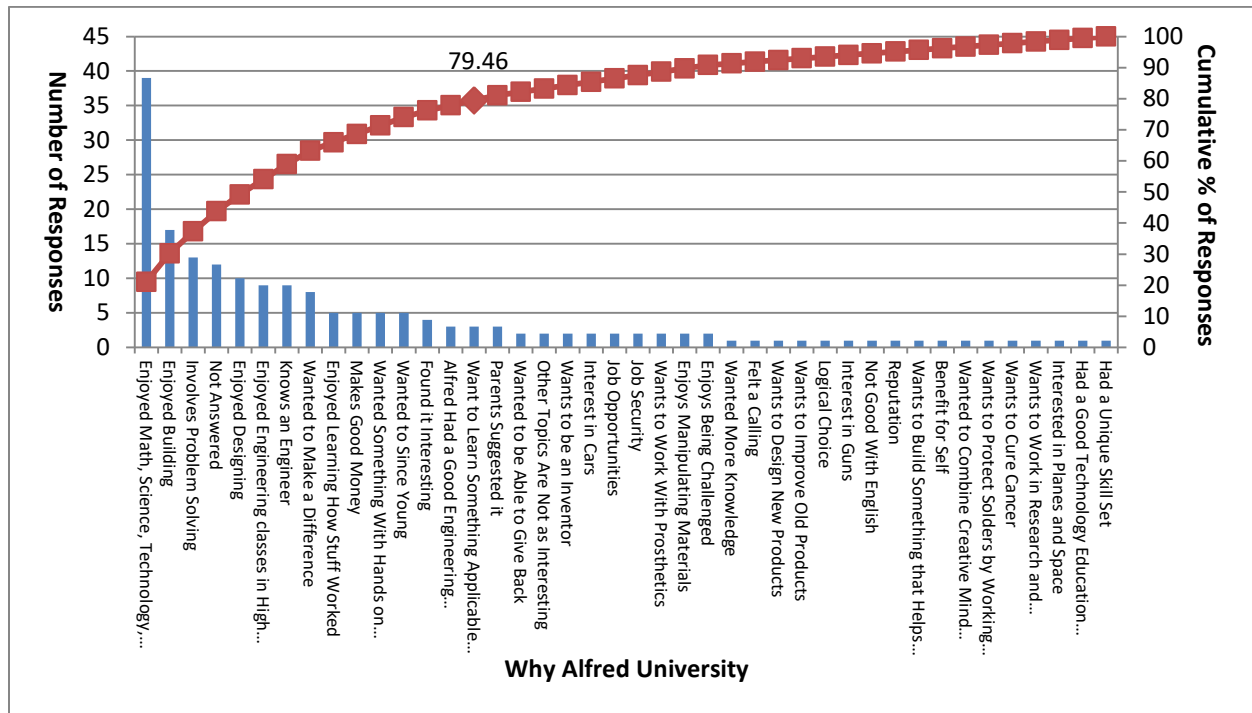


Figure C- 21: Entering Class of 2015 Coded Data from Responses answering the Question of "Why Engineering"; n=127



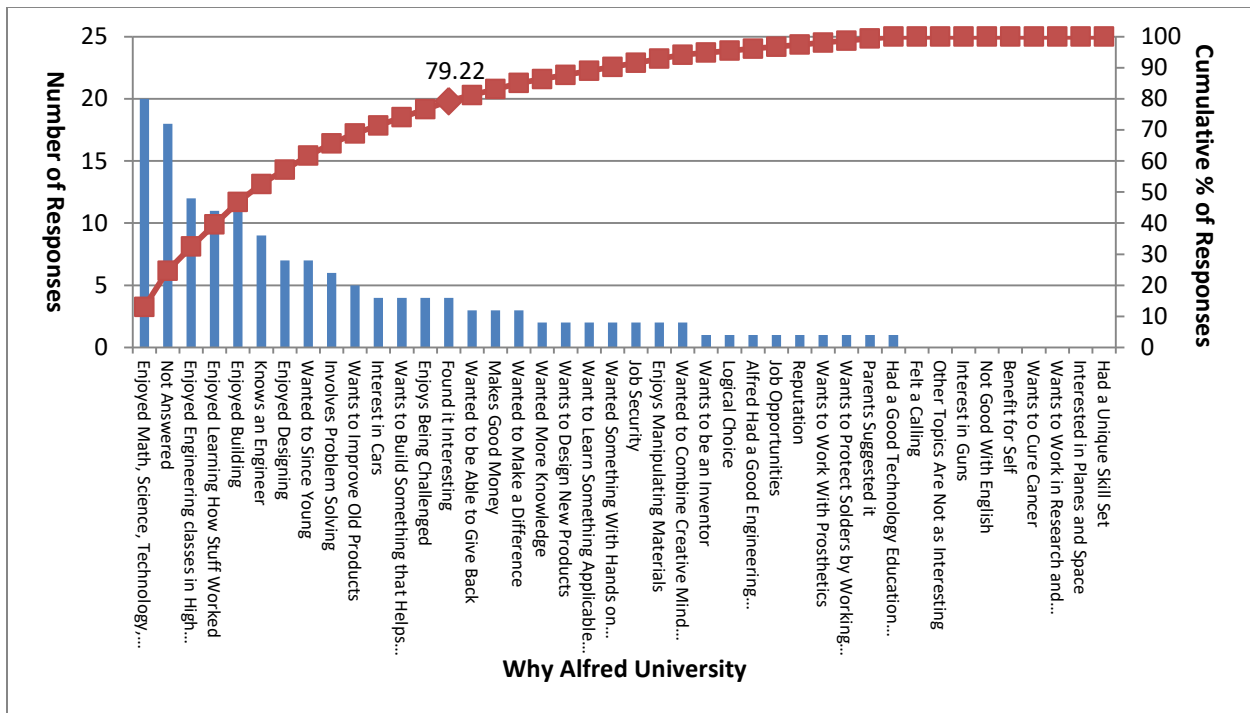


Figure C- 22: Entering Class of 2016 Coded Data from Responses answering the Question of "*Why Engineering*"; n=106

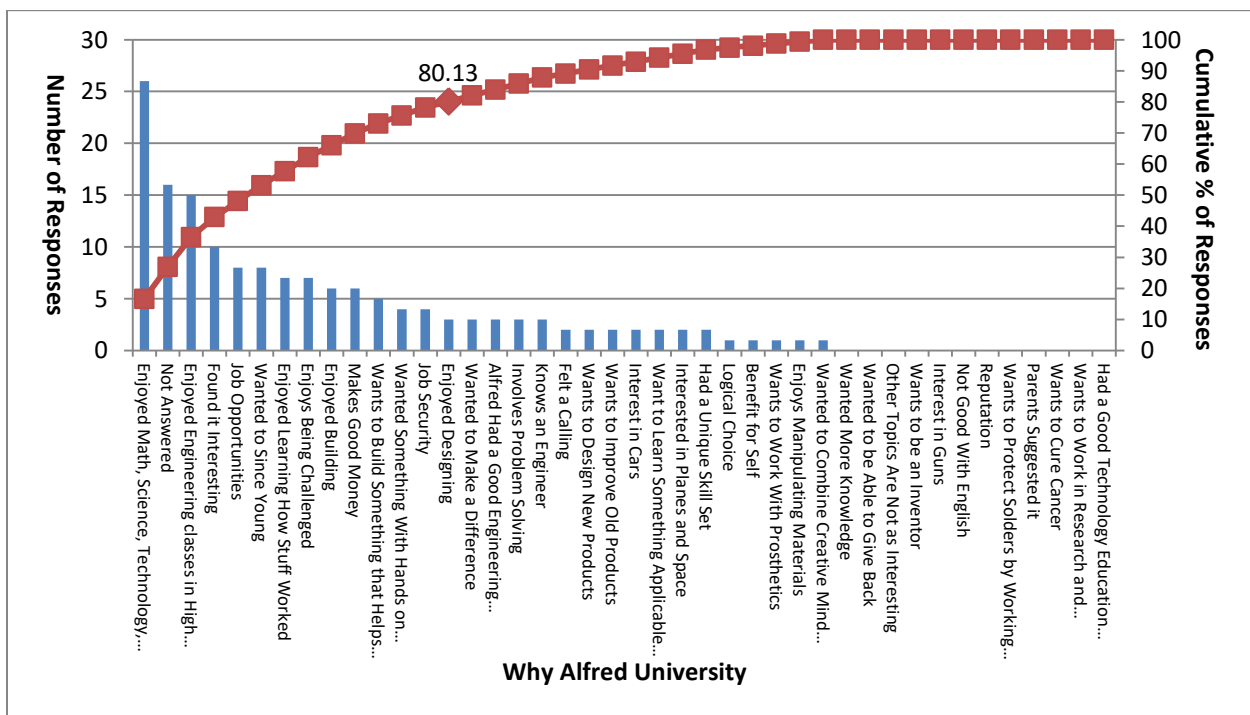
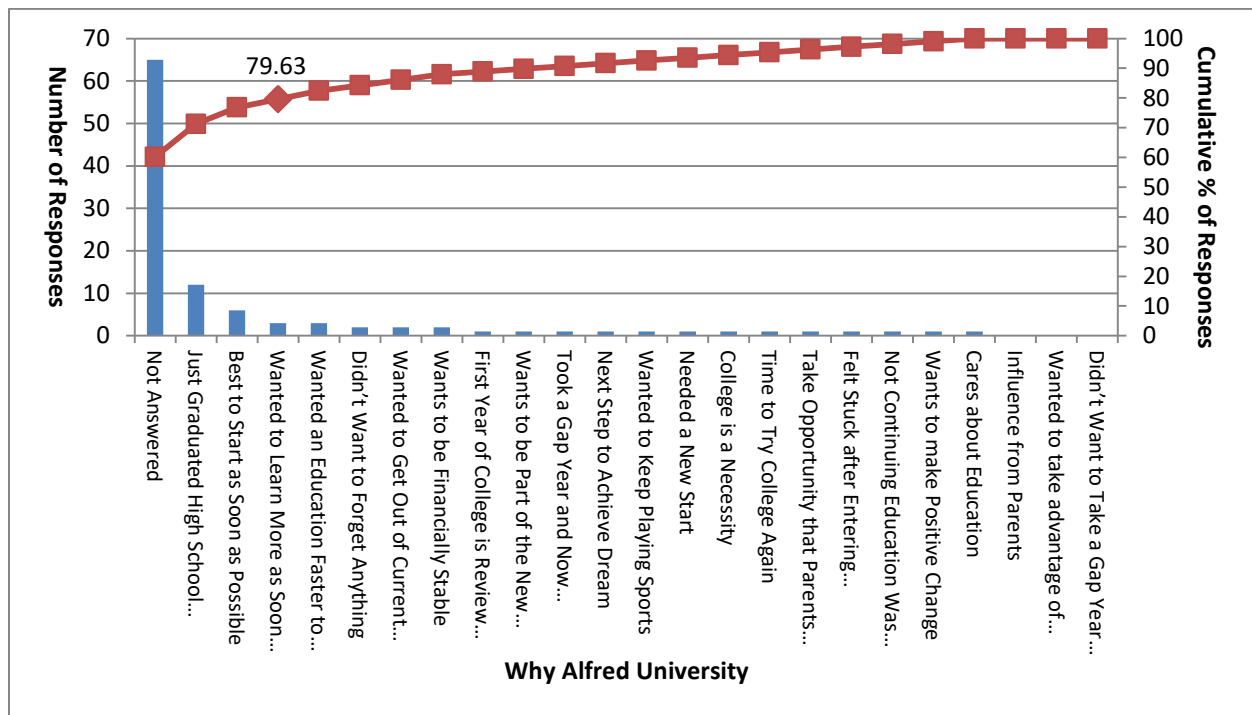


Figure C- 23: Entering Class of 2017 Coded Data from Responses answering the Question of "*Why Engineering*"; n=98

## Additional “Why Now” Figures



**Figure C- 24: Entering Class of 2015 Coded Data from Responses answering the Question of "Why Now";  
n=127**

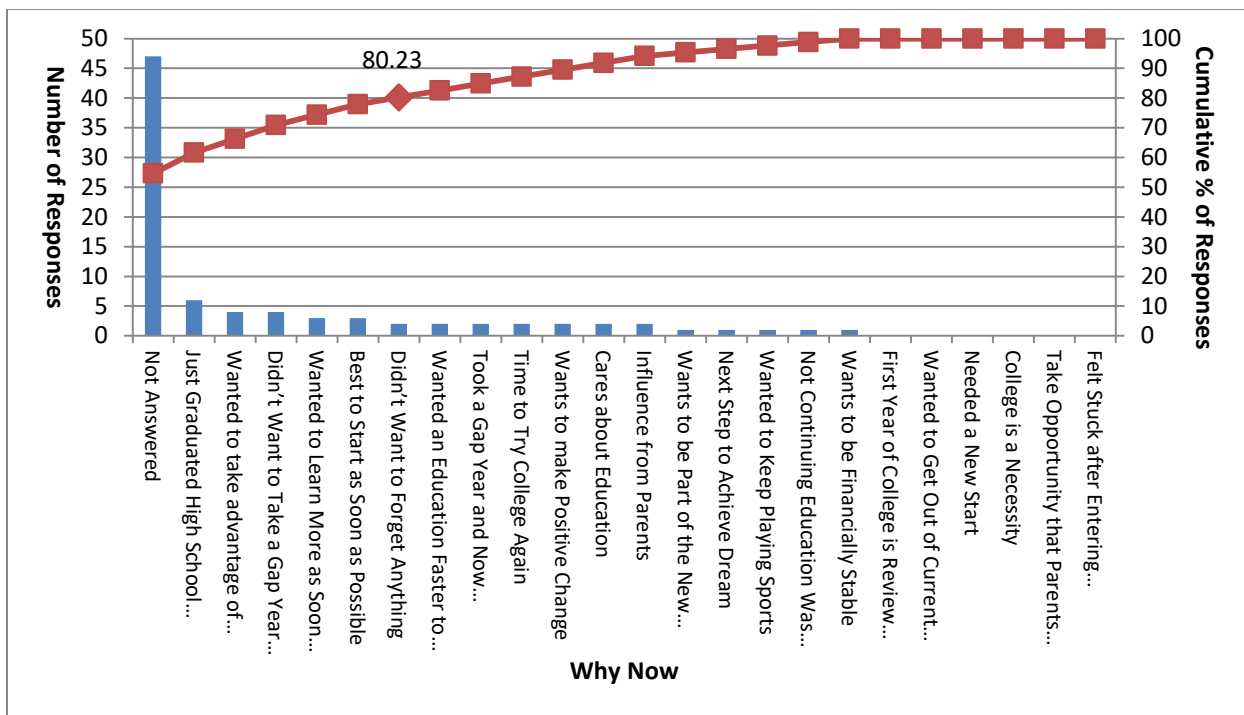


Figure C- 25: Entering Class of 2016 Coded Data from Responses answering the Question of "Why Now";  
n=106

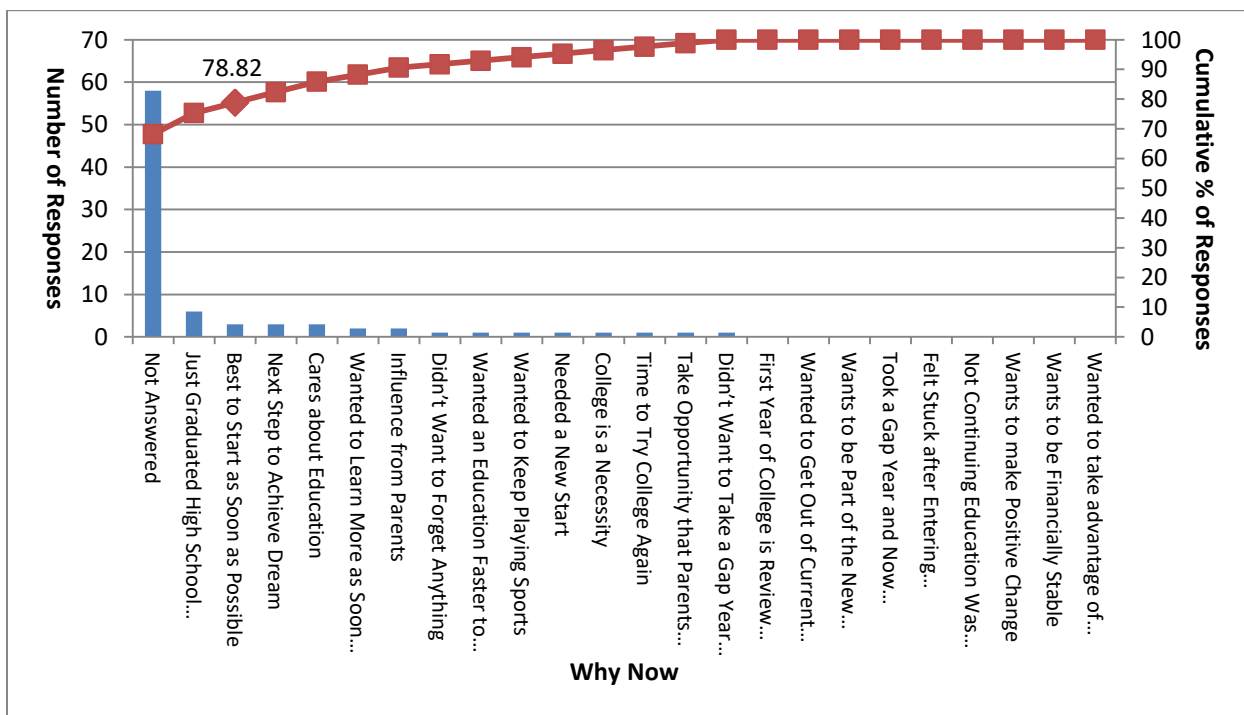
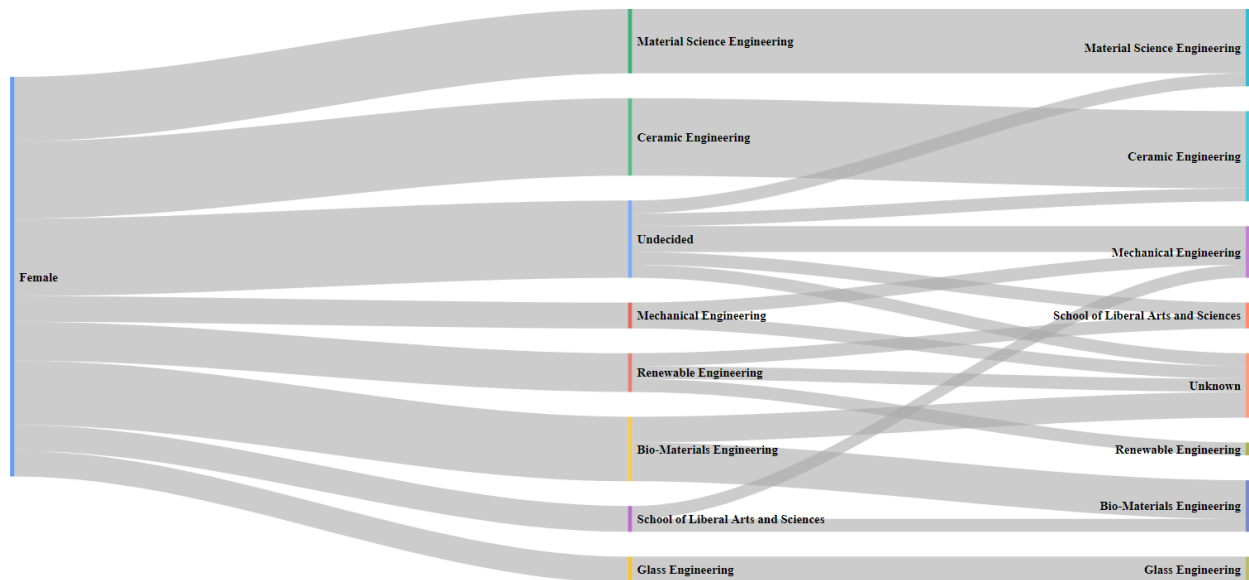
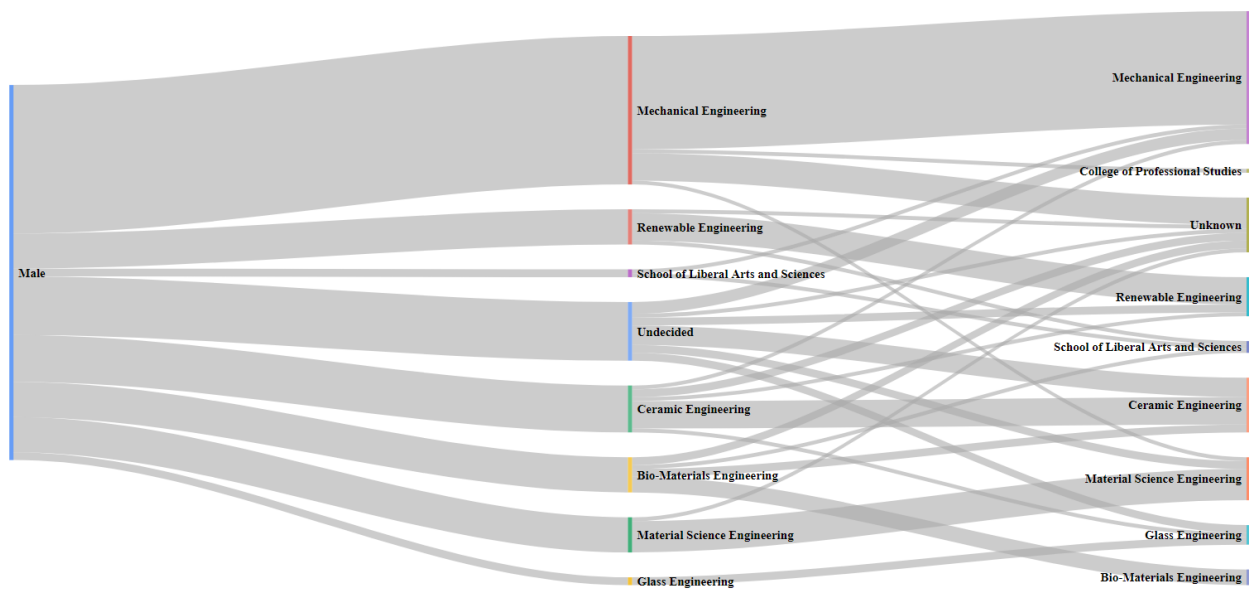


Figure C- 26: Entering Class of 2017 Coded Data from Responses answering the Question of "Why Now";  
n=98

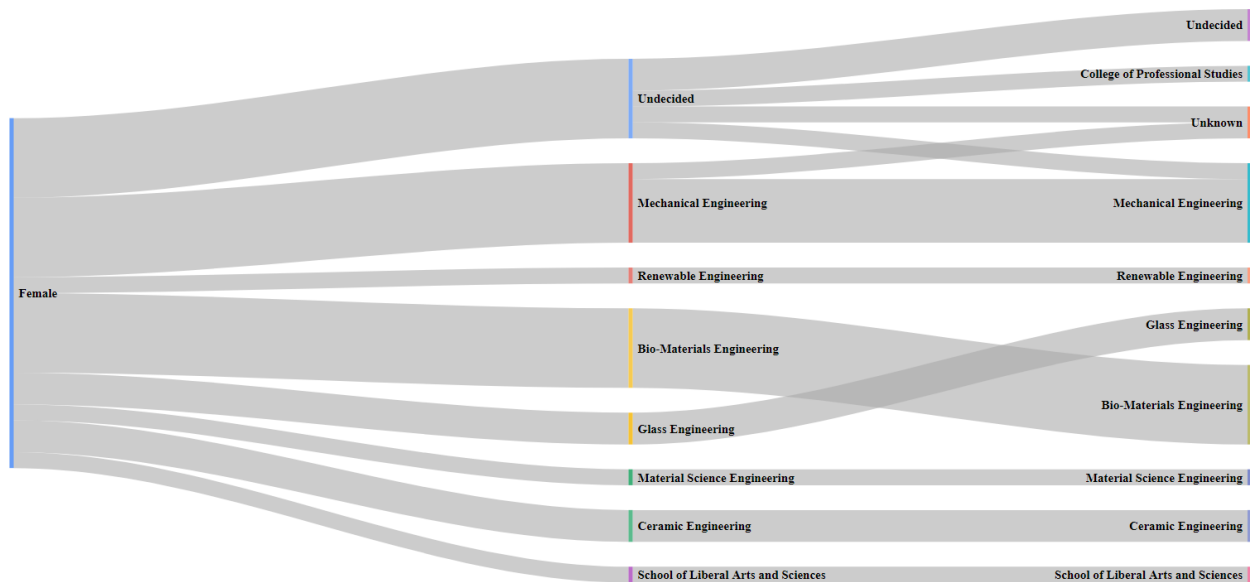
## Additional Sankey Diagrams



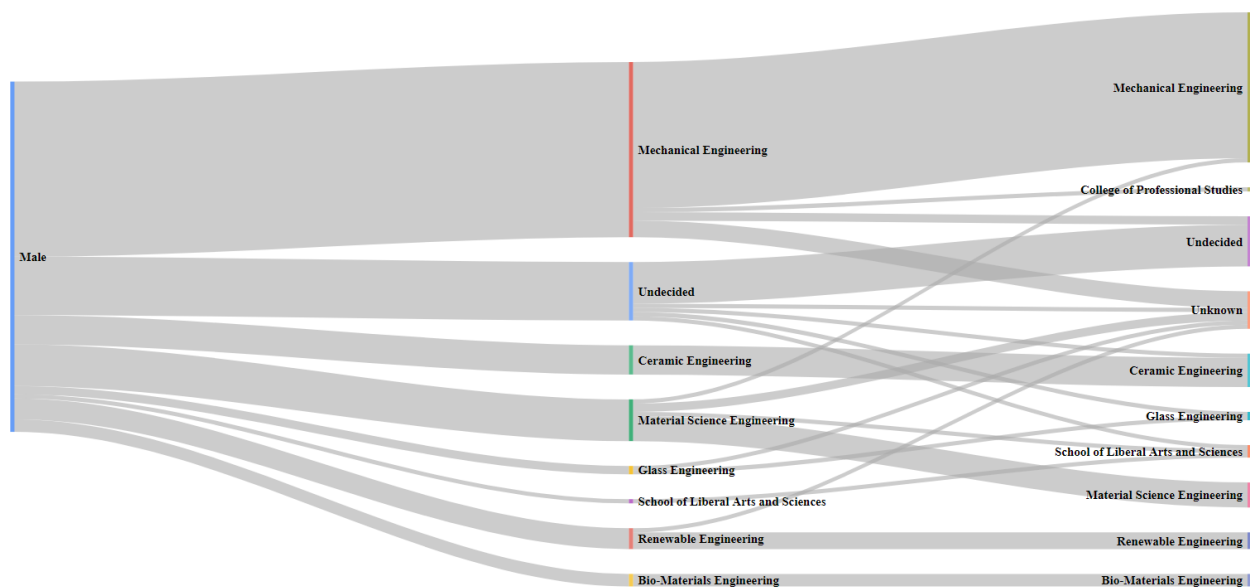
**Figure C- 27: Major Flow for the entering class of 2015 Females. The second node is as of Fall 2015 and the third node as of January 2018. n=30**



**Figure C- 28: Major Flow for the entering class of 2015 Males. The second node is as of Fall 2015 and the third node as of January 2018. n=97**



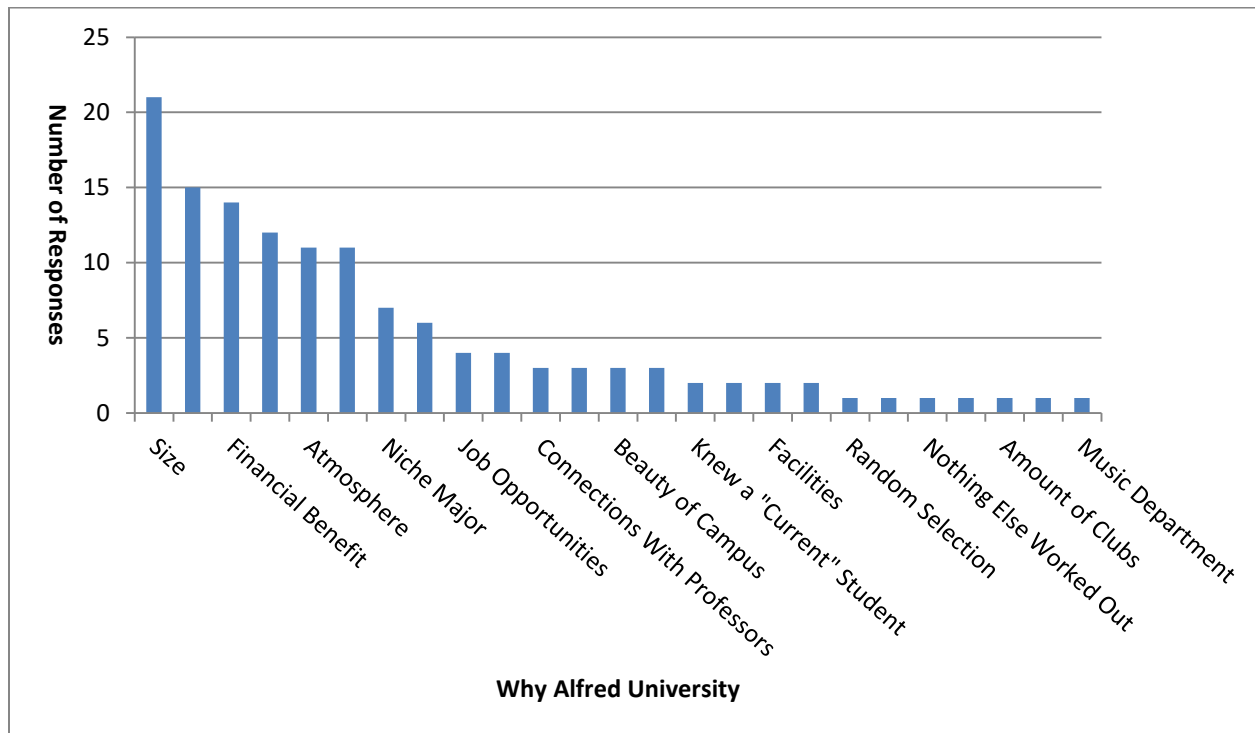
**Figure C- 29: Major Flow for the entering class of 2016 Females. The second node is as of Fall 2016 and the third node as of January 2018. n=22**



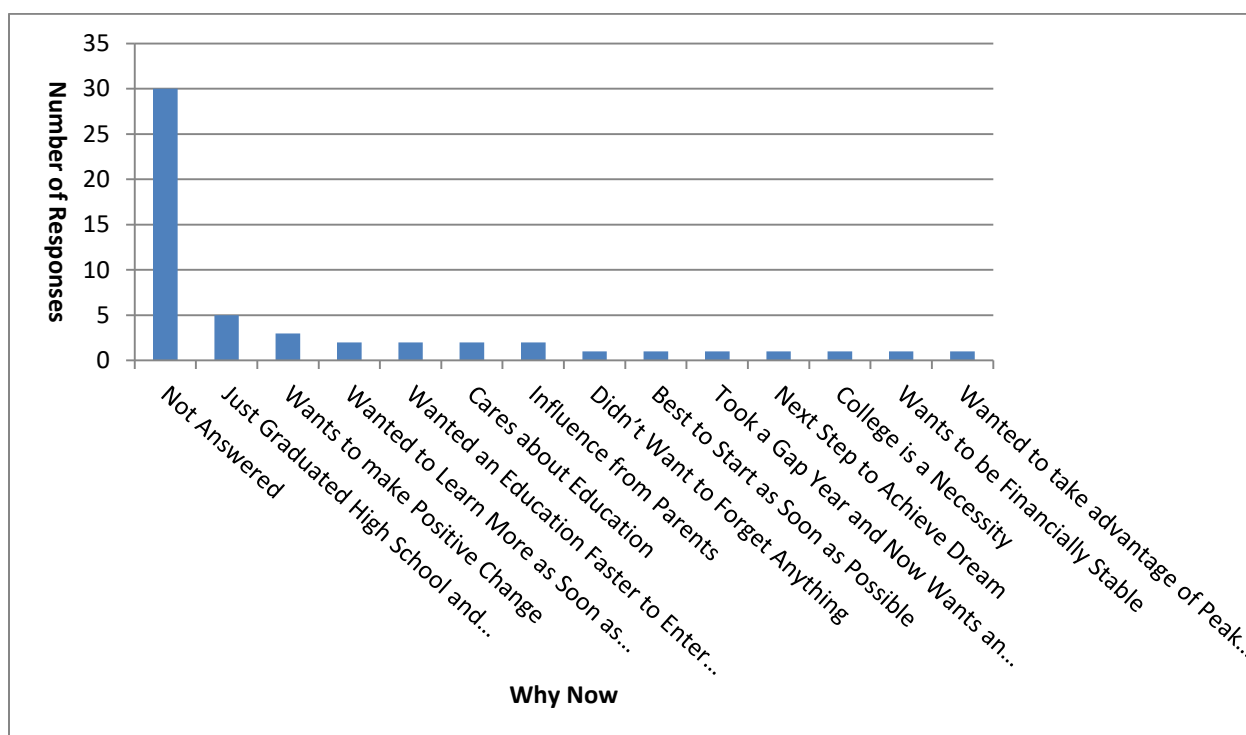
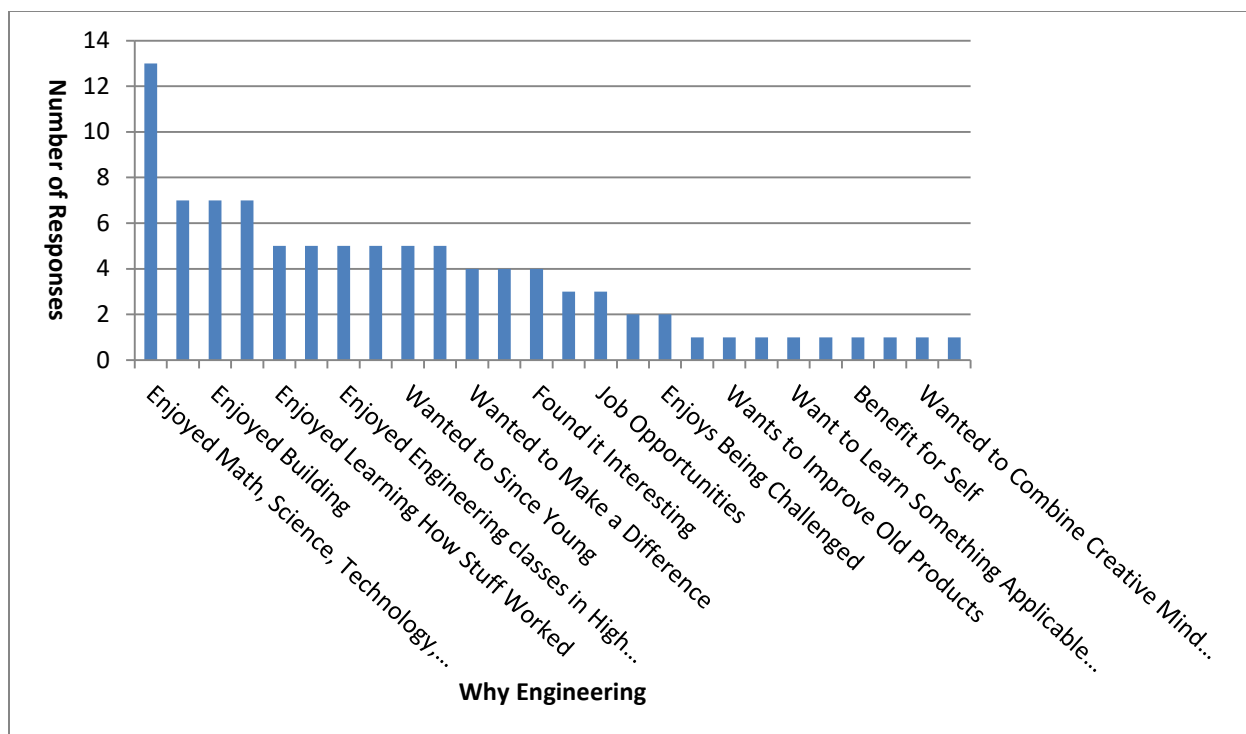
**Figure C- 30: Major Flow for the entering class of 2016 Males. The second node is as of Fall 2016 and the third node as of January 2018. n=84**

## Category Responses to the Three Questions Figures Separated by Major

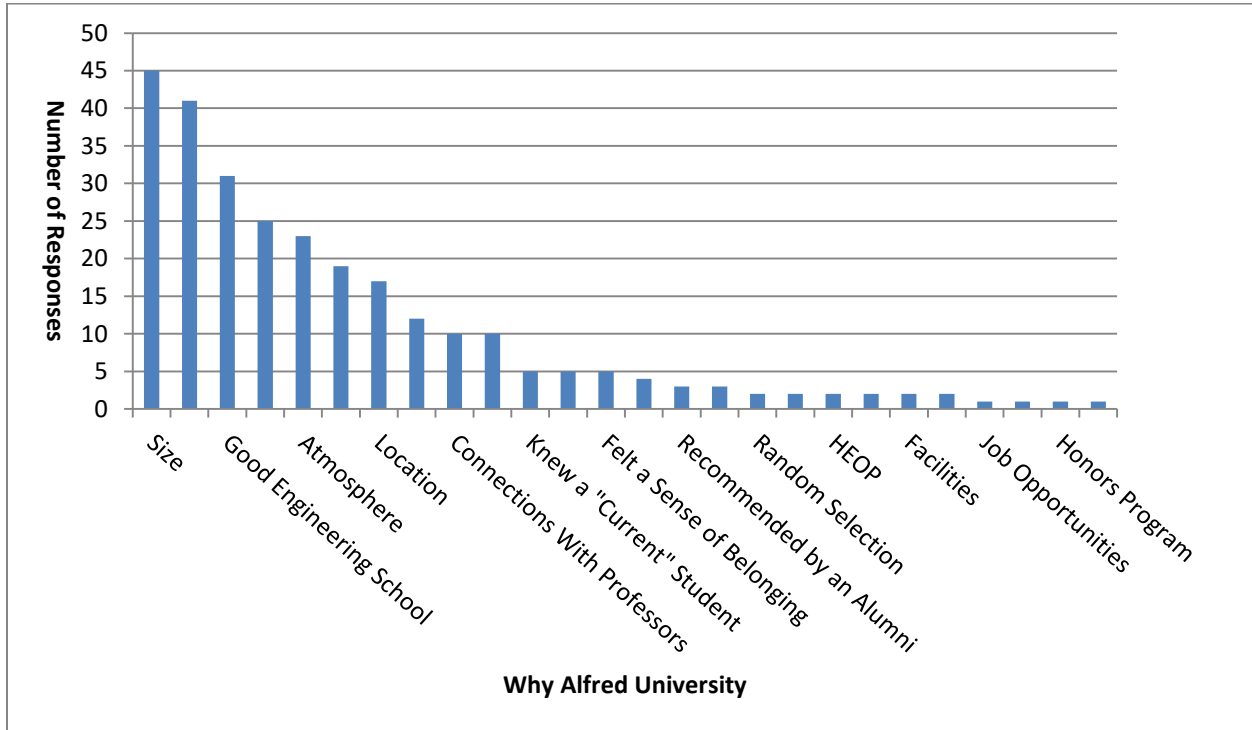
### ➤ Undecided



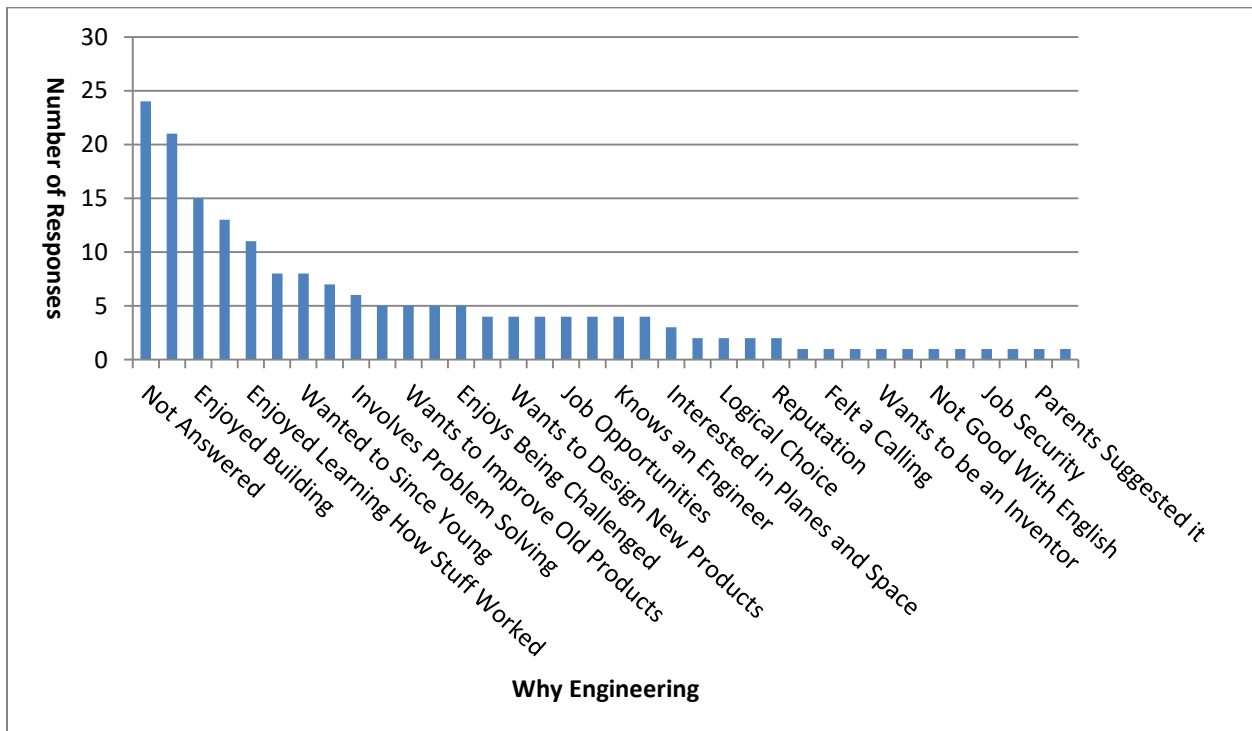
**Figure C- 31: All Coded Data from Responses answering the Question of "Why Alfred University" from Undecided; n=62**



➤ Mechanical Engineering



**Figure C- 34: All Coded Data from Responses answering the Question of "Why Alfred University" from Mechanical Engineering; n=122**



**Figure C- 35: All Coded Data from Responses answering the Question of "Why Engineering" from Mechanical Engineering; n=122**



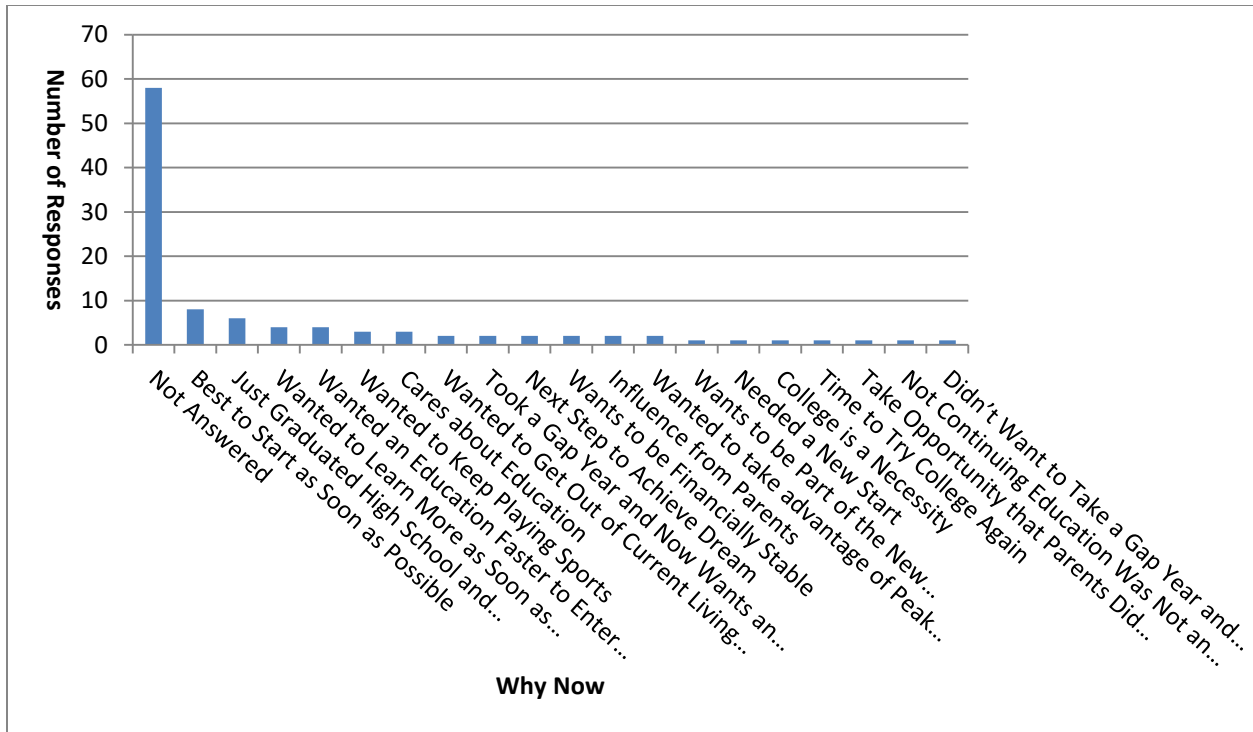


Figure C- 36: All Coded Data from Responses answering the Question of "Why Now" from Mechanical Engineering; n=122

➤ Renewable Energy Engineering

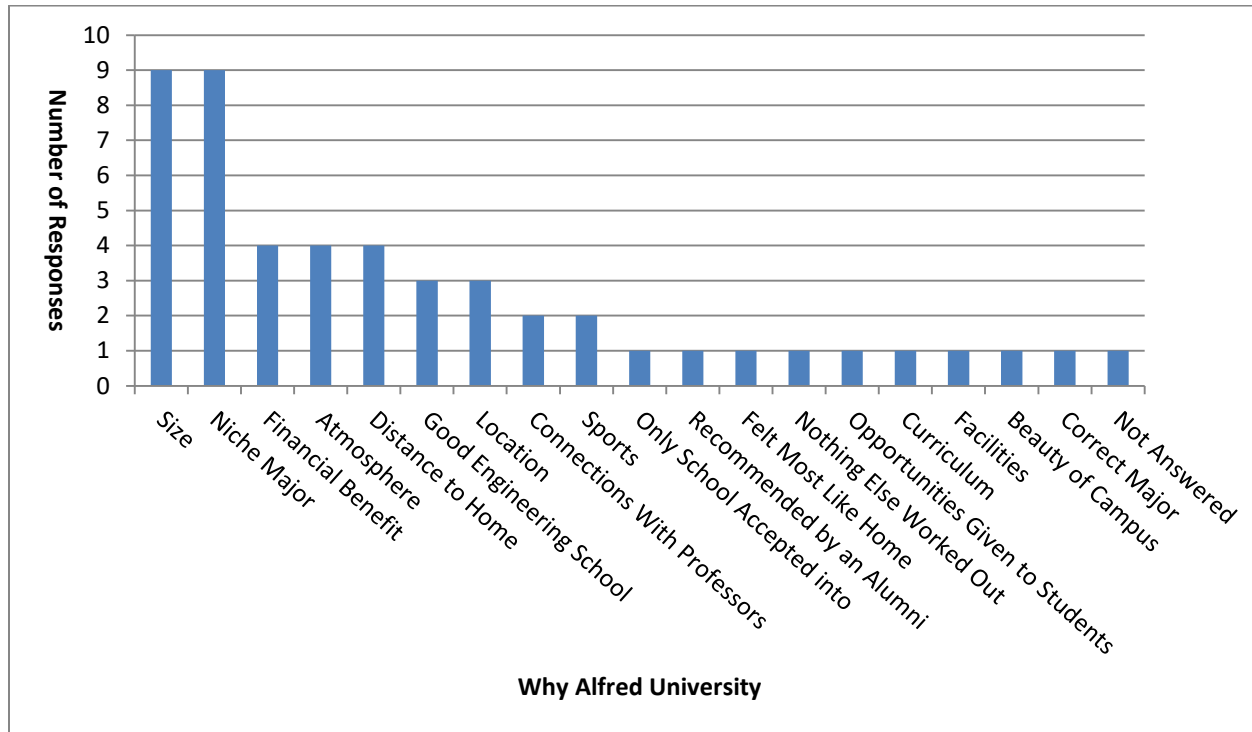


Figure C- 37: All Coded Data from Responses answering the Question of "Why Alfred University" from Renewable Energy Engineering; n=22

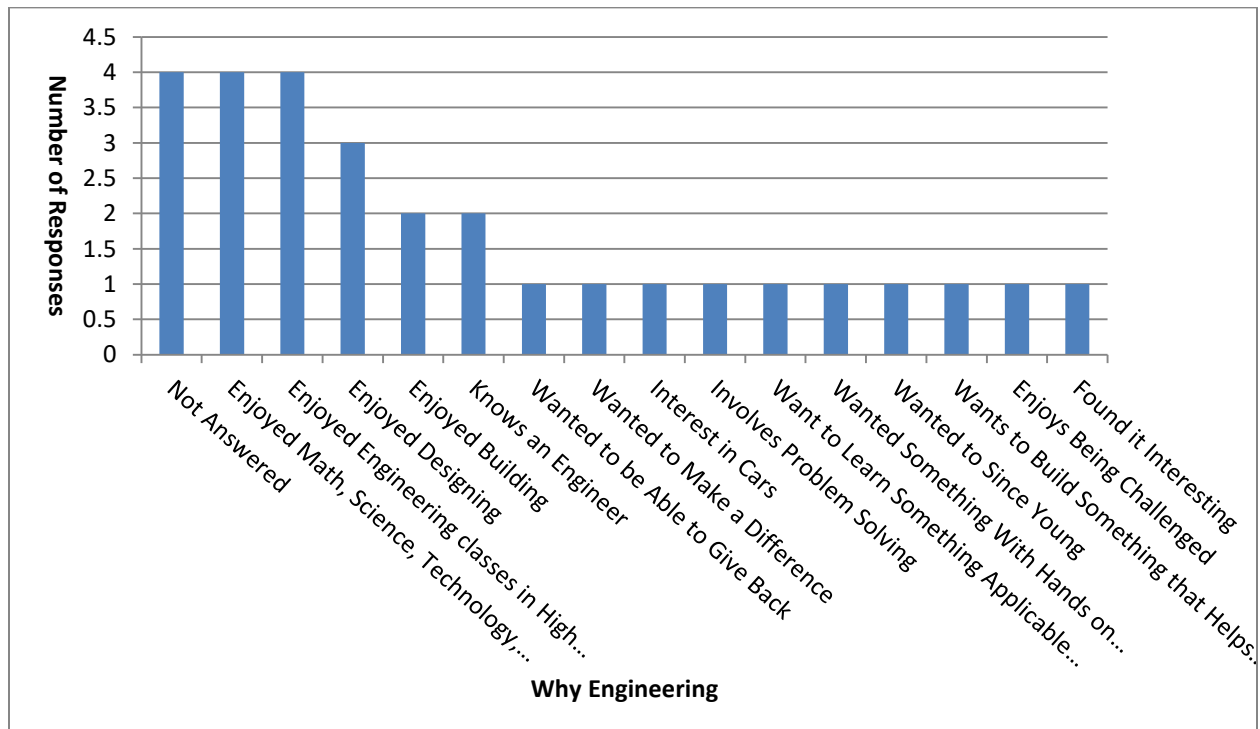
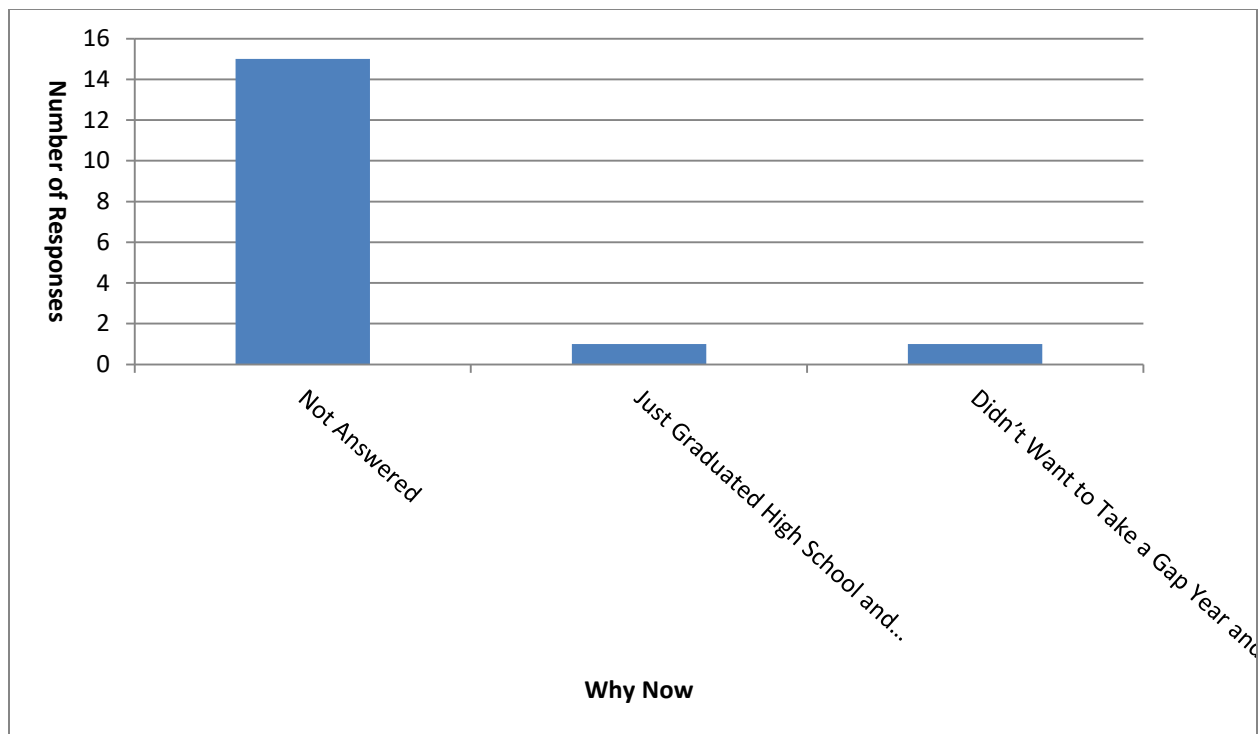


Figure C- 38: All Coded Data from Responses answering the Question of "Why Engineering" from Renewable Energy Engineering; n=22



**Figure C- 39: All Coded Data from Responses answering the Question of "Why Now" from Renewable Energy Engineering; n=22**

➤ Glass Science and Engineering

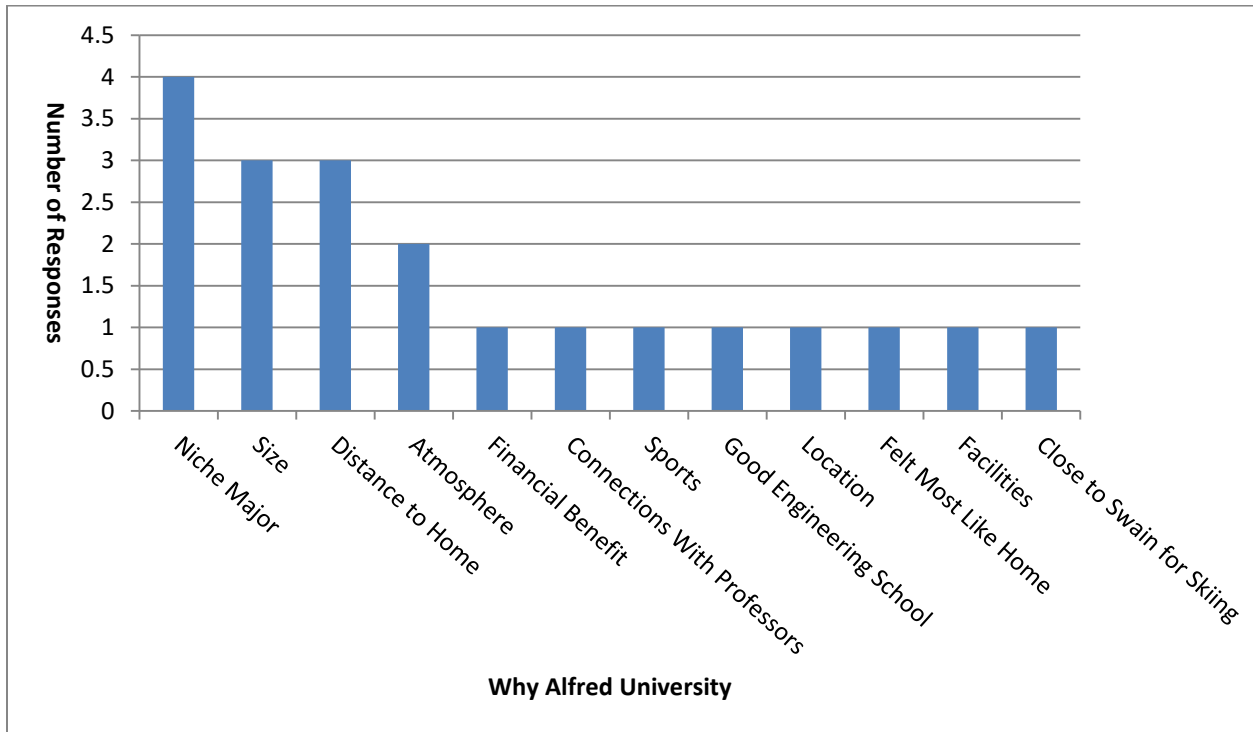


Figure C- 40: All Coded Data from Responses answering the Question of "Why Alfred University" from Glass Science Engineering; n=12

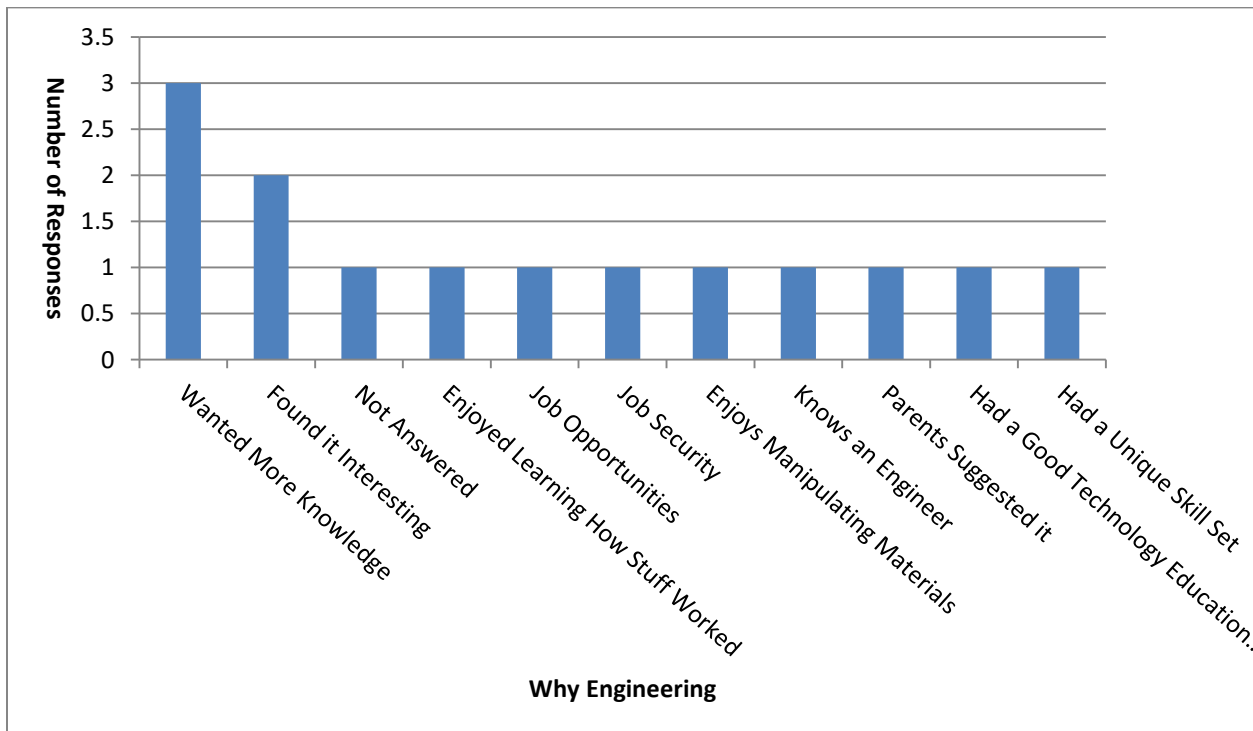
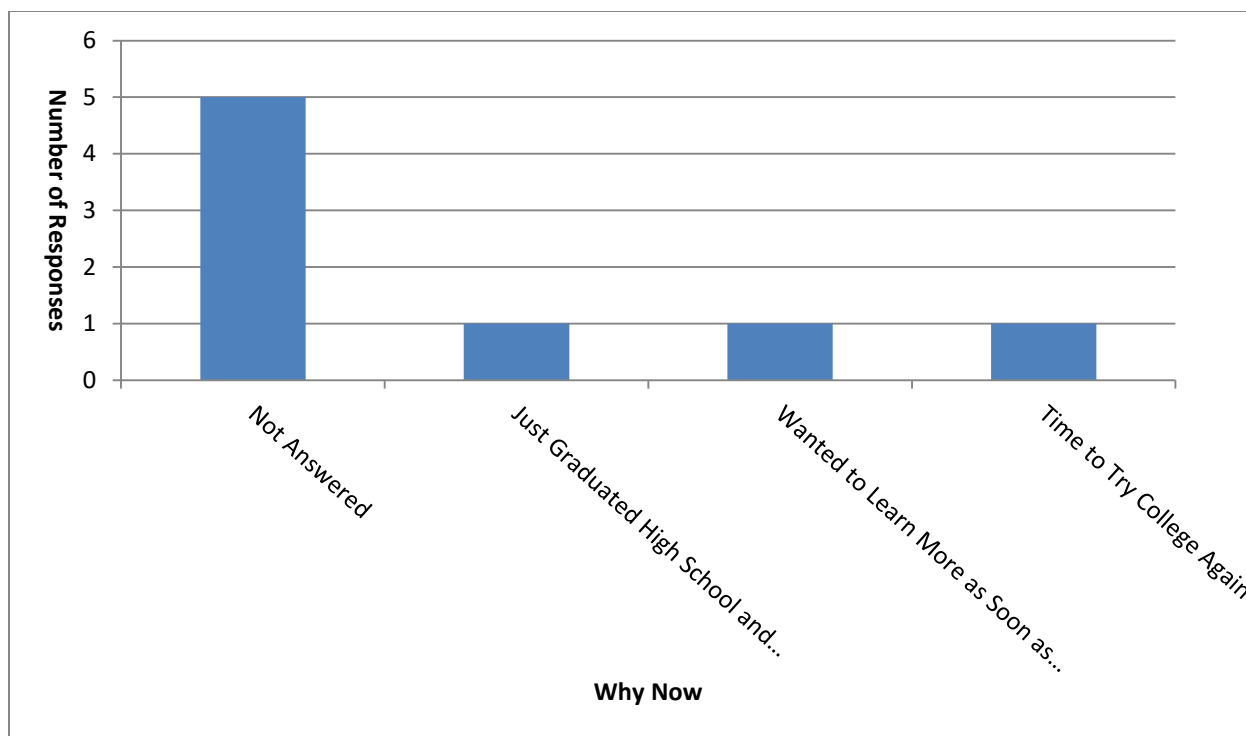


Figure C- 41: All Coded Data from Responses answering the Question of "Why Engineering" from Glass Science Engineering; n=12



**Figure C- 42: All Coded Data from Responses answering the Question of "Why Now" from Glass Science Engineering; n=12**

➤ Bio-Material Engineering

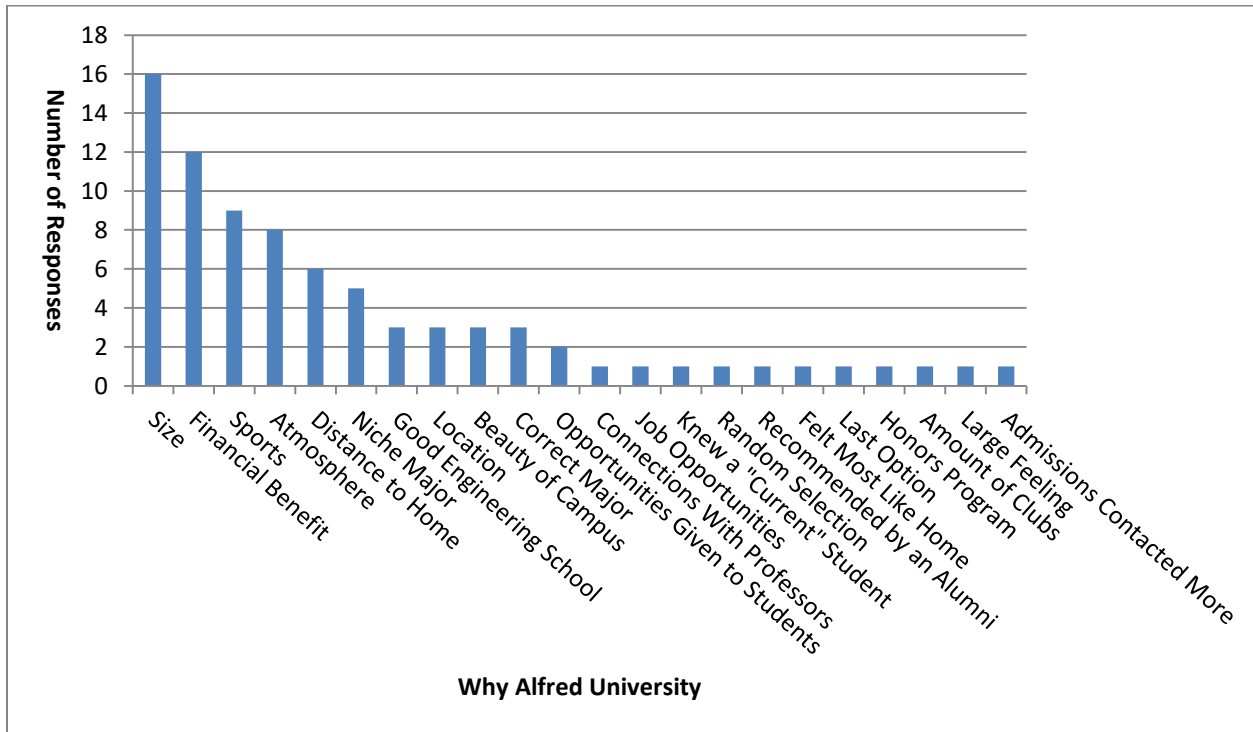


Figure C- 43: All Coded Data from Responses answering the Question of "Why Alfred University" from Bio-Material Engineering; n=33

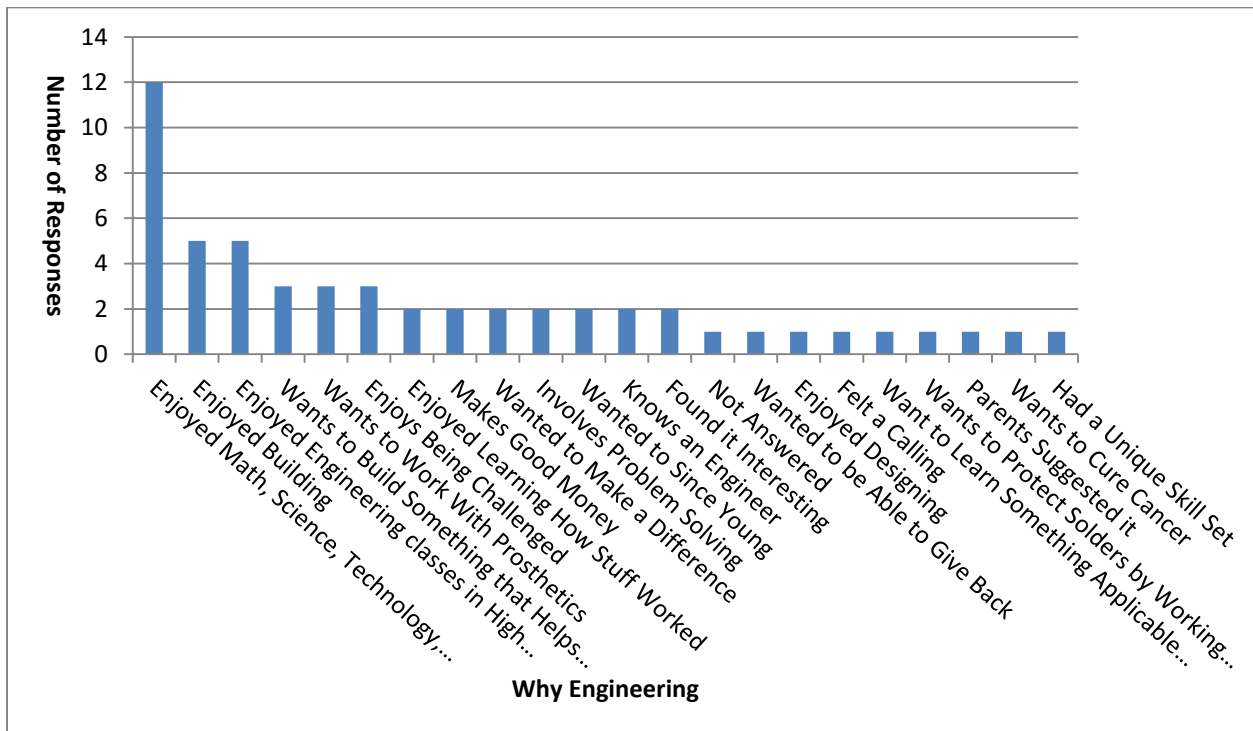
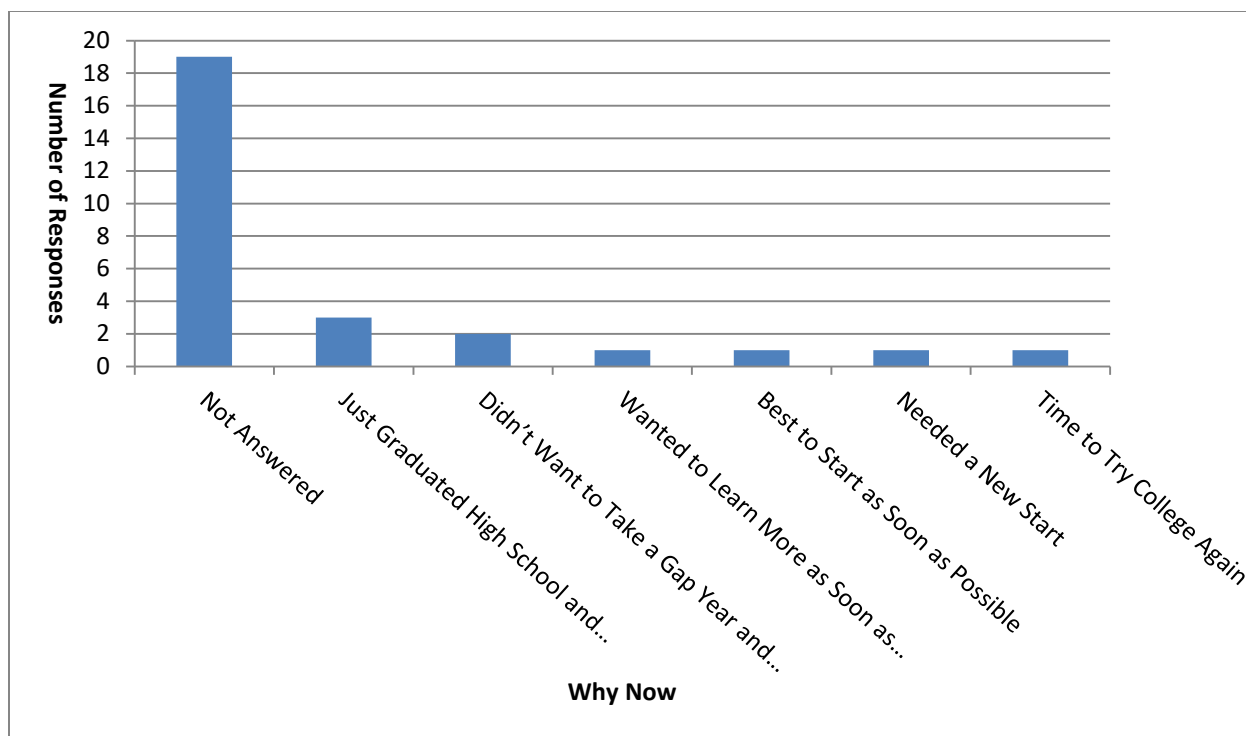


Figure C- 44: All Coded Data from Responses answering the Question of "Why Engineering" from Bio-Material Engineering; n=33



**Figure C- 45: All Coded Data from Responses answering the Question of "Why Now" from Bio-Material Engineering; n=33**

➤ Material Science and Engineering

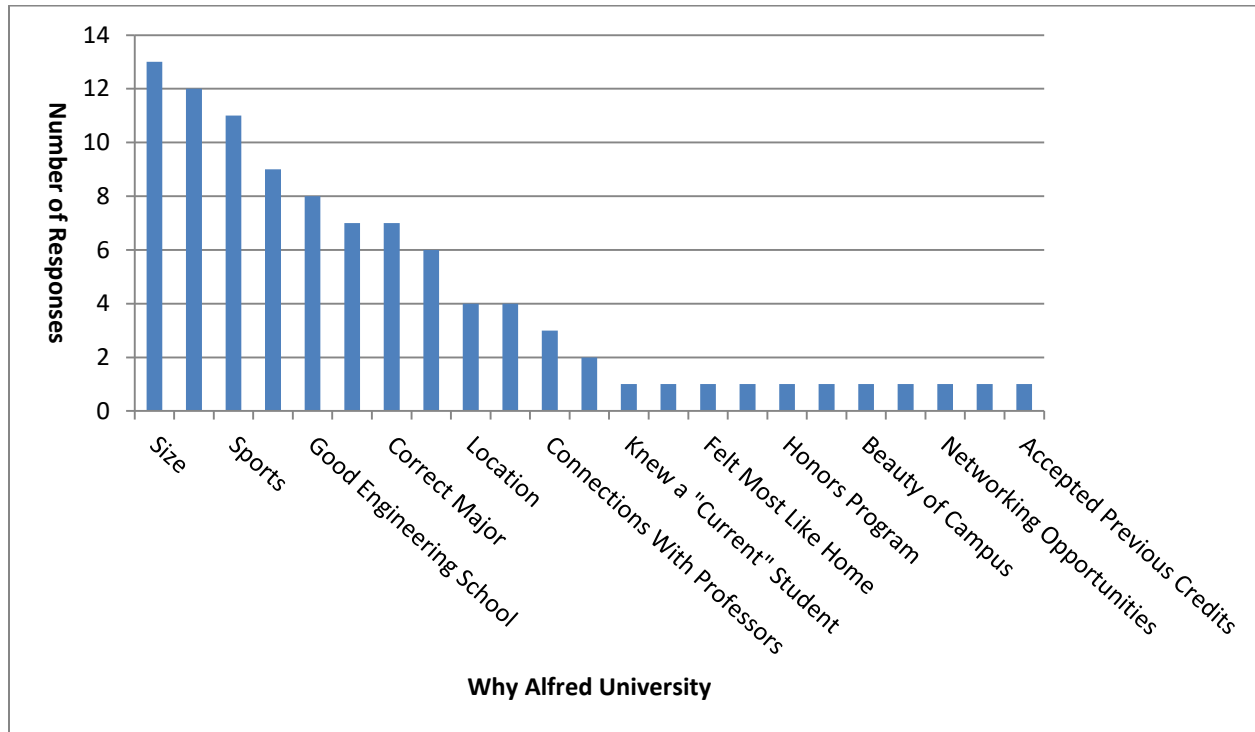


Figure C- 46: All Coded Data from Responses answering the Question of "Why Alfred University" from Material Science and Engineering; n=37

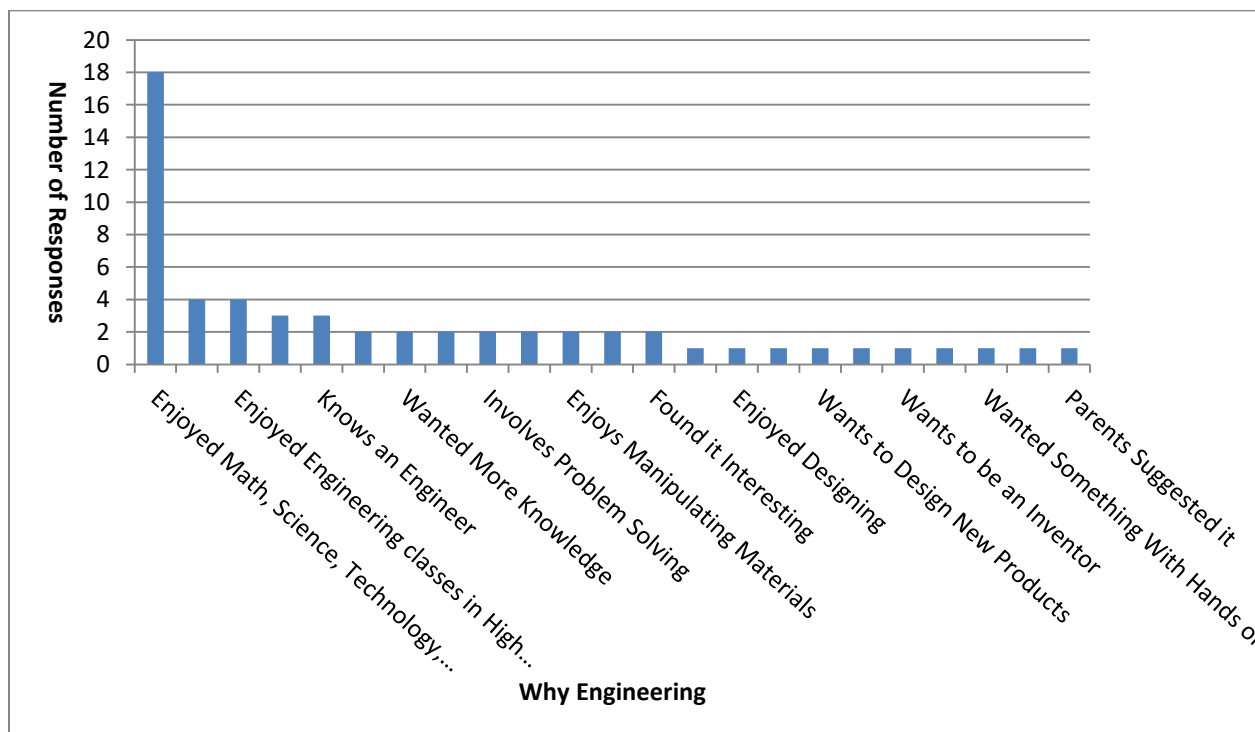
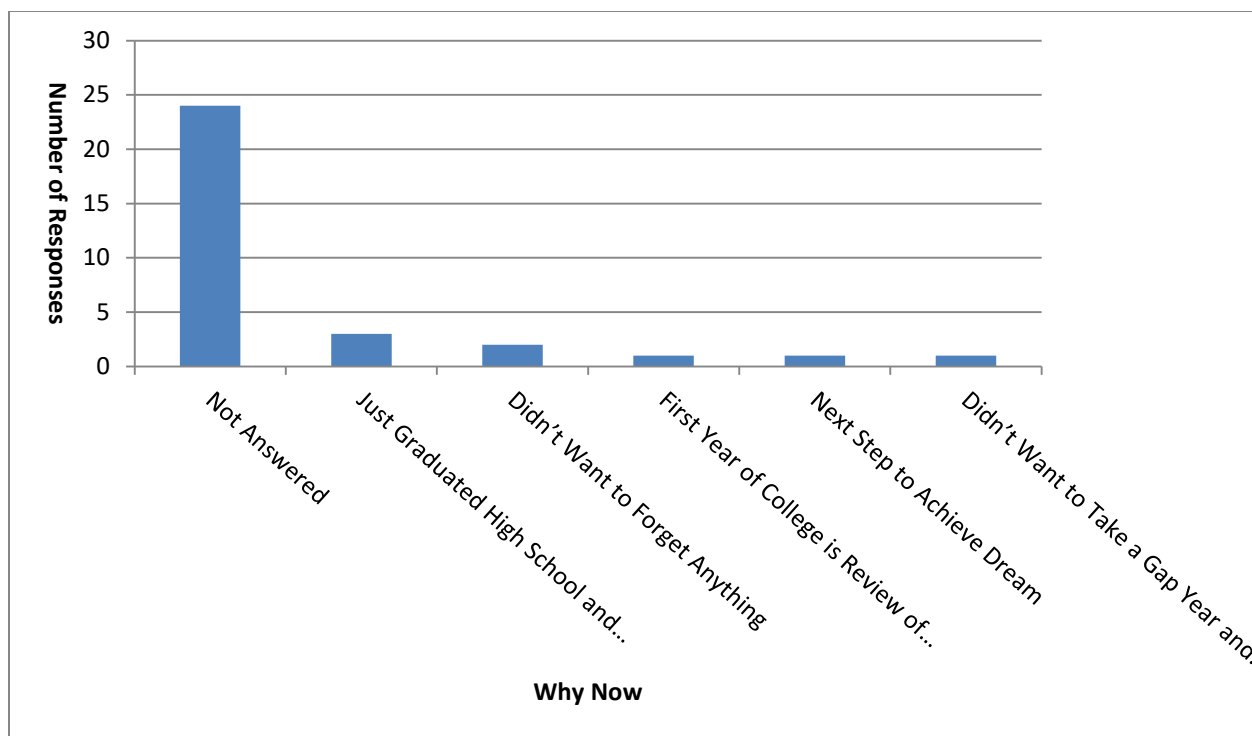


Figure C- 47: All Coded Data from Responses answering the Question of "Why Engineering" from Material Science and Engineering; n=37





**Figure C- 48: All Coded Data from Responses answering the Question of "Why Now" from Material Science and Engineering; n=37**

➤ Ceramic Engineering

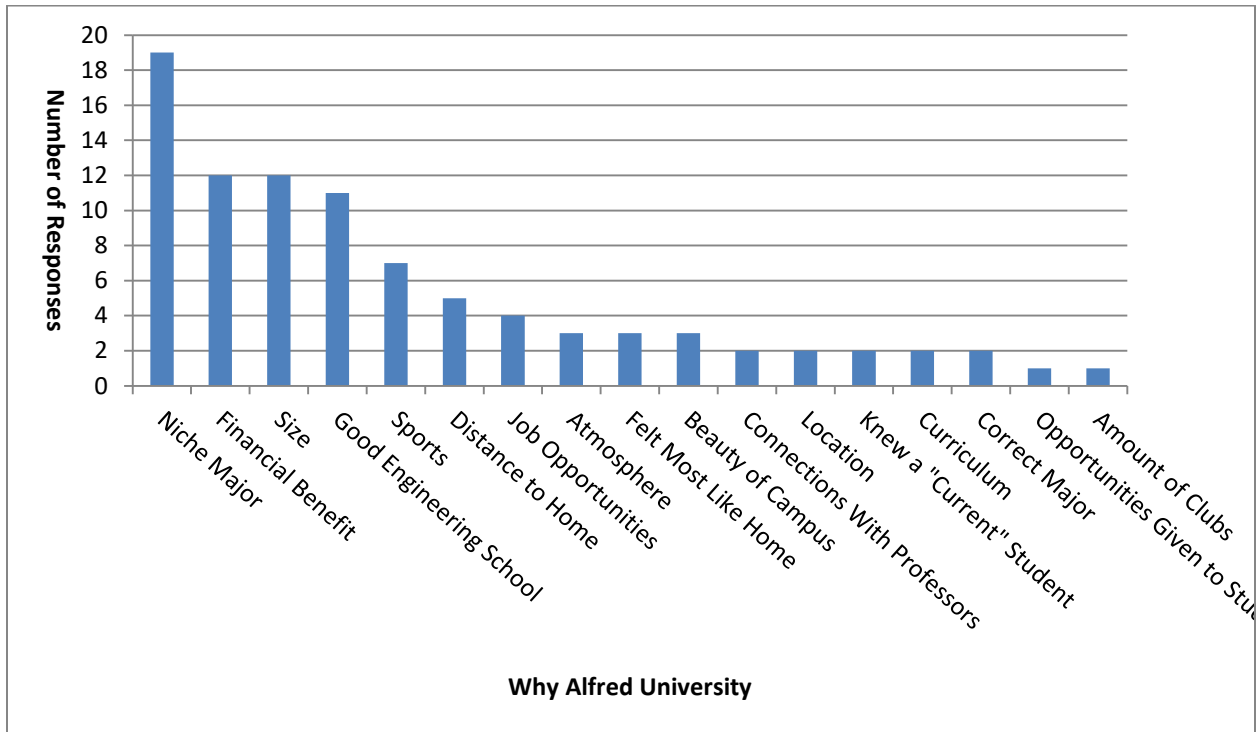


Figure C- 49: All Coded Data from Responses answering the Question of "Why Alfred University" from Ceramic Engineering; n=37

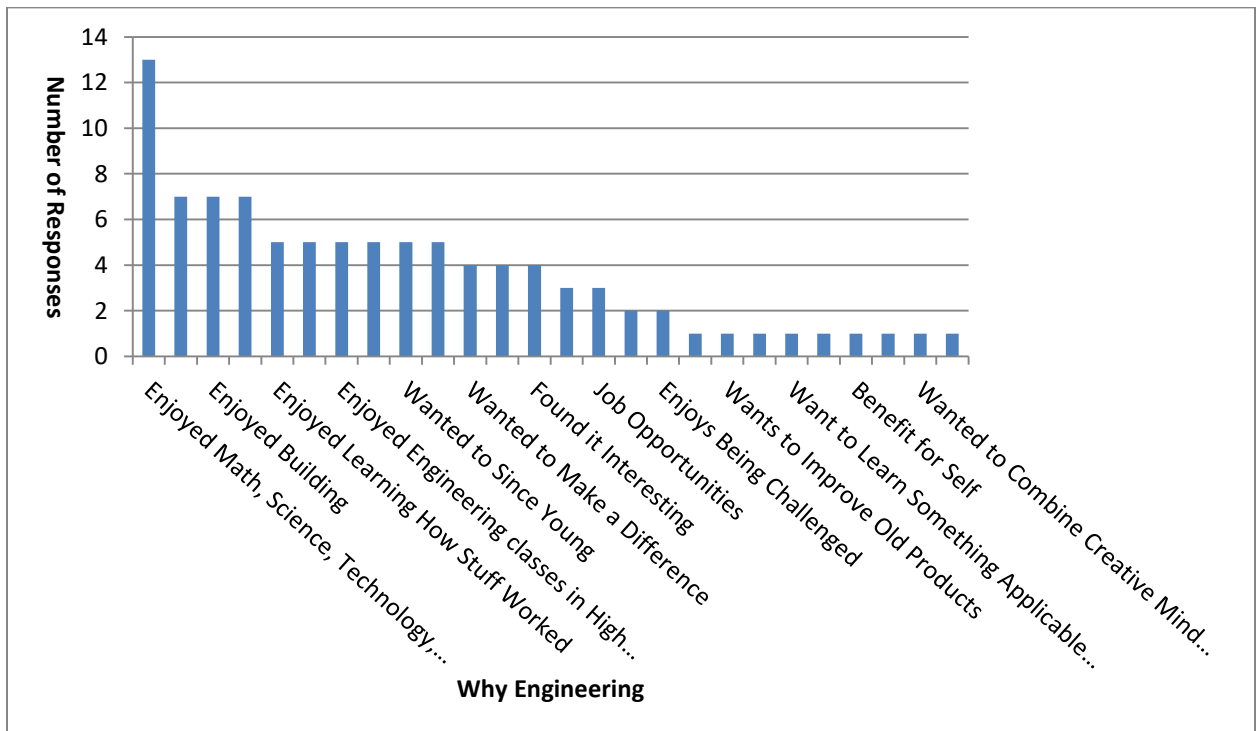
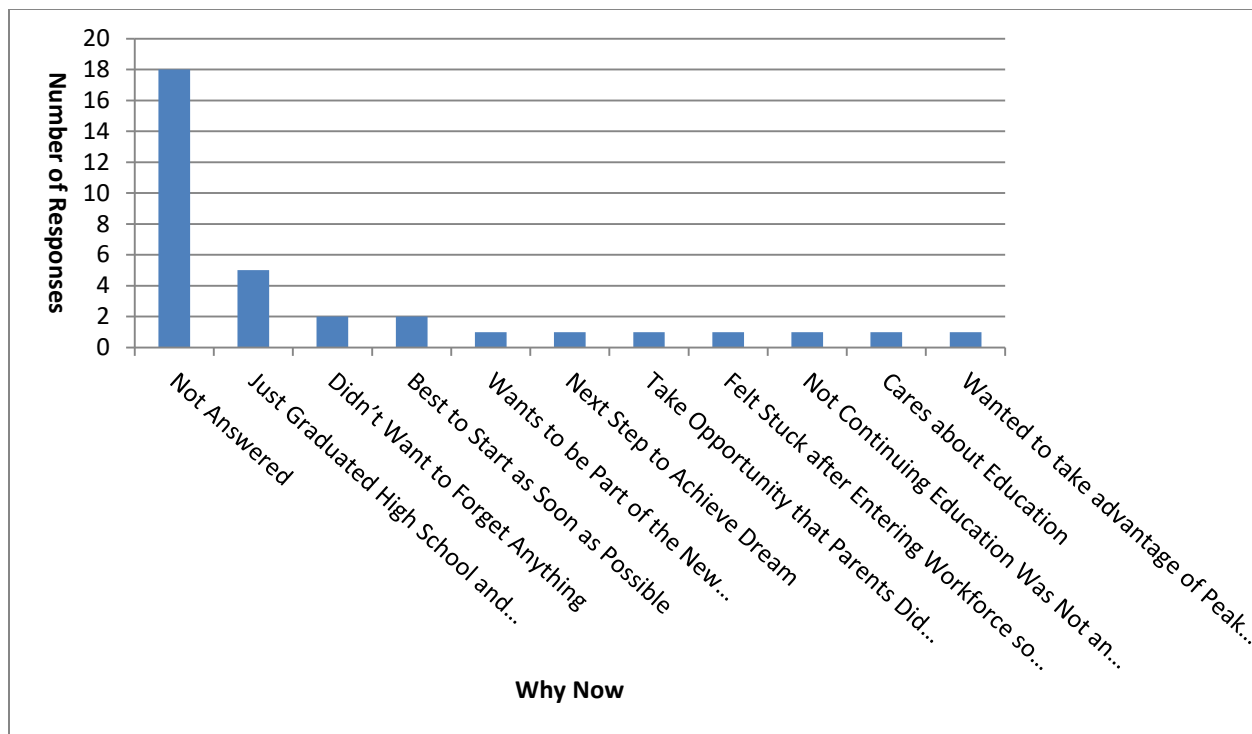


Figure C- 50: All Coded Data from Responses answering the Question of "Why Engineering" from Ceramic Engineering; n=37



**Figure C- 51: All Coded Data from Responses answering the Question of "Why Now" from Ceramic Engineering; n=37**

➤ School of Liberal Arts and Sciences

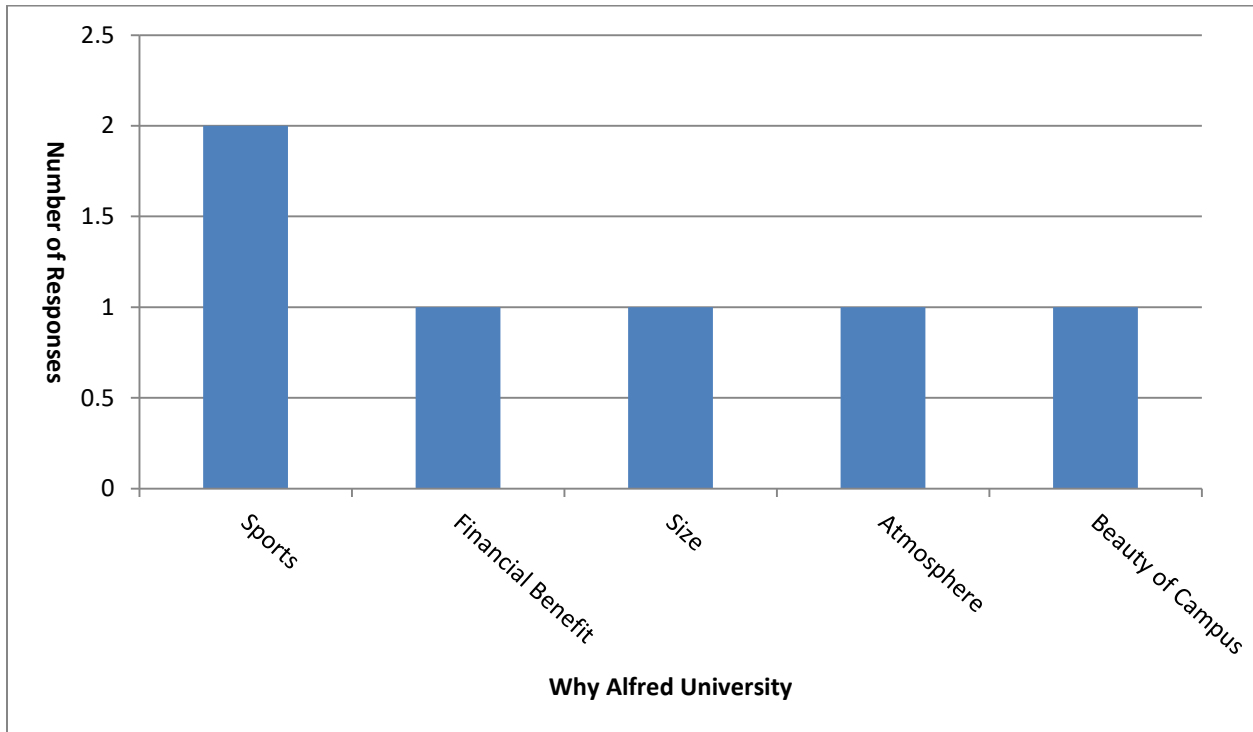


Figure C- 52: All Coded Data from Responses answering the Question of "Why Alfred University" from college of Liberal Arts and Sciences; n=6

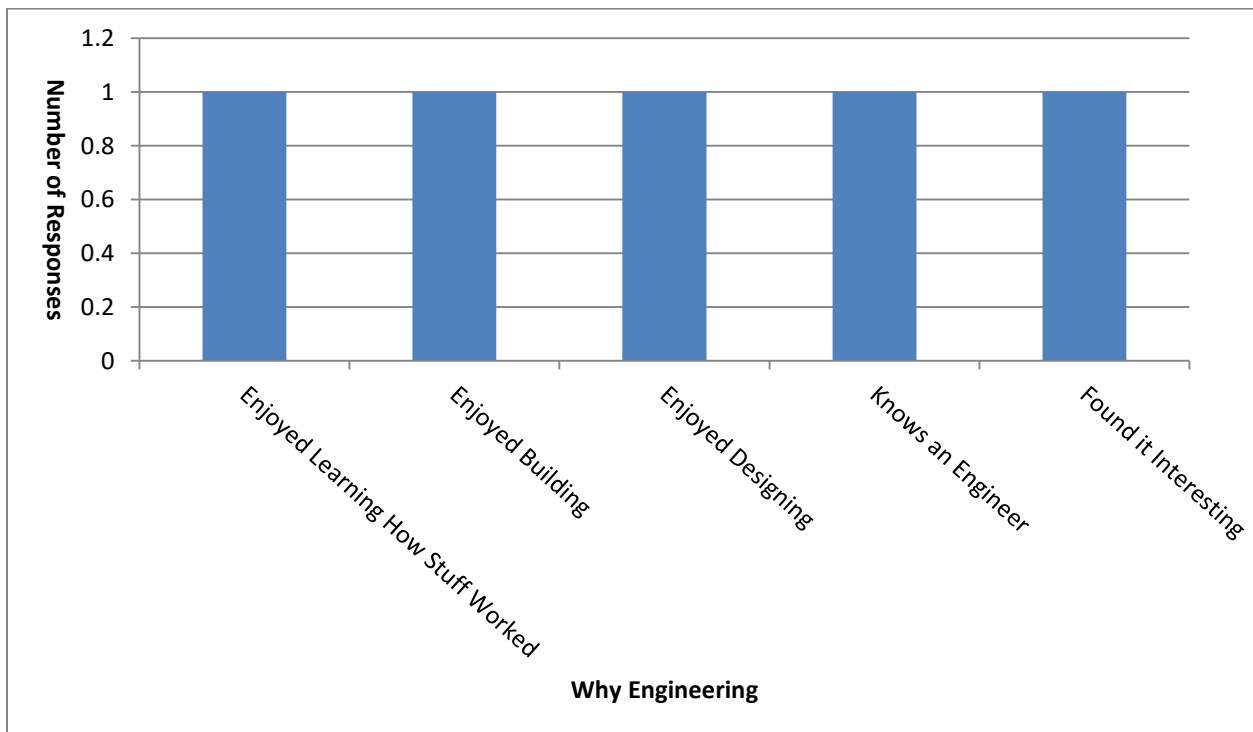
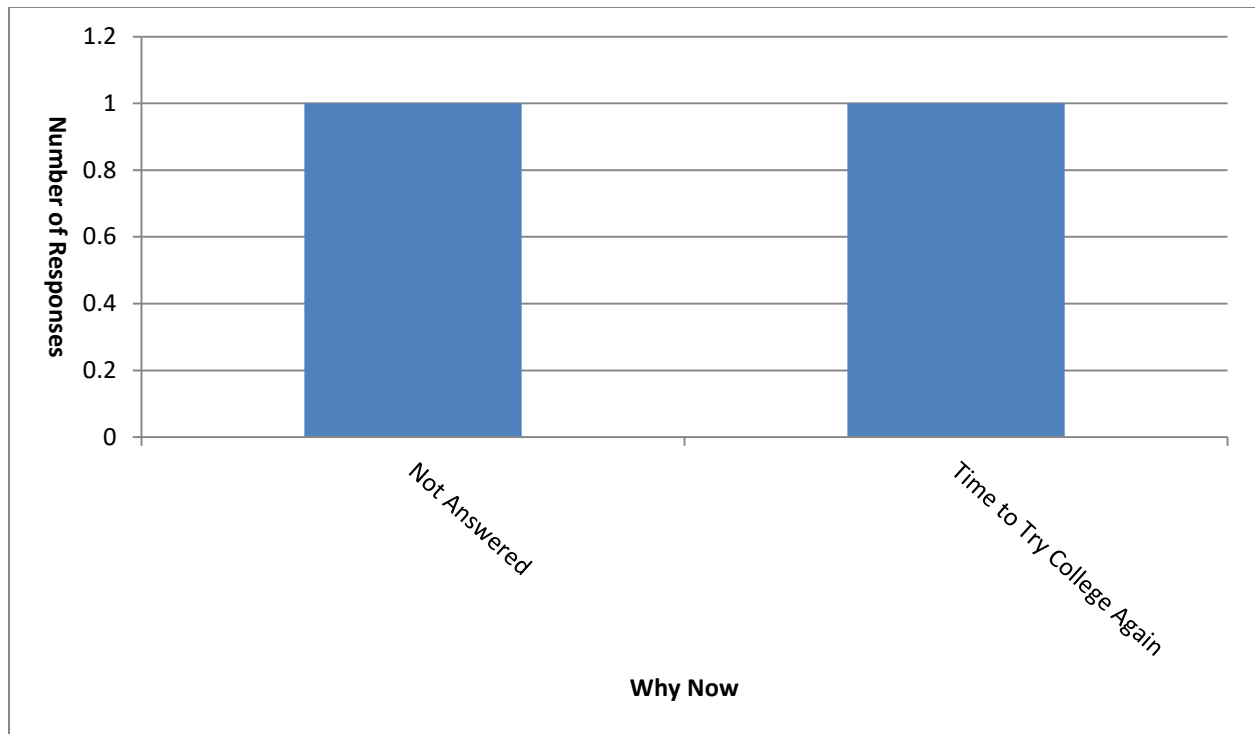


Figure C- 53: All Coded Data from Responses answering the Question of "Why Engineering" from college of Liberal Arts and Sciences; n=6



**Figure C- 54: All Coded Data from Responses answering the Question of "Why Now" from college of Liberal Arts and Sciences; n=6**

## APPENDIX D

| Anonymized | Starting Cohort | Sex | Initial Major | Current Major | Change | Status | Pass Fall of First Year |
|------------|-----------------|-----|---------------|---------------|--------|--------|-------------------------|
| FA15003    | 0               | 1   | 0             | 3             | 1      | 0      | 0                       |
| FA15007    | 0               | 1   | 2             | 2             | 0      | 0      | 0                       |
| FA15012    | 0               | 0   | 2             | 11            | 1      | 2      | 0                       |
| FA15020    | 0               | 1   | 1             | 1             | 0      | 0      | 1                       |
| FA15031    | 0               | 1   | 1             | 1             | 0      | 0      | 0                       |
| FA15037    | 0               | 1   | 1             | 1             | 0      | 0      | 1                       |
| FA15044    | 0               | 1   | 1             | 1             | 0      | 0      | 1                       |
| FA15052    | 0               | 0   | 4             | 11            | 1      | 2      | 1                       |
| FA15065    | 0               | 0   | 0             | 1             | 1      | 0      | 1                       |
| FA15078    | 0               | 1   | 0             | 2             | 1      | 0      | 0                       |
| FA15088    | 0               | 1   | 1             | 11            | 1      | 2      | 0                       |
| FA15092    | 0               | 0   | 3             | 3             | 0      | 0      | 1                       |
| FA15113    | 0               | 0   | 7             | 1             | 1      | 0      | 1                       |
| FA16003    | 1               | 1   | 6             | 6             | 0      | 0      | 1                       |
| FA16013    | 1               | 1   | 0             | 0             | 0      | 0      | 0                       |
| FA16019    | 1               | 0   | 3             | 3             | 0      | 0      | 1                       |
| FA16024    | 1               | 1   | 5             | 5             | 0      | 0      | 1                       |
| FA16033    | 1               | 1   | 1             | 0             | 1      | 0      | 1                       |
| FA16038    | 1               | 1   | 1             | 11            | 1      | 2      | 0                       |
| FA16048    | 1               | 1   | 5             | 5             | 0      | 0      | 1                       |
| FA16060    | 1               | 0   | 1             | 1             | 0      | 0      | 1                       |
| FA16069    | 1               | 0   | 4             | 4             | 0      | 0      | 1                       |
| FA16077    | 1               | 1   | 2             | 2             | 0      | 0      | 1                       |
| FA16084    | 1               | 1   | 0             | 0             | 0      | 0      | 1                       |
| FA16096    | 1               | 1   | 1             | 1             | 0      | 0      | 1                       |
| FA16104    | 1               | 1   | 5             | 11            | 1      | 2      | 1                       |
| FA17015    | 2               | 1   | 0             | 0             | 0      | 0      | 1                       |
| FA17030    | 2               | 1   | 5             | 5             | 0      | 0      | 1                       |
| FA17043    | 2               | 0   | 4             | 4             | 0      | 0      | 1                       |
| FA17059    | 2               | 1   | 5             | 5             | 0      | 0      | 1                       |
| FA17074    | 2               | 1   | 0             | 0             | 0      | 0      | 1                       |
| FA17084    | 2               | 1   | 2             | 2             | 0      | 0      | 1                       |
| FA17093    | 2               | 0   | 5             | 5             | 0      | 0      | 1                       |

| Wrote/Turned in R1 | Why AU 1 | Why AU 2 | Why AU 3 | Why AU 4 | Why AU 5 | Why AU 6 | Why AU 7 |
|--------------------|----------|----------|----------|----------|----------|----------|----------|
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 1                  |          | 1        |          |          |          | 1        |          |
| 1                  | 1        |          |          |          |          |          |          |
| 1                  |          | 1        |          |          |          |          |          |
| 1                  | 1        | 1        | 1        |          |          |          |          |
| 1                  | 1        | 1        |          |          |          |          |          |
| 1                  |          | 1        |          |          |          |          | 1        |
| 1                  | 1        |          |          |          |          |          | 1        |
| 1                  |          |          |          |          |          |          |          |
| 1                  |          | 1        |          |          |          |          | 1        |
| 1                  | 1        |          |          |          |          |          |          |
| 1                  | 1        |          |          |          |          |          |          |
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 1                  | 1        |          | 1        |          |          | 1        |          |
| 1                  |          |          | 1        |          |          | 1        |          |
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 1                  |          |          |          |          |          |          | 1        |
| 1                  | 1        |          |          |          |          |          |          |
| 1                  |          | 1        | 1        |          |          |          |          |
| 1                  | 1        | 1        |          |          |          |          | 1        |
| 1                  |          | 1        |          | 1        |          | 1        |          |
| 1                  |          |          |          |          |          |          | 1        |
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 1                  |          |          |          |          |          |          |          |
| 1                  |          |          |          |          |          |          |          |
| 1                  |          |          |          |          |          | 1        |          |
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 1                  | 1        |          |          |          |          | 1        | 1        |
| 1                  | 1        | 1        | 1        |          |          |          |          |
| 0                  | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| 1                  | 1        |          | 1        |          |          |          | 1        |

| Why AU 8 | Why AU 9 | Why AU 10 | Why AU 11 | Why AU 12 | Why AU 13 | Why AU 14 | Why AU 15 |
|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0        | 0        | 0         | 0         | 0         | 0         | 0         | 0         |

|   |
|---|
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|---|

|   |   |
|---|---|
| 1 | 1 |
| 1 |   |
| 1 |   |

|   |
|---|
| 1 |
| 1 |

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 1 |   |   |   |   |   |   |   |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|   | 1 |   |   |   |   |   |   |

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 1 |   |   |   |   |   |   |   |
| 1 |   |   |   |   |   |   |   |
|   | 1 |   |   |   |   |   |   |
|   | 1 |   |   |   |   |   |   |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
|   |   |   |   |   |   | 1 |   |
|   |   |   |   |   |   | 1 |   |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 |   |   |   |   |   |   |   |
| 1 | 1 |   |   |   |   |   |   |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|   |   | 1 |   |   |   |   |   |



| Why AU 16 | Why AU 17 | Why AU 18 | Why AU 19 | Why AU 20 | Why AU 21 | Why AU 22 | Why AU 23 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |

|   |
|---|
| 1 |
|---|

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|

|   |
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| 1 |
|---|

|   |   |   |   |   |   |   |   |
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## NATIONAL CENTER FOR EDUCATION STATISTICS

# IPEDS DATA FEEDBACK REPORT 2017

### What Is IPEDS?

The Integrated Postsecondary Education Data System (IPEDS) is a system of survey components that collects data from about 7,000 institutions that provide postsecondary education across the United States. IPEDS collects institution-level data on student enrollment, graduation rates, student charges, program completions, faculty, staff, and finances.

These data are used at the federal and state level for policy analysis and development; at the institutional level for benchmarking and peer analysis; and by students and parents, through the College Navigator (<http://collegenavigator.ed.gov>), an online tool to aid in the college search process. For more information about IPEDS, see <http://nces.ed.gov/ipeds>.

### What Is the Purpose of This Report?

The Data Feedback Report is intended to provide institutions a context for examining the data they submitted to IPEDS. The purpose of this report is to provide institutional executives a useful resource and to help improve the quality and comparability of IPEDS data.

### What Is in This Report?

As suggested by the IPEDS Technical Review Panel, the figures in this report provide selected indicators for your institution and a comparison group of institutions. The figures are based on data collected during the 2016-17 IPEDS collection cycle and are the most recent data available. This report provides a list of pre-selected comparison group institutions and the criteria used for their selection. Additional information about these indicators and the pre-selected comparison group are provided in the Methodological Notes at the end of the report.

### Where Can I Do More with IPEDS Data?

Each institution can access previous Data Feedback Reports as far back as 2005 and customize this latest report by using a different comparison group and IPEDS variables of its choosing. To download archived reports or customize the current Data Feedback Report (DFR), please visit our website at <http://nces.ed.gov/ipeds/Home/UseTheData>.



Alfred University  
Alfred, NY



## COMPARISON GROUP

Comparison group data are included to provide a context for interpreting your institution's statistics. If your institution did not define a custom comparison group for this report by July 14, 2017 NCES selected a comparison group for you. (In this case, the characteristics used to define the comparison group appears below.) The Customize Data Feedback Report functionality on the IPEDS Data Center at this provided link (<http://nces.ed.gov/ipeds/datacenter/>) can be used to reproduce the figures in this report using different peer groups.

The custom comparison group chosen by Alfred University includes the following 7 institutions:

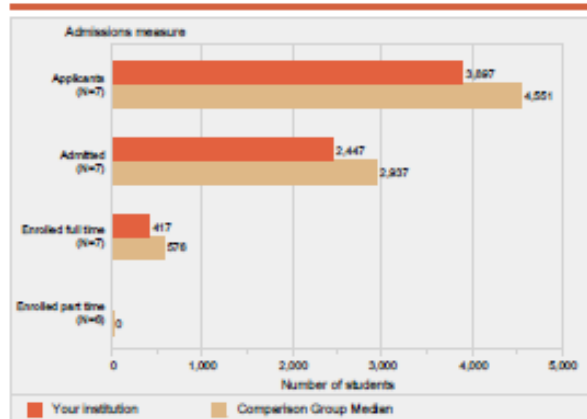
- ▶ Elmira College (Elmira, NY)
- ▶ Hartwick College (Oneonta, NY)
- ▶ Ithaca College (Ithaca, NY)
- ▶ Nazareth College (Rochester, NY)
- ▶ Saint John Fisher College (Rochester, NY)
- ▶ Stevens Institute of Technology (Hoboken, NJ)
- ▶ Utica College (Utica, NY)

The figures in this report have been organized and ordered into the following topic areas:

|                                                      |                                    |                |
|------------------------------------------------------|------------------------------------|----------------|
| 1) Admissions (only for non-open-admissions schools) | Fig. 1 and 2                       | Pg. 3          |
| 2) Student Enrollment                                | Fig. 3 and 4                       | Pg. 3 and 4    |
| 3) Awards                                            | Fig. 5                             | Pg. 4          |
| 4) Charges and Net Price                             | Fig. 6 and 7                       | Pg. 4          |
| 5) Student Financial Aid                             | Fig. 8, 9, 10 and 11               | Pg. 5          |
| 6) Military Benefits*                                | (No charts applicable)             |                |
| 7) Retention and Graduation Rates                    | Fig. 12, 13, 14, 15, 16, 17 and 18 | Pg. 6, 7 and 8 |
| 8) Finance                                           | Fig. 19 and 20                     | Pg. 9          |
| 9) Staff                                             | Fig. 21 and 22                     | Pg. 9          |
| 10) Libraries*                                       | (No charts applicable)             |                |

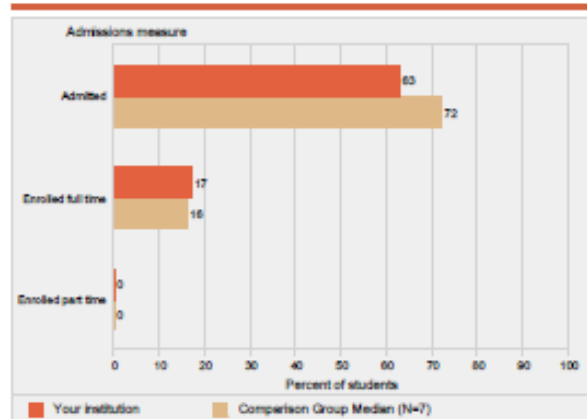
\*These figures only appear in customized Data Feedback Reports (DFR), which are available through Use the Data portal on the IPEDS website.

**Figure 1. Number of first-time undergraduate students who applied, were admitted, and enrolled full and part time: Fall 2016**



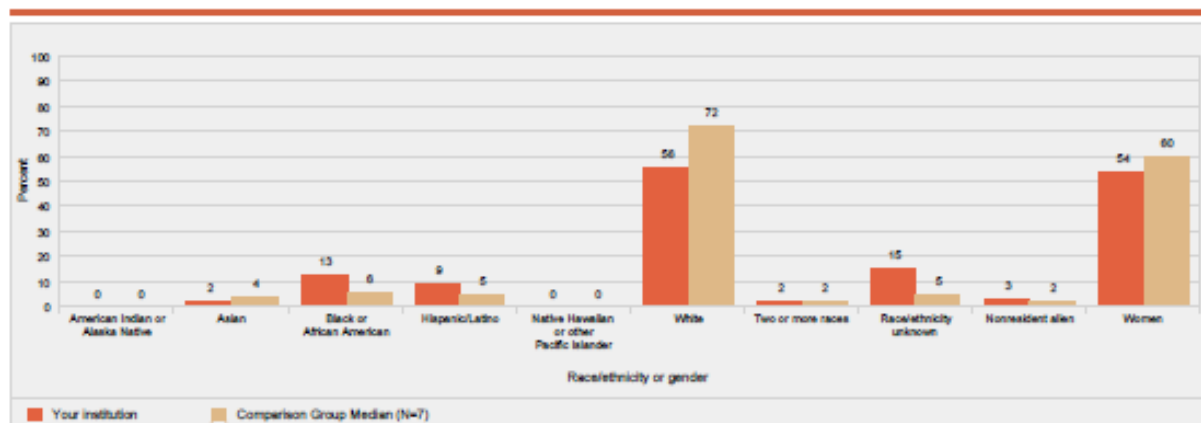
NOTE: Admissions data are presented only for institutions that do not have an open admission policy, and apply to first-time, degree/certificate-seeking undergraduate students only. For details, see the Methodological Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Admissions component.

**Figure 2. Percent of first-time undergraduate applicants admitted, and percent of admissions enrolled, by full- and part-time status: Fall 2016**



NOTE: Admissions data are presented only for institutions that do not have an open admission policy, and apply to first-time, degree/certificate-seeking undergraduate students only. For details, see the Methodological Notes. Median values for the comparison group will not add to 100%. See "Use of Median Values for Comparison Group" for how median values are determined. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Admissions component.

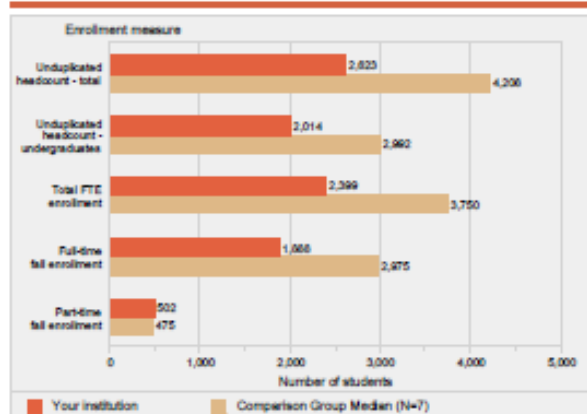
**Figure 3. Percent of all students enrolled, by race/ethnicity, and percent of students who are women: Fall 2016**



NOTE: For more information about disaggregation of data by race and ethnicity, see the Methodological Notes. Median values for the comparison group will not add to 100%. See "Use of Median Values for Comparison Group" for how median values are determined. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Spring 2017, Fall Enrollment component.

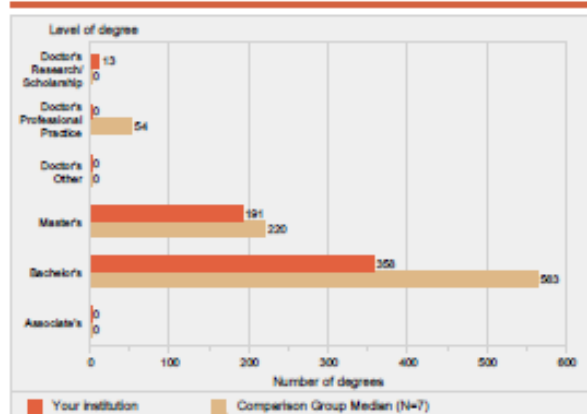


**Figure 4. Unduplicated 12-month headcount of all students and of undergraduate students (2015-16), total FTE enrollment (2015-16), and full- and part-time fall enrollment (Fall 2016)**



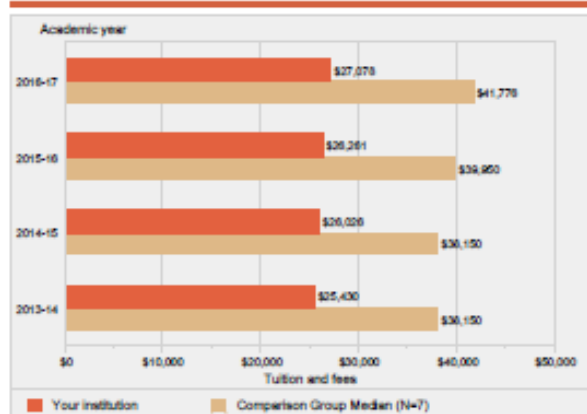
NOTE: For details on calculating full-time equivalent (FTE) enrollment, see Calculating FTE in the Methodology Notes. Total headcount, FTE, and full- and part-time fall enrollment include both undergraduate and postbaccalaureate students, when applicable. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Fall 2016, 12-month Enrollment component and Spring 2017, Fall Enrollment component.

**Figure 5. Number of degrees awarded, by level: 2015-16**



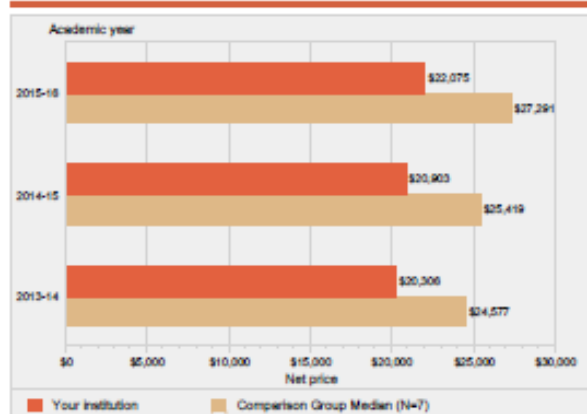
NOTE: For additional information about postbaccalaureate degree levels, see the Methodology Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Fall 2016, Completions component.

**Figure 6. Academic year tuition and required fees for full-time, first-time degree/certificate-seeking undergraduates: 2013-14 to 2016-17**



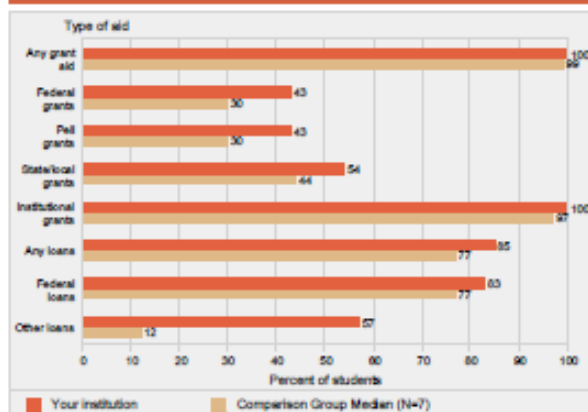
NOTE: The tuition and required fees shown here are the lowest reported from the categories of in-district, in-state, and out-of-state. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Fall 2016, Institutional Characteristics component.

**Figure 7. Average net price of attendance for full-time, first-time degree/certificate-seeking undergraduate students, who were awarded grant or scholarship aid: 2013-14 to 2015-16**



NOTE: Average net price is for full-time, first-time degree/certificate-seeking undergraduate students and is generated by subtracting the average amount of federal, state/local government, and institutional grant and scholarship awarded aid from the total cost of attendance. Total cost of attendance is the sum of published tuition and required fees, books and supplies, and the average room and board and other expenses. For details, see the Methodology Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Fall 2016, Institutional Characteristics component and Winter 2016-17, Student Financial Aid component.

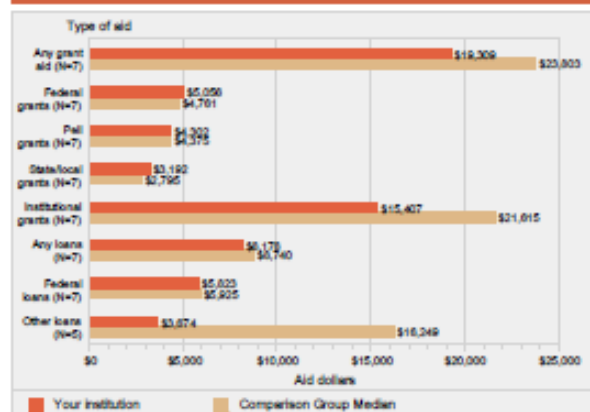
**Figure 8. Percent of full-time, first-time degree/certificate-seeking undergraduate students who were awarded grant or scholarship aid from the federal government, state/local government, or the institution, or loans, by type of aid: 2015-16**



NOTE: Any grant aid above includes grant or scholarship aid awarded from the federal government, state/local government, or the institution. Federal grants includes Pell grants and other federal grants. Any loans includes federal loans and other loans awarded to students. For details on how students are counted for financial aid reporting, see Cohort Determination in the Methodological Notes. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Student Financial Aid component.

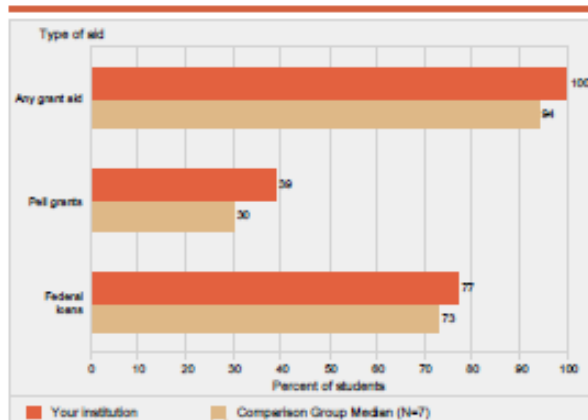
**Figure 9. Average amounts of grant or scholarship aid from the federal government, state/local government, or the institution, or loans awarded to full-time, first-time degree/certificate-seeking undergraduate students, by type of aid: 2015-16**



NOTE: Any grant aid above includes grant or scholarship aid awarded from the federal government, state/local government, or the institution. Federal grants includes Pell grants and other federal grants. Any loans includes federal loans and other loans awarded to students. Average amounts of aid were calculated by dividing the total aid awarded by the total number of recipients in each institution. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Student Financial Aid component.

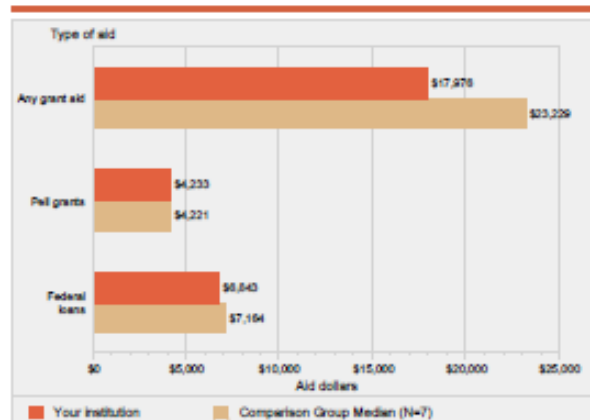
**Figure 10. Percent of all undergraduates awarded aid, by type of aid: 2015-16**



NOTE: Any grant aid above includes grant or scholarship aid awarded from the federal government, state/local government, the institution, or other sources. Federal loans includes only federal loans awarded to students. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Student Financial Aid component.

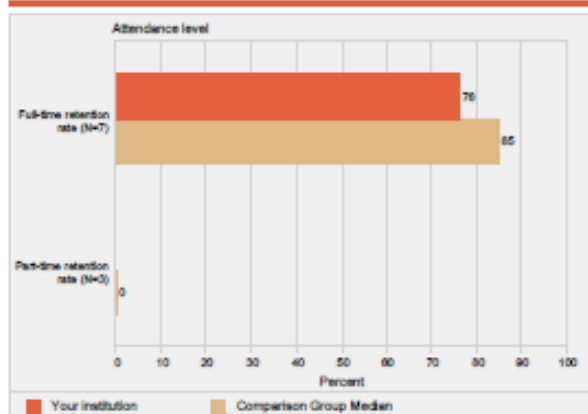
**Figure 11. Average amount of aid awarded to all undergraduates, by type of aid: 2015-16**



NOTE: Any grant aid above includes grant or scholarship aid from the federal government, state/local government, the institution, or other sources. Federal loans includes federal loans to students. Average amounts of aid were calculated by dividing the total aid awarded by the total number of recipients in each institution. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Student Financial Aid component.

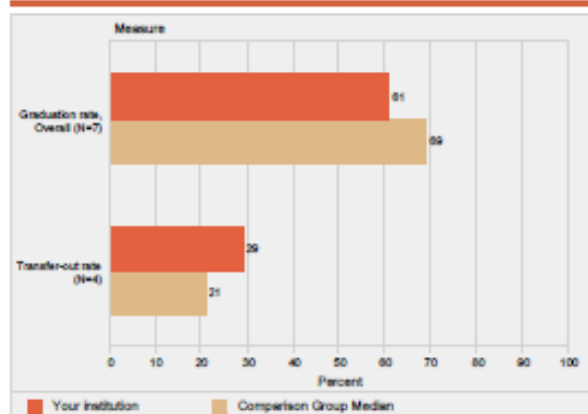
Figure 12. Retention rates of first-time bachelor's degree seeking students, by attendance level: Fall 2015 cohort



NOTE: Retention rates are measured from the fall of first enrollment to the following fall. Academic reporting institutions report retention data as of the institution's official fall reporting date or as of October 15, 2015. Program reporters determine the cohort with enrollment any time between August 1-October 31, 2015 and retention based on August 1, 2016. Four-year institutions report retention rates for students seeking a bachelor's degree. For more details, see the Methodological Notes. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Spring 2017, Fall Enrollment component.

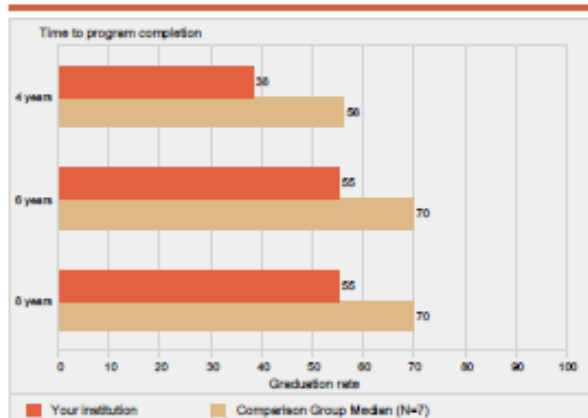
Figure 13. Graduation and transfer-out rates of full-time, first-time degree/certificate-seeking undergraduates within 150% of normal time to program completion: 2010 cohort



NOTE: Graduation rate cohort includes all full-time, first-time degree/certificate-seeking undergraduate students. Graduation and transfer-out rates are the Student Right-to-Know rates. Only institutions with mission to prepare students to transfer are required to report transfer out. For more details, see the Methodological Notes. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Graduation Rates component.

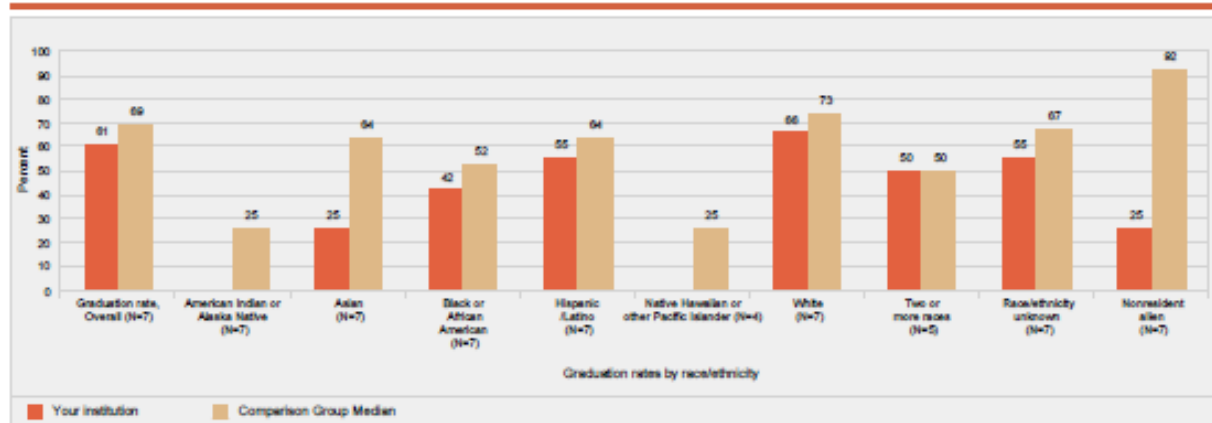
Figure 14. Bachelor's degree graduation rates of full-time, first-time degree/certificate-seeking undergraduates within 4 years, 6 years, and 8 years: 2008 cohort



NOTE: The 4-, 6-, and 8-year graduation rates are calculated using the number students who completed a bachelor's or equivalent degree from a cohort of students who entered the institution seeking a bachelor's or equivalent degree. For details, see the Methodological Notes. N is the number of institutions in the comparison group. Medians are not reported for comparison groups with less than three values.

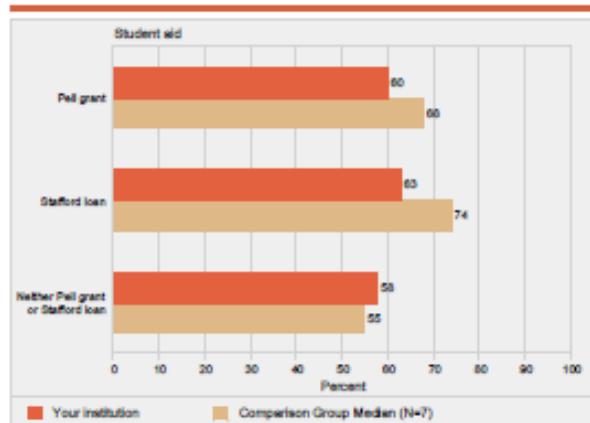
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, 200% Graduation Rates component.

Figure 15. Graduation rates of full-time, first-time degree/certificate-seeking undergraduates within 150% of normal time to program completion, by race/ethnicity: 2010 cohort



NOTE: For more information about disaggregation of data by race and ethnicity, see the Methodological Notes. The graduation rates are the Student Right-to-Know (SRK) rates. Median values for the comparison group will not add to 100%. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Graduation Rates component.

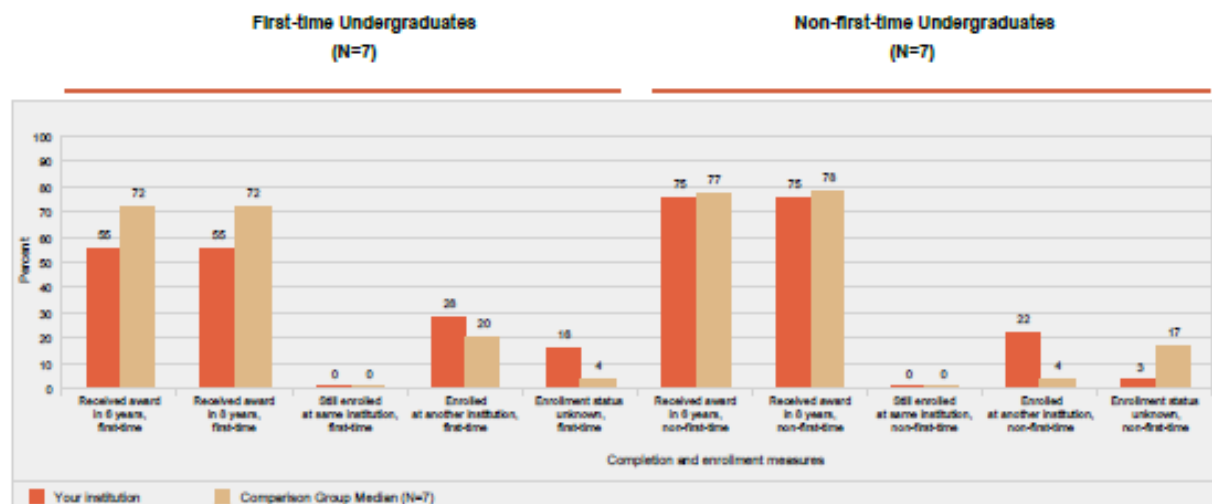
Figure 16. Graduation rates of full-time, first-time degree/certificate-seeking undergraduates within 150% of normal time to program completion, by financial aid recipients: 2010 cohort



NOTE: Graduation rate cohort includes all full-time, first-time degree/certificate-seeking undergraduate students. Data were collected on those students, who at entry of the cohort, were awarded a Pell Grant and students who were awarded a Subsidized Stafford loan, but did not receive a Pell Grant. Graduation rates are the Student Right-to-Know rates. Only institutions with mission to prepare students to transfer are required to report transfer out. For more details, see the Methodological Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Graduation Rates component.

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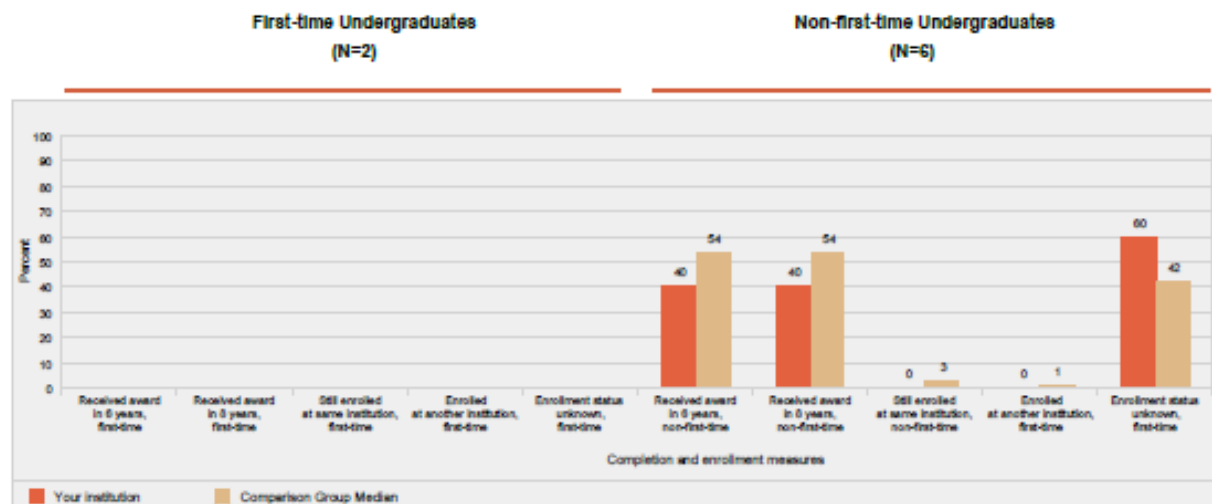
Figure 17. Award and enrollment rates of full-time, degree/certificate-seeking undergraduates after 8 years of entry, by prior postsecondary experience: 2008 cohort



NOTE: Award and enrollment measures are measured from eight years after entering the institution into one of four degree/certificate-seeking undergraduate student cohort (First-time, full-time; First-time, part-time; Non-first-time, full-time; and Non-first-time, part-time). Academic reporting institutions report outcome data as of the institution's official fall reporting date or as of October 15, 2015. Program reporters determine the cohort with enrollment any time between September 1, 2007 and August 31, 2008. For more details, see the Methodological Notes. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Outcome Measures component.

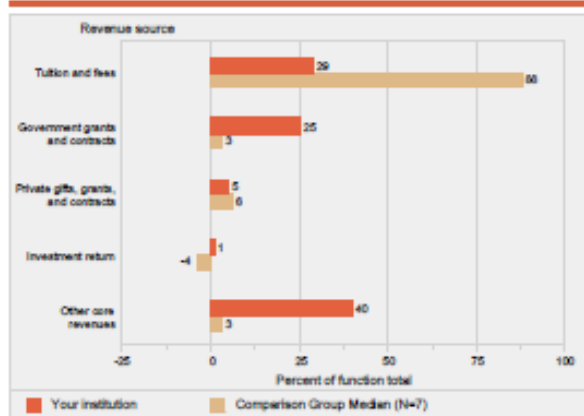
Figure 18. Award and enrollment rates of part-time, degree/certificate-seeking undergraduates after 8 years of entry, by prior postsecondary experience: 2008 cohort



NOTE: Award and enrollment measures are measured from eight years after entering the institution into one of four degree/certificate-seeking undergraduate student cohort (First-time, full-time; First-time, part-time; Non-first-time, full-time; and Non-first-time, part-time). Academic reporting institutions report outcome data as of the institution's official fall reporting date or as of October 15, 2015. Program reporters determine the cohort with enrollment any time between September 1, 2007 and August 31, 2008. For more details, see the Methodological Notes. N is the number of institutions in the comparison group. Medians are not reported for comparison groups with less than three values.

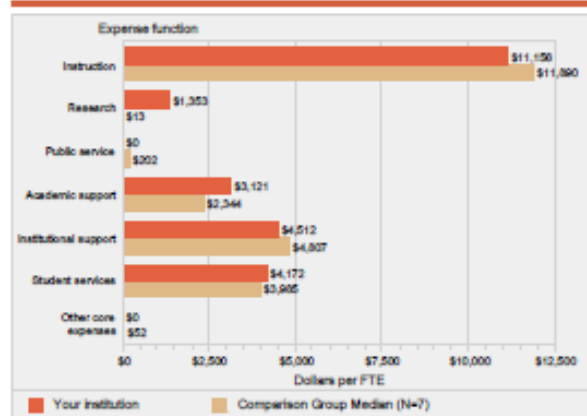
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Winter 2016-17, Outcome Measures component.

Figure 19. Percent distribution of core revenues, by source: Fiscal year 2016



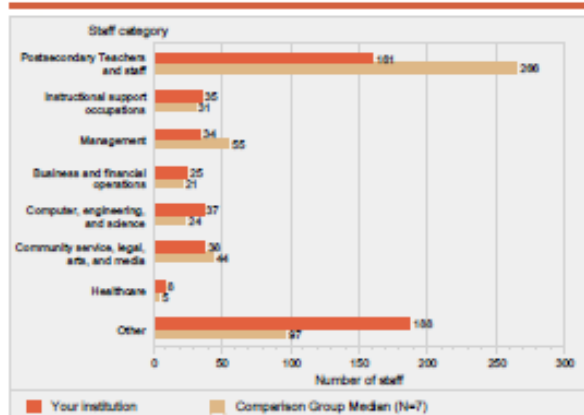
NOTE: The comparison group median is based on those members of the comparison group that report finance data using the same accounting standards as the comparison institution. For more information, see the Methodological Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Spring 2017, Finance component.

Figure 20. Core expenses per FTE enrollment, by function: Fiscal year 2016



NOTE: Expenses per full-time equivalent (FTE) enrollment, particularly instruction, may be inflated because finance data includes all core expenses while FTE reflects credit activity only. For details on calculating FTE enrollment and a detailed definition of core expenses, see the Methodological Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Fall 2016, 12-month Enrollment component and Spring 2017, Finance component.

Figure 21. Full-time equivalent staff, by occupational category: Fall 2016



NOTE: Graduate assistants are not included. For calculation details, see the Methodological Notes. N is the number of institutions in the comparison group.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Spring 2017, Human Resources component.

Figure 22. Average salaries of full-time instructional non-medical staff equated to 9-months worked, by academic rank: Academic year 2016-17



NOTE: See Methodology Notes for more details on average salary. N is the number of institutions in the comparison group. Medians are not reported for comparison groups with less than three values.  
SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Spring 2017, Human Resources component.



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### METHODOLOGICAL NOTES

#### Overview

This report is based on data supplied by institutions to IPEDS during 2016-17 data collection year. Response rates exceeded 99% for most surveys. IPEDS First Look reports at <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=010> provide some information on aggregate institutional responses.

#### Use of Median Values for Comparison Group

This report compares your institution's data to the median value for the comparison group for each statistic shown in the figure. If more than one statistic is present in a figure, the median values are determined separately for each indicator or statistic. Medians are not displayed for comparison groups with fewer than three values. Where percentage distributions are presented, median values may not add to 100%. To access all the data used to create the figures included in this report, go to 'Use the Data' portal on the IPEDS website at this provided link (<http://nces.ed.gov/ipeds>).

#### Missing Statistics

If a statistic is not reported for your institution, the omission indicates that the statistic is not relevant to your institution and the data were not collected. Not all notes may be applicable to your report.

#### Use of Imputed Data

All IPEDS data are subject to imputation for total (institutional) and partial (item) nonresponse. If necessary, imputed values were used to prepare your report.

#### Data Confidentiality

IPEDS data are not collected under a pledge of confidentiality.

#### Disaggregation of Data by Race/Ethnicity

When applicable, some statistics are disaggregated by race/ethnicity. Data disaggregated by race/ethnicity have been reported using the 1997 Office of Management and Budget categories. Detailed information about the race/ethnicity categories can be found at <https://nces.ed.gov/ipeds/Section/Resources>.

#### Cohort Determination for Reporting Student Financial Aid, Graduation Rates, and Outcome Measures

Student cohorts for reporting Student Financial Aid and Graduation Rates data are based on the reporting type of the institution. For institutions that report based on an academic year (those operating on standard academic terms), student counts and cohorts are based on fall term data. Student counts and cohorts for program reporters (those that do not operate on standard academic terms) are based on unduplicated counts of students enrolled during a full 12-month period.

### DESCRIPTION OF STATISTICS USED IN THE FIGURES

#### Admissions (only for non-open-admissions schools)

##### *Admissions and Test Score Data*

Admissions and test score data are presented only for institutions that do not have an open admission policy, and apply to first-time, degree/certificate-seeking undergraduate students only. Applicants include only those students who fulfilled all requirements for consideration for admission and who were notified of one of the following actions: admission, non-admission, placement on a wait list, or application withdrawn (by applicant or institution). Admitted applicants (admissions) include wait-listed students who were subsequently offered admission. Early decision, early action, and students who began studies during the summer prior to the fall reporting period are included. For customized Data Feedback Reports, test scores are presented only if scores are required for admission.

## Student Enrollment

### FTE Enrollment

The full-time equivalent (FTE) enrollment used in this report is the sum of the institution's FTE undergraduate enrollment and FTE graduate enrollment (as calculated from or reported on the 12-month Enrollment component). Undergraduate and graduate FTE are estimated using 12-month instructional activity (credit and/or contact hours). See "Calculation of FTE Students (using instructional activity)" in the IPEDS Glossary at <https://surveys.nces.ed.gov/ipeds/VisGlossaryAll.aspx>.

### Total Entering Undergraduate Students

Total entering students are students at the undergraduate level, both full- and part-time, new to the institution in the fall term (or the prior summer term who returned in the fall). This includes all first-time undergraduate students, students transferring into the institution at the undergraduate level, and non-degree/certificate-seeking undergraduates entering in the fall. Only degree-granting, academic year reporting institutions provide total entering student data.

## Charges and Net Price

### Average Institutional Net Price

Average net price is calculated for full-time, first-time degree/certificate-seeking undergraduates who were awarded grant or scholarship aid from the federal government, state/local government, or the institution anytime during the full aid year. For public institutions, this includes only students who paid the in-state or in-district tuition rate. Other sources of grant aid are excluded. Average net price is generated by subtracting the average amount of federal, state/local government, and institutional grant and scholarship aid from the total cost of attendance. Total cost of attendance is the sum of published tuition and required fees, books and supplies, and the average room and board and other expenses.

For the purpose of the IPEDS reporting, aid awarded refers to financial aid that was awarded to, and accepted by, a student. This amount may differ from the aid amount that is disbursed to a student.

## Retention, Graduation Rates, and Outcome Measures

### Graduation Rates and Transfer-out Rate

Graduation rates are those developed to satisfy the requirements of the Student Right-to-Know Act and Higher Education Act, as amended, and are defined as the total number of individuals from a given cohort of full-time, first-time degree/certificate-seeking undergraduates who completed a degree or certificate within a given percent of normal time to complete all requirements of the degree or certificate program; divided by the total number of students in the cohort of full-time, first-time degree/certificate-seeking undergraduates minus any allowable exclusions. Institutions are permitted to exclude from the cohort students who died or were totally and permanently disabled; those who left school to serve in the armed forces or were called up to active duty; those who left to serve with a foreign aid service of the federal government, such as the Peace Corps; and those who left to serve on an official church mission.

A further extension of the traditional Graduation Rates (GR) component which carries forward 100% and 150% graduation rates data previously reported in the GR component is the Graduation Rates 200% (GR200) component, which request information on any additional completers and exclusions from the cohort between 151% and 200% normal time for students to complete all requirements of their program of study.

Transfer-out rate is the total number of students from the cohort who are known to have transferred out of the reporting institution (without earning a degree/award) and subsequently re-enrolled at another institution within the same time period; divided by the same adjusted cohort (initial cohort minus allowable exclusions) as described above. Only institutions with a mission that includes providing substantial preparation for students to enroll in another eligible institution are required to report transfers out.

### Retention Rates

Retention rates are measures at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall. The full-time retention rate is calculated using the percentage of full-time, first-time degree/certificate-seeking undergraduates, while the part-time rate is calculated using the percentage of part-time, first-time degree/certificate-seeking undergraduates.



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### *Outcome Measures Data*

Alternative measures of student success are reported by degree-granting institutions to describe the outcomes of degree/certificate-seeking undergraduate students who are not only first-time, full-time students, but also part-time attending and non-first-time (transfer-in) students. These measures provide the 6-year and 8-year award-completion rates after entering an institution, which is calculated by dividing the number of total awards at 6- or 8-year status points divided by the adjusted cohort. The initial cohort can be revised and take allowable exclusions resulting in an adjusted cohort. The type of award is not reported, but institutions report the first award earned by the student at each status point. For students who did not earn an undergraduate award after 8-years of entry, the enrollment statuses are reported as either still enrolled at the institution, subsequently transferred out of the institution, or status unknown. Unlike the Graduation Rates data, all reporting institutions must report on their transfer outs regardless if the institution has a mission that provides substantial transfer preparation.

### **Finance**

#### *Core Revenues*

Core revenues for public institutions reporting under GASB standards include tuition and fees; government (federal, state, and local) appropriations and operating and nonoperating grants/contracts; private gifts, grants, and contracts (private operating grants/contracts plus gifts and contributions from affiliated entities); sales and services of educational activities; investment income; other operating and nonoperating sources; and other revenues and additions (capital appropriations and grants and additions to permanent endowments). "Other core revenues" include federal appropriations, sales and services of educational activities, other operating and nonoperating sources, and other revenues and additions.

Core revenues for private, not-for-profit institutions (and a small number of public institutions) reporting under FASB standards include tuition and fees; government (federal, state, and local) appropriations and grants/contracts; private gifts, grants/contracts (including contributions from affiliated entities); investment return; sales and services of educational activities; and other sources (a generated category of total revenues minus the sum of core and noncore categories on the Finance component). "Other core revenues" include government (federal, state, and local) appropriations, sales and services of educational activities, and other sources.

Core revenues for private, for-profit institutions reporting under FASB standards include tuition and fees; government (federal, state, and local) appropriations and grants/contracts; private grants/contracts; investment income; sales and services of educational activities; and other sources (a generated category of total revenues minus the sum of core and noncore categories on the Finance component). "Other core revenues" include government (federal, state, and local) appropriations and other sources.

At degree-granting institutions, core revenues exclude revenues from auxiliary enterprises (e.g., bookstores and dormitories), hospitals, and independent operations. Non-degree-granting institutions do not report revenue from auxiliary enterprises in a separate category, and thus may include these amounts in the core revenues from other sources.

#### *Core Expenses*

Core expenses include expenses for instruction, research, public service, academic support, institutional support, student services, grant aid/scholarships and fellowships (net of discounts and allowances), and other functional expenses (a generated category of total expense minus the sum of core and noncore functions on the Finance component). Expenses for operation and maintenance of plant, depreciation, and interest are allocated to each of the other functions. Core expenses at degree-granting institutions exclude expenses for auxiliary enterprises (e.g., bookstores and dormitories), hospitals, and independent operations. Non-degree-granting institutions do not report expenses for auxiliary enterprises in a separate category and thus may include these amounts in the core expenses as other expenses. "Other core expenses" is the sum of grant aid/scholarships and fellowships and other expenses.

#### *Endowment Assets*

Endowment assets, for public institutions under GASB standards, and private, not-for-profit institutions under FASB standards, include gross investments of endowment funds, term endowment funds, and funds functioning as endowment for the institution and any of its foundations and other affiliated organizations. Private, for-profit institutions under FASB do not hold or report endowment assets.

#### *Salaries and Wages*

Salaries and wages for public institutions under GASB standards and private (not-for-profit and for-profit) institutions under FASB standards, include amounts paid as compensation for services to all employees regardless of the duration of service, and amounts made to or on behalf of an individual over and above that received in the form of a salary or wage.

## Staff

### FTE Staff

The full-time-equivalent (FTE) by occupational category is calculated by summing the total number of full-time staff and adding one-third of the total number of part-time staff. Graduate assistants are not included.

### Equated Instructional Non-Medical Staff Salaries

Institutions reported the number of full-time nonmedical instructional staff and their salary outlays by academic rank, gender, and the number of months worked (9-, 10-, 11-, and 12-months). Salary outlays for staff who worked 10-, 11-, and 12-months were equated to 9-months of work by multiplying the outlays reported for 10-months by 0.90, the outlays reported for 11 months by 0.818, and the outlays reported for 12-months by 0.75. The equated 10-, 11-, and 12-outlays were then added to the outlays for instructional staff that worked 9-months to generate a total 9-month equated salary outlay. The total 9-month equated outlay was then divided by total number of instructional non-medical staff to determine an equated 9-month average salary. This calculation was done for each academic rank. Salary outlays were not reported for staff that work less than 9-months and were excluded.

### Student-to-Faculty Ratio

Institutions can provide their institution's student-to-faculty ratio (i.e., student-to-instructional staff) for undergraduate programs or follow the NCES guidance in calculating their student-to-faculty ratio, which is as follows: the number of FTE students (using Fall Enrollment survey data) divided by total FTE instructional staff (using the total Primarily instruction + Instruction/research/public service staff reported in Human Resources component and adding any not primarily instructional staff that are teaching a credit course). For this calculation, FTE for students is equal to the number of the full-time students plus one-third the number of part-time students; FTE for instructional staff is similarly calculated. Students in "stand-alone" graduate or professional programs (such as, medicine, law, veterinary, dentistry, social work, or public health) and instructional staff teaching in these programs are excluded from the FTE calculations.

## Additional Methodological Information

Additional methodological information on the IPEDS components can be found in the publications available at <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=010>.

Additional definitions of variables used in this report can be found in the IPEDS online glossary available at this provided link <https://surveys.nces.ed.gov/ipeds/VisGlossaryAll.aspx>.