

## Paper 5202-2020

**Determining College Student Success**

Carl Palombaro, Kayla Barrier, Katherine Floyd, UNC Wilmington

**ABSTRACT**

Student loan debt is an extremely hot topic in the media and is continuously on the rise, totaling over 1.5 trillion dollars in the United States alone. The overall goal of this project was to determine a student's best financial option based on the degree they intend to seek, the university they attend, and the average salary per degree after graduation. In order to narrow the scope, this idea was applied to schools in North Carolina within the UNC public school system. The choice to exclude private universities in North Carolina was because many tuition rates at private institutions exceed the amount of funding typically available to a student through federal loans.

**INTRODUCTION**

With student loan debt estimated at 1.5 trillion dollars and \$2,858 accruing every second, many students and recent graduates struggle to repay their loans upon graduation. This paper shows the possible solution to this problem by looking at the best school for each major and the salary of each major post-graduation, along with the average yearly loan repayment at that university.

To narrow the scope of this project and get a more accurate estimate on repayment of student loans, the focus is on the public universities in the UNC school system. These schools include: Appalachian State, East Carolina, Elizabeth City State, Fayetteville State, NC Agricultural and Technical State, NC Central, NC State, North Carolina Central, UNC Asheville, UNC Charlotte, UNC Greensboro, UNC Pembroke, UNC Wilmington, UNC Chapel Hill, Western Carolina, and Winston-Salem State.

In order to estimate student loan repayment, the Federal Student Loan repayment plan was used as a guideline. This approach includes federal subsidized, unsubsidized, and parent plus loans. Knowing the average amount of specific student loans at each of these universities, the average yearly payment of each type of loan with interest was calculated in SAS®.

**METHODS****DATA COLLECTION**

The data pertaining to each individual schools' majors, number of students, and salary was pulled for the 2017 school year from the NC Tower website (<https://nctower.com/aboutdownload/>). NC Tower compiles their data from the North Carolina Department of Commerce's Labor and Economic Analysis Division, The North Carolina Community College System, the University of North Carolina General Administration, and the North Carolina Office of Information Technology Services.

The student loan data used in this paper was pulled directly from the Federal Student Loan website. This dataset shows the number of loans available at every school in the United States, the number of students receiving each type of loan, and the amount of each loan given for the 2017 school year.

## PROJECT APPROACH

As a student is preparing for college there are several assumptions made in this paper. First the student is from North Carolina and therefore will receive in state tuition. Second, the student is attending one of the public schools mentioned above and will be completing all four years at the same university. Next, the student will take out at least enough loans for the tuition and fees of the school. Lastly, the student will be employed in North Carolina after graduation, and will use a standard repayment plan to repay loans.

Following the flow chart found in the appendix, the student will fall into one of three cases: knows the department they want to study, knows the school they want to attend, or simply wants to achieve a degree. Each case creates a unique process in choosing a school or department and leads to the repayment of student loans.

From choosing a school the student was to take out a loan and would not be paying off the loan until the completion of their degree. The paper uses average amount of student loans per person at each university along with the standard repayment plan to determine total loan amount with interest after graduation. The paper accounts for a 4.53% interest rate on subsidized and unsubsidized loans, while a 7.08% rate is used for parent plus loans following graduation. While subsidized loans would not accrue interest while in school, both unsubsidized and parent plus loans accrue interest continuously during this time. The final step was to look at the calculated mean salary for each department and determine if the student would be able to repay the loan with accrued interest within the standard 10 years.

## DATA CLEANING AND MANIPULATION

Cleaning of the datasets, provided by NC Tower, consisted of removing special symbols such as ampersands, quotes, and slashes using the TRANWRD function. Upon closer investigation, many of the degree names included extra spaces and white space after the degree names. The names were stripped of the extra white space with the STRIP function, and the extra spaces were handled with the TRANWRD function.

Upon cleaning of the NC Tower data, PROC SQL was used to extract rows containing bachelor's degree as the degree earned. Two more columns were added to the data using IF statements. The first column was a school abbreviation column which would allow for better visualizations, and the second column was a department column. The department column was created from subjectively classifying each major into eight departments: Applied Sciences, Business, Fine Arts, Engineering, Education, Natural Resources, Natural Sciences, and Humanities and Social Sciences.

When cleaning the loan data, any schools not in the UNC public school system were removed. Additionally, all grants were also removed, as the focus is on student loans specifically.

## RESULTS

The results can be broken down into theoretical cases as seen in the flow chart. For the purpose of this paper several assumptions are made for each case. The first case assumes the student knows their department of study and possess the ability to attend any school of their choosing within the UNC system, choosing a school based on salary. The second case assumes the student has been accepted into a school they chose and decides a department

on the likelihood of being employed after school. The final case is of a student who wants to spend a minimal amount while receiving a valuable degree.

The first student will use the table found in Appendix E to determine the school in which their department makes the highest salary once the degree has been earned. For example, the student decides on the natural sciences department, and sees that UNC Chapel-Hill has one of the highest salaries earned after college. The student then looks at the trends of past graduates to determine potential salary after ten years. Considering the cost of living in North Carolina, approximately \$29,000 per year, the cost of their loans found in Appendix D, and the salary trend from previous years, the student can adjust their lifestyle based on remaining disposable income. Appendix G shows the result of the case.

The second student will use the table found in Appendix F to determine the department in which they wish to study while attending the school of their choice. For the specific case of attending East Carolina University the student chooses the business department to study as the most students are employed after graduation. Much like the first case the student will consider the cost of living, loans, and salary trend to determine disposable income. Appendix H shows the result of the case.

The third student decides on choosing a college with a lower tuition cost, but with a department that has a high salary after graduation. Using the chart in Appendix D the student decides that they want to attend Western Carolina University and study a subject from the applied sciences department. Similar to the other two cases the student will consider the cost of living, loans, and salary trend to determine disposable income. Appendix I shows the result of the case.

The monthly loan repayment amount was calculated using a compounding continuously formula on the average amount of student loans per person at each university post-graduation. These amounts are found in Appendix D. It was found that Western Carolina has the highest amount of unsubsidized loans, while UNC Chapel Hill had the highest amount of subsidized and UNC School of the Arts parent plus loans.

The primary results of this paper are reflected in the tables in Appendix B, C, and D. The table in Appendix B shows the overall average salary of a graduate in their first year from each of the different departments of every university. Appendix C highlights the total tuition cost for four years at each of the universities, as well as the average total subsidized, unsubsidized, and parent plus loans that each student takes out, with accrued interest included. These two tables are used in conjunction for the table in Appendix D. This table uses these average departmentalized salaries and the average loan amount at each university to determine how much of a recent graduate's yearly salary will go towards repaying student loans. This information would allow a prospective student to easily determine which university to go to considering their field of interest, essentially maximizing their dollars spent compared to what they will receive from the program.

This information would help students that have a certain career interest determine which university would be best for them based on overall tuition, loans taken out, their department of choice, and average salary of students that have completed that program. Obtaining an idea of what percentage of a possible future salary will be designated to repaying student loans within the allotted time will greatly benefit students on a tight budget. Some students may be willing to pay 20-30% of their income, whereas some may be willing to pay more, based on their circumstances. The importance of this paper is to

determine who would be able to live comfortably, and who may be treading water trying to continue making the appropriate payments.

## FUTURE STUDIES

One limitation found in the general approach to the project was the average salary found within counties of North Carolina. As salary is heavily based on county size, location, and overall popularity the mean salary per degree may not be a true indicator for projected loan repayment. A future study could expand the salaries to become more specific to counties located within the state. Additionally, assumptions were made about acceptance into schools and degree programs which, if difficulty of the program were accounted for, could alter outcomes. For example, UNC Chapel Hill is known for its low acceptance rate, and even lower acceptance rate for students into desired degree programs. Therefore, students who possess a degree from UNC Chapel Hill may be more widely sought after for high salaries outside of North Carolina. Finally, data for the project was limited to North Carolina graduates within North Carolina. Therefore, salaries outside of North Carolina were not presented which may lead to an undesirable salary prediction, and hence a longer time to repay student loans.

## CONCLUSION

This paper has proposed a question about the outcomes of a college career and a possible solution to solve it. This idea will be able to help students entering college with at least some idea of what they want to study. It will allow these students to select a university that is strong in their desired field as well as finding the perfect blend of prestige and affordability. If this is a strong prediction, it could help students long-term plan their financial situation in order to give them some desired stability. It would also allow students to plan their future financial success, as they will have some general idea of how much their salary will be along with their respective loan repayment amounts.

## REFERENCES

- Desjardins, J. (2018, July 25). Chart: Which college degrees get the highest salaries?. Retrieved from <https://www.visualcapitalist.com/visualizing-salaries-college-degrees/>
- Fay, B. (2017). Student loan resources: Financial aid & loan debt management. Retrieved from <https://www.debt.org/students/>
- Federal Student Aid. (2019). Repayment calculator | Federal student loans. Retrieved from <https://studentloans.gov/myDirectLoan/repaymentEstimator.action>
- Federal Student Aid. (2020, January 2). Title IV program volume reports. Retrieved from <https://studentaid.ed.gov/sa/about/data-center/student/title-iv>
- Glasmeier, A. K. (2014). Living Wage Calculator. Retrieved from <https://livingwage.mit.edu/>
- NC Tower. (2019). Data Download. Retrieved from <https://nctower.com/aboutdownload/>
- The University of North Carolina. (2019). *Tuition and fees applicable to all regular full-time undergraduate students*. Retrieved from [https://www.northcarolina.edu/sites/default/files/2019-20\\_ug\\_tuition\\_and\\_fees.pdf](https://www.northcarolina.edu/sites/default/files/2019-20_ug_tuition_and_fees.pdf)

Trivette, M. (2018, August 2). Admission statistics for all 16 UNC system schools. Retrieved from <https://www.charlotteagenda.com/135476/unc-statistics-college-university-stats-2018/>

## ACKNOWLEDGMENTS

Dr. James E. Blum

Coordinator, Master of Science Mathematics & Graduate Certificate in Applied Statistics

Professor, Dept. of Mathematics and Statistics

## CONTACT INFORMATION

Carl Palombaro

UNC Wilmington

[cp5031@uncw.edu](mailto:cp5031@uncw.edu)

Kayla Barrier

UNC Wilmington

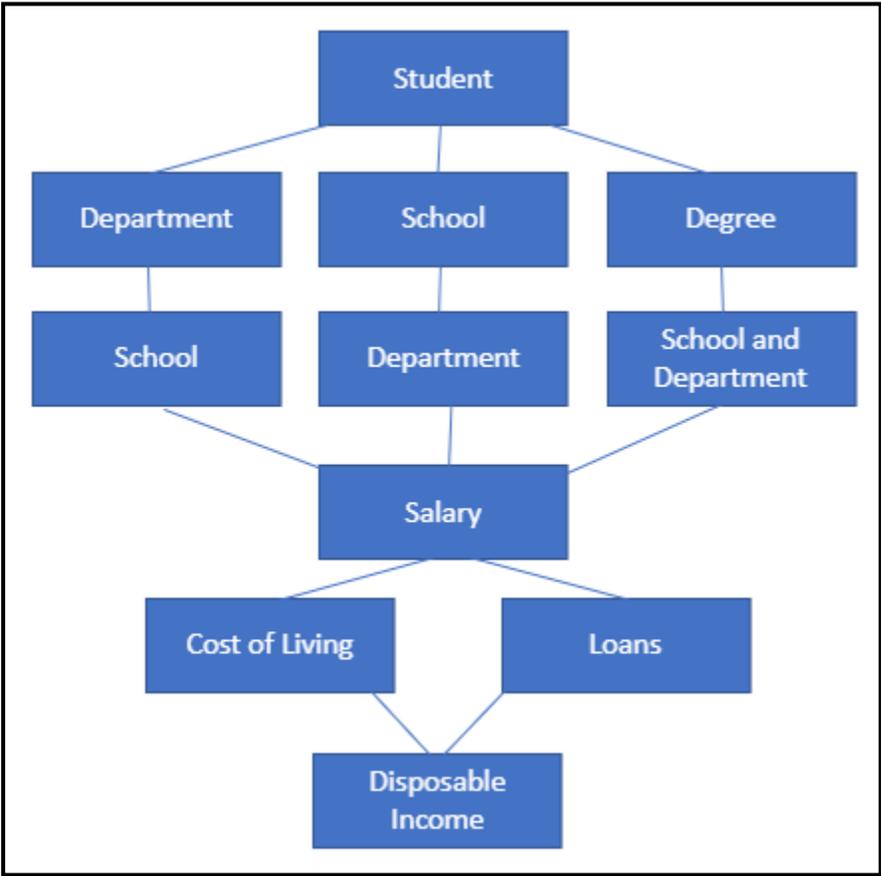
[ksb3369@uncw.edu](mailto:ksb3369@uncw.edu)

Katherine Floyd

UNC Wilmington

[kaf6805@uncw.edu](mailto:kaf6805@uncw.edu)

**APPENDIX A: PROCESS FLOW CHART**



*The general flow chart for the thought process of this project.*

## APPENDIX B: SALARY RESULTS

Average Salaries for First Year

Campus	department	Mean_Wage
Appalachian State University	Applied Sciences	50445.544
	Business	42901.779
	Education	34112.538
	Engineering	40379.816
	Fine Arts	28670.113
	Health Sciences	35824.229
	Humanities and Social Science	32259.738
	Natural Resources	21985.208
	Natural Sciences	36729.554
East Carolina University	Applied Sciences	53218.095
	Business	44101.264
	Education	34986.51
	Engineering	54201.935
	Fine Arts	29327.547
	Health Sciences	41212.222
	Humanities and Social Science	33935.26
	Natural Sciences	43135.657
Elizabeth City State University	Applied Sciences	31337.082
	Business	28303.104
	Education	30446.49
	Engineering	26964.897
	Fine Arts	22701.382
	Humanities and Social Science	25260.647
	Natural Sciences	29326.605
Fayetteville State University	Applied Sciences	35573.695
	Business	32081.713
	Education	33997.745
	Fine Arts	25177.82
	Health Sciences	55844.806
	Humanities and Social Science	28656.648
	Natural Sciences	31429.408
NC Agricultural and Technical State University	Applied Sciences	44078.919
	Business	34516.394
	Education	36978.851
	Engineering	42878.324
	Fine Arts	25889.57
	Health Sciences	39727.796
	Humanities and Social Science	28408.119
	Natural Resources	30527.487
Natural Sciences	30882.518	
NC State University	Applied Sciences	59094.597
	Business	46785.985
	Education	38502.418

	Engineering	58510.063
	Fine Arts	38489.906
	Health Sciences	38827.8
	Humanities and Social Science	37570.685
	Natural Resources	39697.438
	Natural Sciences	41405.481
North Carolina Central University	Applied Sciences	46906.051
	Business	32074.684
	Education	35270.977
	Fine Arts	24597.404
	Health Sciences	44792.066
	Humanities and Social Science	28459.859
	Natural Resources	26189.75
	Natural Sciences	35743.938
UNC Asheville	Applied Sciences	36695.687
	Business	40107.326
	Engineering	42511.5
	Fine Arts	22729.487
	Health Sciences	25218.125
	Humanities and Social Science	26891.561
	Natural Resources	27287.242
	Natural Sciences	32733.048
UNC Charlotte	Applied Sciences	51862.002
	Business	48711.76
	Education	35277.752
	Engineering	59561.244
	Fine Arts	31944.566
	Health Sciences	45796.385
	Humanities and Social Science	36167.914
	Natural Sciences	39706.122
UNC Greensboro	Applied Sciences	47574.625
	Business	40982.386
	Education	35198.654
	Fine Arts	28103.612
	Health Sciences	39505.274
	Humanities and Social Science	30835.194
	Natural Sciences	36702.908
UNC Pembroke	Applied Sciences	39399.29
	Business	35448.913
	Education	35175.085
	Fine Arts	24958.087
	Health Sciences	41302.367
	Humanities and Social Science	29270.142
	Natural Resources	26463.667
	Natural Sciences	38436.444
UNC School of the Arts	Fine Arts	19540.801

	Humanities and Social Science	19719.619
UNC Wilmington	Applied Sciences	50881.946
	Business	44433.871
	Education	34622.438
	Fine Arts	22548.778
	Health Sciences	40340.765
	Humanities and Social Science	32039.218
	Natural Resources	32750.167
	Natural Sciences	35627.307
UNC-Chapel Hill	Applied Sciences	58746.779
	Business	52834.058
	Education	35764.837
	Engineering	44714
	Fine Arts	26834.97
	Health Sciences	52669.57
	Humanities and Social Science	39882.146
	Natural Resources	34910.286
	Natural Sciences	41643.489
Western Carolina University	Applied Sciences	44465.989
	Business	38903.655
	Education	33826.46
	Engineering	49046.408
	Fine Arts	25685.715
	Health Sciences	40898.372
	Humanities and Social Science	30198.292
	Natural Resources	26608.324
	Natural Sciences	34909.186
Winston-Salem State University	Applied Sciences	41718.996
	Business	33047.186
	Education	33642.644
	Fine Arts	22635.337
	Health Sciences	42571.676
	Humanities and Social Science	29575.022
	Natural Sciences	32004.98

*Average Salaries for each department post-graduation for each of the UNC system universities.*

## APPENDIX C: LOAN AMOUNTS

Campus	Tuition	Unsubsidized Loans	Subsidized Loans	Parent Plus Loans	Total Amount of Loans
Appalachian State University	57992	8096.4165	8728.5917	28254.62	45079.628
East Carolina University	56544	8548.008	8588.7164	36603.004	53737.729
Elizabeth City State University	26072	7986.4154	8097.7855	25591.639	41675.839
Fayetteville State University	42472	7901.7571	9464.1924	16989.944	34355.893
NC Agricultural and Technical State University	52400	8124.8589	7804.7673	30187.354	46116.981
NC State University	71160	8281.8434	9508.7496	35100.694	52891.287
North Carolina Central University	51336	7852.6826	8321.4629	25188.335	41362.481
UNC Asheville	56704	8377.0481	9158.5914	30528.525	48064.164
UNC Charlotte	55240	8461.9331	9209.7388	31544.943	49216.615
UNC Greensboro	58296	8270.613	8393.4094	25026.794	41690.816
UNC Pembroke	27912	8390.2909	8731.4575	20295.753	37417.502
UNC School of the Arts	71288	8651.413	8471.1029	49733.474	66855.99
UNC Wilmington	56608	8366.3818	8823.6191	38047.415	55237.415
UNC-Chapel Hill	70000	7753.843	11771.336	38610.813	58135.992
Western Carolina University	30600	8657.8354	8530.2268	27717.603	44905.665
Winston-Salem State University	46904	8018.9677	7146.1543	20408.987	35574.11

*In-State Tuition for 4 years, average total amount (interest included) that each student will repay for each loan type*

## APPENDIX D: LOAN AND SALARY COMPARISON

Campus	4 Year Tuition	Total Yearly Loan Payment	Department	Average Salary	Loan Repayment Percentage of Salary			
Appalachian State University	57992	4507.9628	Applied Sciences	50445.544	8.9362954			
			Business	42901.779	10.507638			
			Education	34112.538	13.214973			
			Engineering	40379.816	11.163901			
			Fine Arts	28670.113	15.723561			
			Health Sciences	35824.229	12.583559			
			Humanities and Social Science	32259.738	13.97396			
			Natural Resources	21985.208	20.504527			
			Natural Sciences	36729.554	12.273394			
			East Carolina University	56544	5373.7729	Applied Sciences	53218.095	10.097642
			Business	44101.264	12.185077			
			Education	34986.51	15.359557			
			Engineering	54201.935	9.9143561			
			Fine Arts	29327.547	18.323295			
			Health Sciences	41212.222	13.03927			
			Humanities and Social Science	33935.26	15.835367			
			Natural Sciences	43135.657	12.457844			
Elizabeth City State University	26072	4167.5839	Applied Sciences	31337.082	13.299209			
			Business	28303.104	14.72483			
			Education	30446.49	13.688225			
			Engineering	26984.897	15.45559			
			Fine Arts	22701.382	18.358283			
			Humanities and Social Science	25260.847	16.498326			
			Natural Sciences	29326.805	14.210932			
Fayetteville State University	42472	3435.5893	Applied Sciences	35573.695	9.657668			
			Business	32081.713	10.706871			
			Education	33997.745	10.105345			
			Fine Arts	25177.82	13.645301			
			Health Sciences	55844.806	6.1520302			
			Humanities and Social Science	28556.648	11.988804			
			Natural Sciences	31429.408	10.93113			
			NC Agricultural and Technical State University	52400	4611.6581	Applied Sciences	44078.919	10.462367
						Business	34516.394	13.960892
						Education	36978.851	12.471177
			Engineering	42878.324	10.756313			
			Fine Arts	25889.57	17.812957			
			Health Sciences	39727.796	11.60824			
			Humanities and Social Science	28408.119	16.233733			
			Natural Resources	30527.487	15.106707			
			Natural Sciences	30882.518	14.933038			
NC State University	71160	5289.1287	Applied Sciences	59094.597	8.9502748			
			Business	46785.985	11.304943			
			Education	38502.418	13.737134			
			Engineering	58510.083	9.0396907			
			Fine Arts	38489.906	13.741599			
			Health Sciences	38827.8	13.622015			
			Humanities and Social Science	37570.685	14.077808			
			Natural Resources	39697.438	13.323602			
			Natural Sciences	41405.481	12.773982			
			North Carolina Central University	51336	4138.2481	Applied Sciences	48906.051	8.8181546
			Business	32074.684	12.895978			
			Education	35270.977	11.727058			
			Fine Arts	24597.404	16.815791			

			Health Sciences	38827.8	13.622016
			Humanities and Social Science	37570.685	14.077808
			Natural Resources	39697.438	13.323602
			Natural Sciences	41405.481	12.773962
North Carolina Central University	51338	4136.2461	Applied Sciences	48906.051	8.8181546
			Business	32074.684	12.896978
			Education	35270.977	11.727058
			Fine Arts	24597.404	16.815791
			Health Sciences	44792.086	9.234332
			Humanities and Social Science	28459.859	14.533821
			Natural Resources	26189.75	15.793385
			Natural Sciences	35743.938	11.571887
UNC Asheville	56704	4806.4164	Applied Sciences	36695.687	13.096042
			Business	40107.326	11.983886
			Engineering	42511.5	11.306156
			Fine Arts	22729.487	21.146172
			Health Sciences	25218.125	19.059373
			Humanities and Social Science	26891.561	17.873326
			Natural Resources	27287.242	17.614153
			Natural Sciences	32733.046	14.663661
UNC Charlotte	55240	4921.6615	Applied Sciences	51862.002	9.4899181
			Business	48711.76	10.103641
			Education	35277.752	13.951177
			Engineering	59661.244	8.2631947
			Fine Arts	31944.566	15.406882
			Health Sciences	45796.385	10.746834
			Humanities and Social Science	36167.914	13.607611
			Natural Sciences	39706.122	12.395221
UNC Greensboro	58296	4169.0816	Applied Sciences	47574.625	8.7632464
			Business	40982.386	10.172862
			Education	35196.654	11.844435
			Fine Arts	26103.612	14.834682
			Health Sciences	39505.274	10.553228
			Humanities and Social Science	30835.194	13.52053
			Natural Sciences	36702.908	11.569995
UNC Pembroke	27912	3741.7502	Applied Sciences	39399.29	9.466999
			Business	35448.913	10.555331
			Education	35175.085	10.637501
			Fine Arts	24958.087	14.992135
			Health Sciences	41302.367	9.0594088
			Humanities and Social Science	29270.142	12.783505
			Natural Resources	26463.667	14.139198
			Natural Sciences	38436.444	9.7349021
UNC School of the Arts	71288	6665.599	Fine Arts	19540.861	34.213431
			Humanities and Social Science	19719.619	33.903267
UNC Wilmington	56608	5523.7415	Applied Sciences	50881.946	10.855995
			Business	44433.871	12.431376
			Education	34622.438	15.954225
			Fine Arts	22548.778	24.496855
			Health Sciences	40340.785	13.692704
			Humanities and Social Science	32039.218	17.240663
			Natural Resources	32750.167	16.8663
			Natural Sciences	35627.307	15.504235
UNC-Chapel Hill	70000	5813.5992	Applied Sciences	56746.779	9.8960306
			Business	52634.058	11.003507
			Education	35764.837	16.25507
			Engineering	44714	13.001743
			Fine Arts	26834.97	21.664266
			Health Sciences	52689.57	11.037871
			Humanities and Social Science	39882.146	14.576947
			Natural Resources	34910.286	16.652969
			Natural Sciences	41643.469	13.960404
Western Carolina University	30600	4490.5665	Applied Sciences	44465.969	10.096679
			Business	38903.655	11.542788
			Education	33826.46	13.275307
			Engineering	49046.408	9.1557501
			Fine Arts	25685.715	17.462739
			Health Sciences	40896.372	10.979817
			Humanities and Social Science	30196.292	14.870267
			Natural Resources	26608.324	16.876548
			Natural Sciences	34909.186	12.863667
Winston-Salem State University	46904	3557.411	Applied Sciences	41718.996	8.5270771
			Business	33047.166	10.764641
			Education	33642.644	10.574112
			Fine Arts	22635.337	15.716183
			Health Sciences	42571.676	8.3662659
			Humanities and Social Science	29575.022	12.02843
			Natural Sciences	32004.98	11.115179

*Comparison of tuition, average loan amounts, and percentage of salary monthly used for future loan repayment for each university and department.*

## APPENDIX E: NATURAL SCIENCE SALARY COMPARISON

### Average Salaries for Natural Sciences

Campus	Average Salary
Appalachian State University	38729.554
East Carolina University	43135.857
Elizabeth City State University	29326.805
Fayetteville State University	31429.408
NC Agricultural and Technical S	30882.518
NC State University	41405.481
North Carolina Central Universi	35743.938
UNC Asheville	32733.048
UNC Charlotte	39706.122
UNC Greensboro	38702.908
UNC Pembroke	38436.444
UNC Wilmington	35627.307
UNC-Chapel Hill	41643.489
Western Carolina University	34909.188
Winston-Salem State University	32004.98

*Comparison of mean salaries of graduates in the Natural Sciences department*

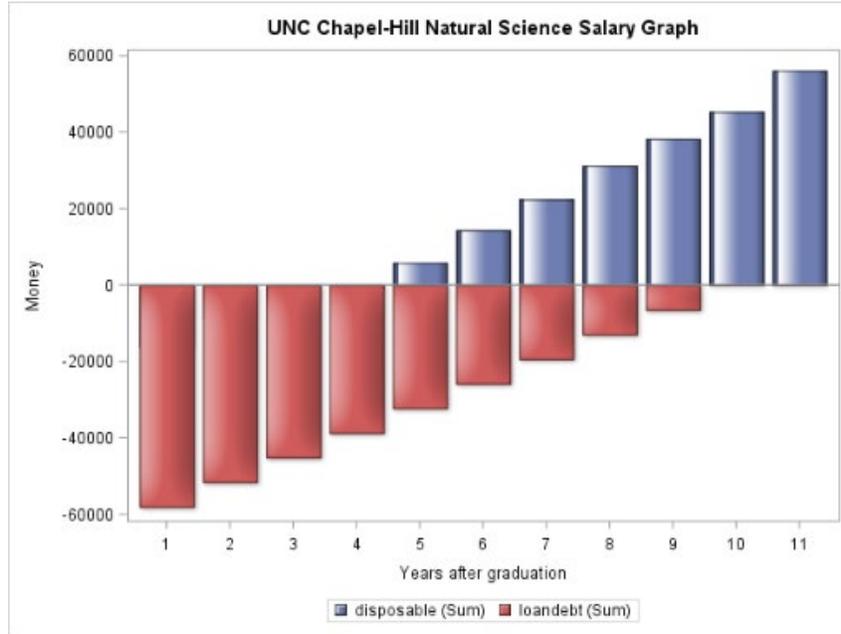
## APPENDIX F: EAST CAROLINA EMPLOYMENT RATES

### ECU Students Employed After Graduation

department	Employed
Applied Sciences	142
Business	1898
Education	942
Engineering	467
Fine Arts	6
Health Sciences	868
Humanities and Social Science	3908
Natural Sciences	318

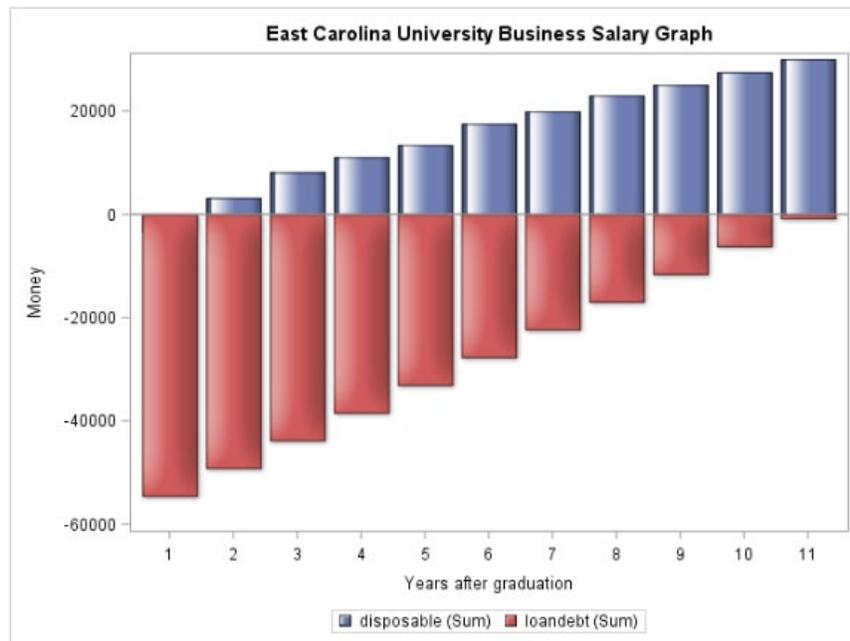
*Chart indicating number of graduates in 2017 from each department from East Carolina University*

## APPENDIX G: CASE 1 RESULT



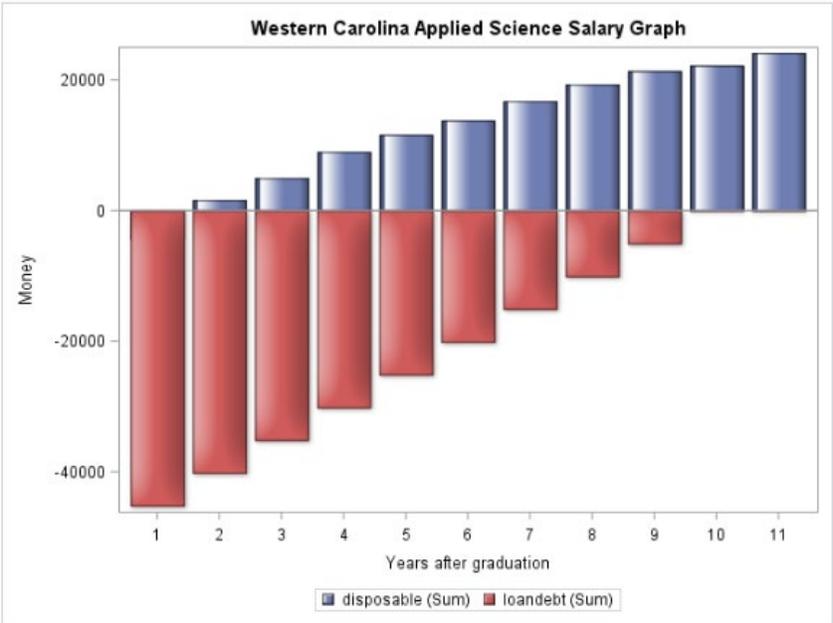
Vertical bar graph showing disposable income using mean salaries from 2007 through 2017 of UNC Chapel-Hill graduates in the Natural Science department

## APPENDIX H: CASE 2 RESULT



Vertical bar graph showing disposable income using mean salaries from 2007 through 2017 of East Carolina University graduates in the Business department

**APPENDIX I: CASE 3 RESULT**



*Vertical bar graph showing disposable income using mean salaries from 2007 through 2017 of Western Carolina University graduates in the Applied Science department*