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Understanding the Drivers of Academic Success in University Students

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ABSTRACT

An in depth survey was conducted to understand the drivers for academic success in university students. Over 400 undergraduate students, mostly majoring in business, participated in an online survey at the beginning of the fall 2010 semester. The survey questionnaire consisted of both closed-ended (structured) and open-ended (unstructured) questions. The combining of both structured and unstructured data gave a better understanding of the factors which impact academic performance. This paper demonstrates the application of both the data mining and text mining techniques that were used.

INTRODUCTION

How is academic success measured in university students? Grades are usually the primary indicator of academic performance. The overall grade point average (CGPA) is the method most universities use to measure a student's academic performance. As such, the CGPA variable is used as the measure for academic success in this paper.

In the fall 2010 semester, the author taught a quantitative methods course to 650 students in 3 separate classes at a public research university in Canada. To understand the drivers for academic success in these students, an online survey was administered. The other purpose for this survey was to provide students with actual data to analyze. The survey was anonymous and participation was voluntary. The survey took place between September 8 and 16, 2010 using the university's web survey tool. There was a 68% response rate. Of the 441 students who participated in the survey, over 57% were from the Business faculty and 36% were from the Arts and Social Sciences faculty. The survey questionnaire consisted of both structured (closed-ended) and unstructured (open-ended) questions. The survey data consisted of 90 variables - both quantitative and qualitative, providing a rich data source.

METHODOLOGY

For structured data, statistical techniques such as contingency and correlation were used to understand the drivers of academic success and text mining was used to analyze the open-ended questions. For unstructured data, using SAS® Text Miner tool, the text clustering mining technique was applied to group the textual data. The text mined data was further analyzed with structured data to profile the clusters.

RESULTS

The following sections will review analysis and various statistical outputs, and shows the relationship of various numerical variables that have an impact on overall Grade Point Average (CGPA).

I. VARIABLES THAT HAVE A NEGATIVE IMPACT ON CGPA

Figure 1: Variables with a negative impact on CGPA

	Correlation Coefficient*
Going to the movies	-0.154
Giving more importance to eating convenience foods	-0.113
Giving more importance to earning lots of money	-0.099
Giving more importance to using social media for social interaction	-0.096
Employment hours	-0.095

*Correlation is statistically significant at an alpha level of 0.05

Using correlation analysis, five statistically significant numerical variables are identified that have a negative impact on overall Grade Point Average as shown in Figure 1. In the following section, using cross-tabs, these variables were analyzed individually.

- **GOING TO THE MOVIES**

Figure 2: Impact of Going to the Movies on CGPA

	Hours per week spent watching movies			
	0	1 – 2 (1 movie)	3 – 4 (2 movies)	5+ (3+ movies)
	A	B	C	D
Base	139	199	62	41
Overall Grade Point Average	3.040 D	2.910	2.864	2.819

Pairwise statistical significance comparisons at an alpha level of 0.05

Figure 2 above shows that students who spend 5 or more hours per week on movies have a significantly lower CGPA than those who do not watch movies. This does not mean watching movies has an altogether negative effect on CGPA, as statistically there is no significant difference between those who watch 1 or 2 movies a week and those who watch no movies at all.

- EATING CONVENIENCE FOODS**

Figure 3: Impact of giving more importance to eating convenience foods on CGPA

	Importance Rating		
	1 – 4 (Low Importance)	5 – 6 (Neutral)	7 – 10 (High Importance)
	A	B	C
Base	136	156	149
Overall Grade Point Average	3.026 C	2.918	2.873

Pairwise statistical significance comparisons at an alpha level of 0.05

Here the 10-point importance scale is used, where 1 is “Not at all important” and 10 is “Very important”. To simplify interpretation, the scale is further divided into three categories: Lower importance (1-4), Neutral (5-6) and Higher importance (7-10). Students who give a higher importance rating (7-10), have a significantly lower CGPA than those who give a lower importance rating (1-4).

- EARNING LOTS OF MONEY**

Figure 4: Impact of giving more importance to earning lots of money on CGPA

	Importance Rating		
	1 – 4 (Low Importance)	5 – 8 (Moderate Importance)	9 – 10 (Higher Importance)
	A	B	C
Base	17	246	178
Overall Grade Point Average	2.982	2.989 C	2.859

Pairwise statistical significance comparisons at an alpha level of 0.05

Who wouldn't want “more” money? For students, placing higher importance on earning lots of money shows a negative impact on their CGPA. Figure 4 above shows that students who give a higher importance rating to earning lots of money (9-10), have a significantly lower CGPA than those who give a moderate importance (5-8) to earning lots of money.

- EMPLOYMENT HOURS**

Figure 5: Impact of employment hours on CGPA

	Hours per Week			
	0	0 up to 10	10 up to 20	More than 20
	A	B	C	D
Base	250	66	84	41
Overall Grade Point Average	2.944	3.061	2.861	2.844

Over half of the students (56.7%) surveyed do not work. Figure 5 above shows that as the hours of employment increases, the CGPA drops. There is no statistical significant difference between the four groups. Students who are working up to 10 hours a week have higher CGPAs compared to other groups.

• USING SOCIAL MEDIA FOR SOCIAL INTERACTION

Figure 6: Impact of giving more importance to using social media on CGPA

	Importance Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	33	99	208	101
Overall Grade Point Average	2.946	3.012	2.928	2.876

The 10-point importance scale is used, where 1 is “Not at all important” and 10 is “Very important” to rate the statement “Using social media for social interaction”. Figure 6 shows that students who give a neutral importance rating (5-6), tend to have a slightly higher CGPA than those who give either a lower (1-4) or higher (9-10) rating.

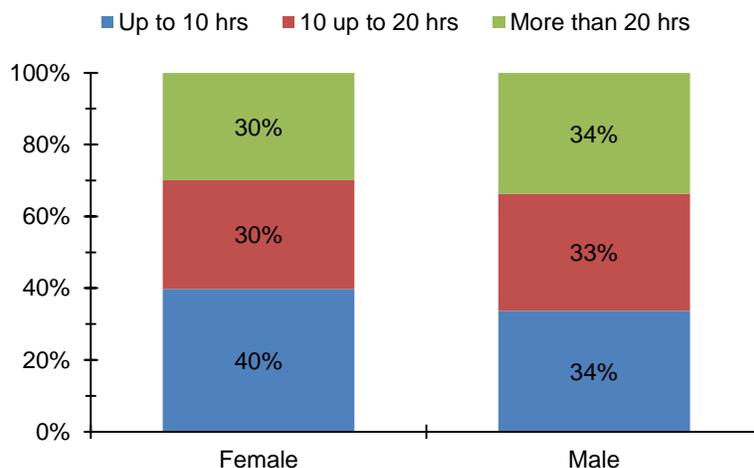
Students who give a higher importance (9-10) rating to “Using social media for social interaction” do not necessarily spend more time on the Internet as a leisure activity than those who gave a lower rating (1-4). Figure 7 below shows the relationship between being on the Internet as a leisure activity and CGPA score.

Figure 7: Impact of time spent on the Internet on CGPA

	Hours per Week		
	Up to 10 (Light users)	10 up to 20 (Moderate users)	More than 20 (Heavy users)
	A	B	C
Base	164	138	208
Overall Grade Point Average	2.963	2.911	2.929

The question was asked “How many hours per week do you spend on the Internet as a leisure activity?”. Based on responses, the responses were categorized into three groups: Light users (up to 10 hrs.), Moderate users (10 up to 20 hrs.) and Heavy users (More than 20 hrs.) There is no relationship found between time spent on the Internet and student CGPA scores as shown in Figure 7 above. The correlation coefficient between these two variables is weak (-0.056) and statistically insignificant. Figure 8 below shows the time spent on internet by gender.

Figure 8: Time spent on Internet by Gender



On average, female students tend to spend slightly less time on the Internet than male students (19.31 vs. 21.44 hrs./wk.), but the difference is not statistically significant.

II. VARIABLES THAT HAVE A POSITIVE IMPACT ON CGPA

Using correlation analysis, five statistically significant numerical variables are identified which have a positive impact on student overall Grade Point Average (CGPA) as shown in the table below.

Figure 9: Variables that have a positive impact on CGPA

	Correlation Coefficient*
Number of credit course hours	0.205
Time spent on school work	0.146
Satisfaction with co-op program	0.134
Importance of knowledge of historical events	0.117
Satisfaction with extracurricular activities	0.106

*Correlation is statistically significant at an alpha level of 0.05

In the following section, using cross-tabs, these numerical variables were analyzed individually.

- NUMBER OF CREDIT COURSE HOURS (PER SEMESTER)**

Figure 10: Impact of number of credit course hours on CGPA

	Number of Course Hours		
	Less than 9 (part-time)	9 – 12	More than 12
	A	B	C
Base	61	169	211
Overall Grade Point Average	2.78	2.87	3.04 A,B

Pairwise statistical significance comparisons at an alpha level of 0.05

The question was asked “How many credit course hours are you taking this semester?” Student responses were divided into three categories: “Less than 9”, which is generally part-time students, “9 to 12”, and “More than 12”. Figure 10 shows that the full-time students (9+ credit hours) CGPA is higher than part-time students. Students with more than 12 credit hours have a significantly higher CGPA.

- TIME SPENT ON SCHOOL WORK**

Figure 11: Impact of time spent on school work on CGPA

	Hours per Week		
	Up to 5	5 up to 15	More than 15
	A	B	C
Base	125	211	105
Overall Grade Point Average	2.807	2.965 A	3.032 A

Pairwise statistical significance comparisons at an alpha level of 0.05

The question was asked “What is the average number of hours you spend doing school work per week?”. For simplicity, the responses were divided into three categories: “Up to 5 hours”, “5 < 15 hours”, and “More than 15 hours”. Figure 11 shows that students who are spending 5 or less hours per week on doing school work have a significantly lower CGPA. However, more hours put into school work does not necessarily lead to a much higher CGPA, as there is no statistical difference between students spending “5<15” and “More than 15” hours on school work.

- **CO-OP PROGRAM**

Figure 12: Impact of satisfaction with co-op program on CGPA

	Satisfaction Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	49	153	179	60
Overall Grade Point Average	2.818	2.921	2.915	3.133 ABC

Pairwise statistical significance comparisons at an alpha level of 0.05

Students were asked to rate their satisfaction with the co-op program at the university, on a scale of 1 to 10, where 1 is “Very dissatisfied” and 10 is “Very satisfied”. Satisfaction is higher for those students who are involved in the co-op program, and students with higher satisfaction with the co-op program tend to have a higher CGPA as shown in Figure 12.

- **KNOWLEDGE OF HISTORICAL EVENTS**

Figure 13: Impact of importance of knowledge of historical events on CGPA

	Importance Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	79	157	162	43
Overall Grade Point Average	2.892	2.906	2.929	3.153 ABC

Pairwise statistical significance comparisons at an alpha level of 0.05

Students were asked to rate the “Importance of knowledge of historical events” on a scale of 1 to 10, where 1 is “Not at all important” and 10 is “Very important”. Figure 13 shows that as the importance ratings go up, so does the CGPA. Students who gave higher importance ratings (9-10) to knowledge of historical events have significantly higher GPAs.

- **EXTRACURRICULAR ACTIVITIES**

Figure 14: Impact of student satisfaction with extracurricular activities on CGPA

	Satisfaction Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	65	171	173	32
Overall Grade Point Average	2.902	2.923	2.921	3.158

Students were asked to rate their satisfaction with extracurricular activities at the university, on a scale of 1 to 10, where 1 is "Very Dissatisfied" and 10 is "Very Satisfied". The correlation coefficient (0.106) suggests that there is a positive relationship between satisfaction with extracurricular activities and CGPA (see Figure 9). Figure 14 show that, although not statistically significant, students who gave a 9-10 satisfaction rating have slightly higher CGPAs.

III. STUDENT SATISFACTION WITH UNIVERSITY ATTRIBUTES

Students were asked to rate their satisfaction with the attributes directly related to university on a scale of 1 to 10, where 1 is "Very dissatisfied" and 10 is "Very satisfied". Figure 15 lists the four attributes which stood out as significant when correlated with CGPA.

Figure 15: University attributes that have a positive impact on CGPA

	Correlation Coefficient*
Professors/Instructors	0.116
Lecture difficulty	0.112
TAs	0.110
University reputation	0.100

*Correlation is statistically significant at an alpha level of 0.05

- **Instructors:** There is a positive correlation (0.116) between student satisfaction with their instructors and their overall Grade Point Average. Figure 16 below shows that students with higher satisfaction with their instructors tend to have a higher CGPA than those who are less satisfied with their instructors.

Figure 16: Impact of student satisfaction with Instructors on CGPA

	Satisfaction Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	21	92	267	61
Overall Grade Point Average	2.771	2.894	2.939	3.045

- **Lecture difficulty:** There is a positive correlation (0.112) between student satisfaction with lecture difficulty and their CGPA. Figure 17 below shows that students who gave a higher satisfaction rating to lecture difficulty have a higher CGPA than those who are less satisfied.

Figure 17: Impact of student satisfaction with Lecture Difficulty on CGPA

	Satisfaction Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	29	165	227	20
Overall Grade Point Average	2.783	2.915	2.959	3.073

- **Course TAs:** The correlation coefficient (0.110) suggests that there is a positive relationship between student satisfaction with course TAs and CGPA scores. Figure 18 below shows that as student satisfaction with TAs goes up, so does the CGPA scores.

Figure 18: Impact of student satisfaction with Course TAs on CGPA

	Satisfaction Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	45	142	219	35
Overall Grade Point Average	2.849	2.881	2.974	3.034

- **University reputation:** The correlation coefficient (0.100) suggests that there is a positive relationship between student satisfaction with the university reputation and CGPA score. Figure 19 below shows that students who gave higher satisfaction ratings (7-10) have slightly higher CGPAs than those who gave lower satisfaction ratings (1-6).

Figure 19: Impact of student satisfaction with University Reputation on CGPA

	Satisfaction Rating			
	1 – 4	5 – 6	7 – 8	9 – 10
	A	B	C	D
Base	34	103	243	61
Overall Grade Point Average	2.827	2.869	2.973	2.963

IV. IMPACT OF CATEGORICAL VARIABLES ON CGPA

In the previous sections, numerical response variables in the survey that had impacts on the overall Grade Point Average (CGPA) were analyzed. In this section, categorical response variables such as “yes” or “no” are analyzed.

Figure 20: Impact of categorical variables on CGPA

	No	Yes
	A	B
Own a bicycle	2.897	3.080 A
Co-op education	2.917	3.065 A
Eat breakfast regularly	2.868	2.986 A
Have a specific career goal in mind	2.844	2.978 A
Case competitions	2.929	3.078
Volunteering	2.907	2.999
Student club(s)	2.916	2.970
Study abroad	2.929	2.975
Athletic team	2.935	2.948

Pairwise statistical significance comparisons at an alpha level of 0.05

- 22% of students own a bicycle. On average, the CGPA of these bicycle owners is higher than those who do not own a bicycle. These bicycle owners tend to be full-time students and spend more than 5 hours per week on school work. Both of these attributes have a positive impact on the CGPA.
- 13% of the students surveyed are involved in the co-op program. In the survey sample, more business students are in the co-op program than non-business students. Figure 20 shows that students who are involved in the co-op program have a significantly higher CGPA than those who are not involved in the program. Students in the co-op program tend to be more satisfied with their academic pursuits than those who are not involved in the co-op program.
- 57% of students eat breakfast regularly. Figure 20 above shows that students who eat their breakfast regularly have a higher CGPA than those who do not eat breakfast regularly.
- 68% of students have a specific career goal in mind while they are pursuing their studies at the university. Figure 20 shows that students with specific career goals in mind have a higher CGPA than those without a specific career goal. Students who have a specific career goal in mind are also more likely to be involved in activities such as student clubs, co-op programs, and volunteering. These students tend to be more satisfied with their educational experience and academic pursuits.
- 32% of students indicated that they are involved in some sort of volunteer activity. Analyzing the CGPA by volunteer activities, Figure 20 shows that those who are involved in volunteering tend to have slightly higher CGPAs.
- Students who are involved in case competitions (5%), student clubs (37%), study abroad (16%) and athletic teams (6%) have higher CGPAs than those who are not involved in any of these activities as shown in Figure 20.

V. USING SAS ENTERPRISE MINER FOR TEXT MINING

- **CLUSTER ANALYSIS**

Using SAS Enterprise Miner's text mining tool, open-ended questions are analyzed.

Figure 21: Process flow diagram of SAS Enterprise Miner for Text Mining

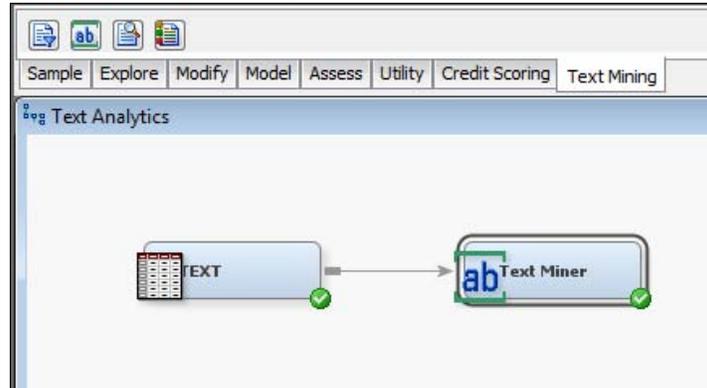


Figure 21 above illustrates the process flow chart using SAS Enterprise Miner's Text Miner tool. The open-ended question responses are reduced into manageable and identifiable categories (i.e. cluster) to understand the common theme of the open texts.

Prior to using SAS Enterprise Miner for text mining, all text data was converted into a SAS data file. The data preprocessing for creating a SAS data file was conducted in SAS 9.1.

Figure 22: Text Variables

Name	Role	Level	Report	Order	Drop	Lower Limit	Upper Limit
Observation_	Rejected	Interval	No		No	.	.
Q18_Website	Rejected	Nominal	No		No	.	.
Q21_Beverage	Rejected	Nominal	No		No	.	.
Q22_Music	Rejected	Nominal	No		No	.	.
Q23_Language	Rejected	Nominal	No		No	.	.
Q24_Respect	Rejected	Nominal	No		No	.	.
Q25_Life	Text	Nominal	No		No	.	.
Q26_Lifetime	Rejected	Nominal	No		No	.	.

There are 7 open-ended questions in the survey. Figure 22, shows the list of 7 text variables for text mining. When the data file was prepared for text mining, a primary id was ensured (Observation #) which could connect back the mined text data into the original data file which contained all closed end-ended questions.

In the next few figures, the SAS Text Miner outputs for mining the open-ended question "My university life would be great, if only____" are shown.

- TERM EXTRACTION

Figure 23: Terms and Weights

Term	Role	Attribute	Freq	# Documents	Keep	Weight
+ have	...Verb	Alpha	96	96Y		0.2504
+ much	...Adj	Alpha	56	56Y		0.33892
+ can	...Aux	Alpha	54	54Y		0.34489
+ not	...Adv	Alpha	52	52Y		0.35109
in	...Prep	Alpha	41	40Y		0.39568
+ friend	...Noun	Alpha	35	35Y		0.41611
+ tuition	...Noun	Alpha	34	34Y		0.42087
+ do	...Verb	Alpha	29	29Y		0.44699
no	...Adj	Alpha	23	23Y		0.48506
gpa	...Prop	Alpha	15	15Y		0.55526
+ grade	...Noun	Alpha	15	15Y		0.55526
+ student	...Noun	Alpha	15	15Y		0.55526
+ cheap	...Adj	Alpha	14	14Y		0.56659
more	...Adv	Alpha	14	13Y		0.58285
school	...Noun	Alpha	13	13Y		0.57876
more	...Noun	Alpha	12	12Y		0.59191
+ exam	...Noun	Alpha	12	12Y		0.59191
+ high	...Adj	Alpha	12	12Y		0.59191
+ study	...Verb	Alpha	12	12Y		0.59191
+ will	...Aux	Alpha	12	12Y		0.59191
money	...Noun	Alpha	11	11Y		0.6062
+ involve	...Verb	Alpha	11	11Y		0.6062
good	...Adj	Alpha	10	10Y		0.62185
sfu	...Prop	Alpha	10	10Y		0.62185
time	...Noun	Alpha	10	10Y		0.62185
with	...Prep	Alpha	10	10Y		0.62185
+ class	...Noun	Alpha	10	10Y		0.62185
+ fee	...Noun	Alpha	10	10Y		0.62185
campus	...Noun	Alpha	9	9Y		0.63915
job	...Noun	Alpha	9	9Y		0.63915

Figure 23 above shows the Text Miner output of key terms in the documents. The Term column, in the above figure represents the distinct word mentioned in the question. The plus sign (+) in the beginning of the term means that they are "Rollup Terms". The Freq column represents the frequency of term occurrence. The # of Document column represents the number of documents the term occurred in. The Weight column is the weight of the term; the higher the weight, the more distinguished the term is between the documents.

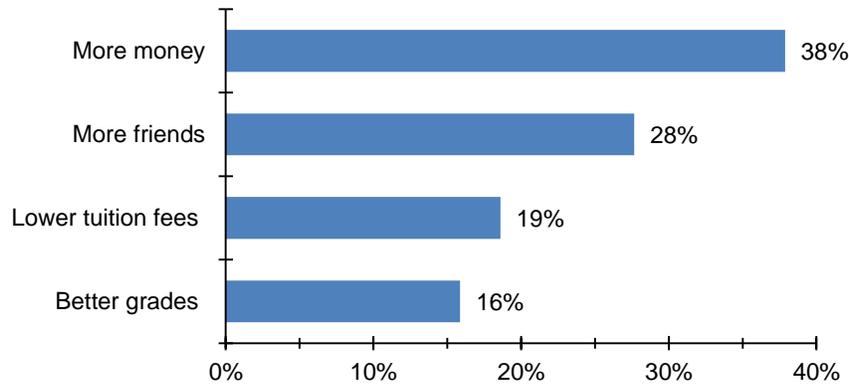
Figure 24: Clusters with Relative Frequency and Descriptive Terms

Cluster	Percent age	_SVD_1	_SVD_44	Freq	RMS Std.	Descriptive Terms
1	16%	0.1528...	0.004501	70	0.135881	+ can, better, english, speak, goal, as, above, complete, finis...
2	28%	0.1568...	0.063345	122	0.145971	more, a lot of, + live, closer, great, experience, + class, less, ...
3	38%	0.3009...	-0.01254	167	0.141299	+ study, time, job, + know, high, + high gpa, people, girlfriend...
4	19%	0.1366...	-0.01028	82	0.110866	+ cheap, + tuition, + exam, + tuition fee, lower, free, reduce, n...

Numerous cluster solutions are produced, but the 4-cluster solution is selected, as the clusters are relatively large and distinct. Figure 24 above shows the output of clusters. The clusters are characterized by descriptive terms. The largest cluster is 3 (38%) and the smallest cluster is 1 (16%). The clusters are named using the descriptive terms and reviewing the statements the students wrote by cluster. This way each cluster is uniquely characterized by a single

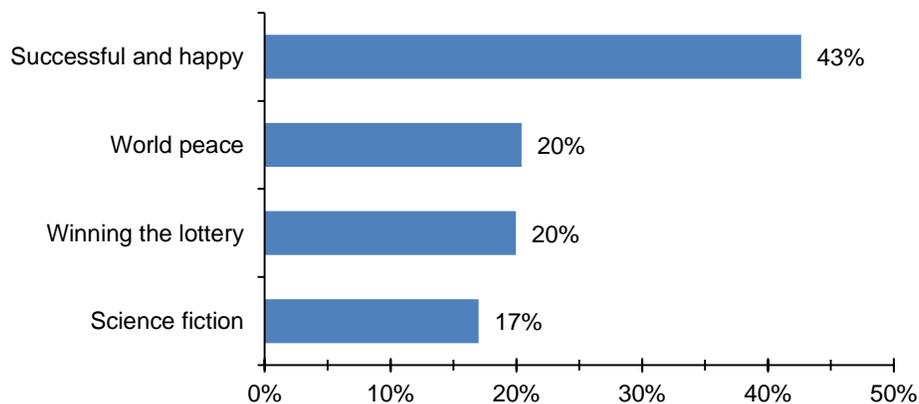
term. The following are the names given to each cluster for classification: Cluster 1: Had better grades, Cluster 2: Had more friends, Cluster 3: Had more money and Cluster 4: Had lower tuition fees. Figure 25 below shows the frequency distribution of the 4 clusters.

Figure 25: My university life would be great if only I had...



Similarly, the open-ended question “If there is ONE thing you want to see happen in your lifetime, what would be?” is analyzed. Figure 26 below shows the name and size of the clusters.

Figure 26: If there is ONE thing you want to see happen in your lifetime, what would that be?



After the open-ended data is clustered, it is combined with the rest of the structured data for profiling using the Segment Profile tool in SAS Enterprise Miner, as shown in Figure 27. To illustrate the Segment Profile tool, the open-ended question “If there is ONE thing you want to see happen in your lifetime, what would that be?” is profiled by gender.

- PROFILING SEGMENTS

Figure 27: Segment Profile

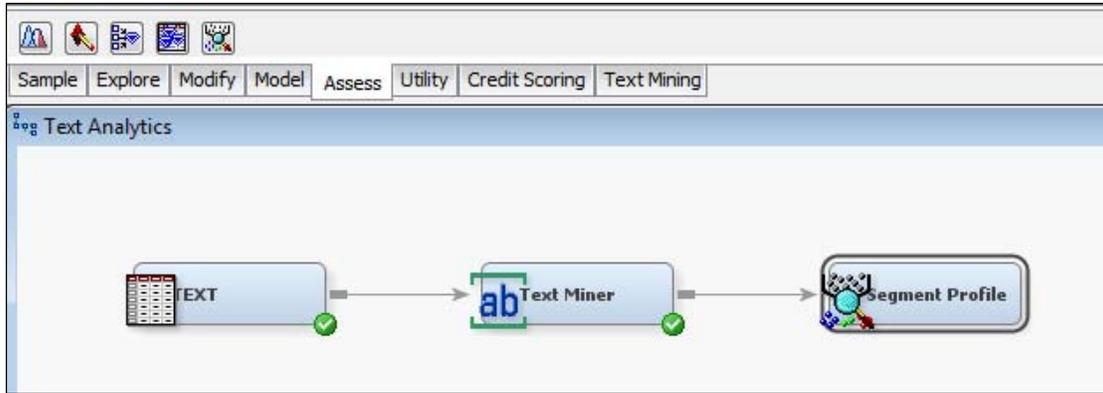
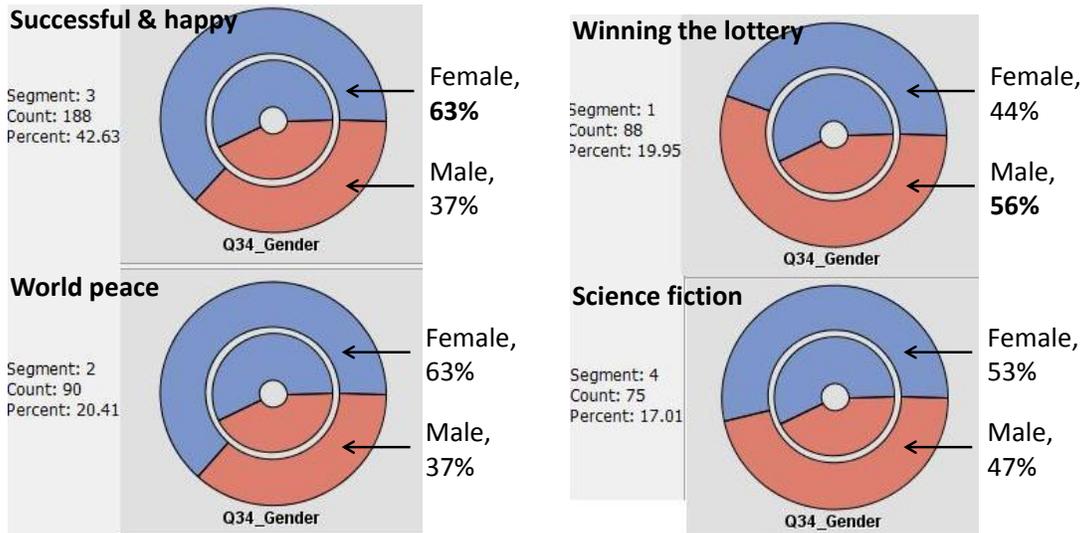


Figure 28 below is the SAS Enterprise Miner output of the Segment Profile, showing the proportion of gender by cluster. A significantly higher number of males fall into Cluster 1 “Winning the lottery” and more females are in Cluster 3 “Successful and happy”.

Figure 28: Gender, showing % within Cluster



DISCUSSION AND CONCLUSION

NEGATIVE IMPACT VARIABLES

- **Going to the movies:** The survey shows that going to the movies has a negative impact on the student CGPA. Watching movies in moderation does not impact the CGPA. However, as the movie going hours go up, the CGPA scores come down.
- **Convenience foods:** In the survey, students were not asked how often they ate convenience foods or what type of foods they ate. It can only be assumed that a higher importance rating may be somewhat related to frequent consumptions of convenience foods. A study has shown that frequent consumption of fast food has a negative impact on GPAs (Costa, 2003).
- **Giving higher importance on earning lots of money:** The survey shows that giving higher importance on earning lots of money has a negative impact on student CGPA, whereas students who place moderate importance on earning lots of money have a higher CGPA.

The survey shows that more male students (45.5%) gave a higher importance rating (9-10) to earning lots of money compared to female students (36.6%). In the open-ended question of "what is the one thing you want to see happen in your lifetime?", compared to other clusters, 56% of those who said "Winning the Lottery" gave a higher importance to earning lots of money.

- **Employment hours:** The survey shows that limited employment (up to 10 hours a week) has a positive impact on student CGPA, but as the hours of employment increase, the CGPA drops.
- **Social media:** The survey shows that giving more importance to using social media for social interaction has a negative impact on student CGPA, but statistically there is no significant difference between the various importance rating groups (1-4, 5-6, 7-8 and 9-10). The survey also shows that there is no relationship between time spent on the Internet as a leisure activity and student CGPA scores.

POSITIVE IMPACT VARIABLES

- **Full-time studies:** Students are considered full-time when they are registered for 9 credit hours or more, and part-time students are registered for less than 9 credit hours. The survey shows that the CGPA for full-time students is higher than part-time students. The survey also found that part-time students tend to have full-time jobs.
- **Time spent doing school work:** Doing homework does pay off with a better CGPA. The survey found that students who spend more than 5 hours per week doing school work have a higher CGPA than those who spend 5 hours or less per week.
- **Knowledge of historical events:** The survey shows that students who give higher importance to knowledge of historical events have higher CGPAs. Though students were not asked questions to measure their level of historical knowledge, it can only be assumed that students who gave a higher importance rating to knowledge of historical events may have a higher level of knowledge of historical events. Brayfield et al. (1990) found that a higher level of historical and geographical knowledge help students achieve higher course grades.
- **Involvement in extracurricular activities:** The survey shows that extracurricular activities have a positive impact on CGPA. Students who are involved in extracurricular activities have higher CGPAs than those who are not involved in such activities. Wang & Shiveley (2009) studied the impact of extracurricular activity on student academic performance and found that extracurricular activities have a positive impact on the academic performance of students.
- **Engaging in co-operative education:** The survey shows that students who are involved in co-op programs have higher CGPAs than those that are not involved in such programs. Stern et al. (1992) found evidence that cooperative education improves further employment quality and opportunities for students.
- **Eating breakfast:** The survey shows that students who eat their breakfast regularly tend to have higher CGPAs than those who do not eat their breakfast regularly. Scragg et al. (2007) study showed that eating breakfast improved student academic performance.

- **Having career goals:** The survey shows that students with specific career goals in mind have a higher CGPA than those without a specific career goal in mind. Nemko (2008) study showed that students with a career goal in mind are highly motivated to put the effort to achieve that goal and are more likely to graduate from school.

The above listed variables have both negative and positive impacts on student academic performance. To some extent, students have control over these variables and can improve their academic performance.

- **University Specific Attributes:** Four attributes stood out as significant, namely: Professors/Instructors; Lecture difficulty; TAs; and University reputation. Though students may not have direct control over these attributes, these variables show to have positive impacts on student academic performance.

OPEN-ENDED QUESTIONS

- The responses for the open-ended question “My university life would be great if only I had...” are classified into four clusters: More money (38%), More friends (28%), Lower tuition fees (19%) and Better grades (16%). Comparing the average CGPA across these four clusters, the “Had Better Grades” cluster CGPA was the lowest, but there is no significant difference with the other clusters.
- The open-ended question “If there is ONE thing you want to see happen in your lifetime, what would that be?” was classified into four distinct clusters: Successful and happy (43%), World peace (20%), Winning the lottery (20%), and Science fiction (17%). Comparing the average CGPA across these four clusters, the cluster “World Peace” has the highest average CGPA. Except for the “Successful and Happy” cluster, there is no significant difference with the other clusters.

RESEARCH LIMITATIONS

The survey is based on a selected group of students. As such, the findings cannot be generalized for the entire student body.

REFERENCES

- Brayfield, A. A., M. A. Adler and D. L. Zablotsky (1990, July). Gender, Race, and Cultural Literacy: Consequences for Academic Performance. *Teaching Sociology*, 18 (3) pp. 362-371.
- Canadian Council on Learning (February 21, 2008). *The benefits of experiential learning*. Retrieved from <http://www.ccl-cca.ca/pdfs/LessonsInLearning/Feb-21-08-Benefit-of-exper.pdf>
- Costa, A.R. (2004, May). The Relationship between Health and College Students' Grade Point Average. Retrieved from <http://clearinghouse.missouriwestern.edu/manuscripts/499.php>
- Dobson, D. (2010, April). Segmenting Textual Data for Automobile Insurance Claims. Paper presented at SAS® Global Forum 2010 Conference in Seattle, Washington.
- Dobson, D. (2008, August). Customer Segmentation: The Application of Data Mining for the Automobile Insurance Industry. Paper presented at the Joint Statistical Meetings in Denver, Colorado.
- Schreiner, E. (2010, May 13), "How to Measure the Success of a Student". Retrieved from http://www.ehow.com/how_6510810_measure-success-student.html
- Gallien, T. & J. Oomen-Early (2008). Personalized Versus Collective Instructor Feedback in the Online Courseroom: Does Type of Feedback Affect Student Satisfaction, Academic Performance and Perceived Connectedness With the Instructor?. *International Journal on E-Learning*, 7(3), 463-476. Chesapeake, VA: AACE. Retrieved from <http://www.editlib.org/p/23582>
- Hummel, P. (2010, October 17), Begin With the End in Mind – Valuable Advice for College Students. In *Suite101 Blog*. Retrieved from <http://www.suite101.com/content/begin-with-the-end-in-mind--valuable-advice-for-college-students-a297866>
- Kelly, W. E., K. E. Kelly, R. C. Clanton (2001, March). *College Student Journal*. The Relationship Between Sleep Length And Grade-Point Average Among College Students - Statistical Data Included. Retrieved from http://findarticles.com/p/articles/mi_m0FCR/is_1_35/ai_74221510/
- Wang, J. and J. Shiveley (2009). "The Impact of Extracurricular Activity on Student Academic Performance". In *Office of Institutional Research, California State University*. Retrieved from <http://www.csus.edu/oir/Assessment/Non-academic%20Program%20Assessment/Student%20Activities/Student%20Activity%20Report%202009.pdf>
- Marklein, M. B. (April 13, 2009), "Facebook use linked to less textbook time" Retrieved from http://www.usatoday.com/news/education/2009-04-13-facebook-grades_N.htm
- Nemko, M. (2008, July 4). Easy ways to improve a college's retention rate. *Chronicle of Higher Education*, 54(43).
- Scragg, R., R. Quigley, and R. Taylor (2007, May 23). Report Shows Eating Breakfast Helps Children's Academic Performance. In *Agencies for Nutrition Action (ANA)*. Retrieved from <http://www.ana.org.nz/documents/BreakfastReportPressRelease.pdf>
- Simon Fraser University (2011). *Grading Systems and Policies*. Retrieved from http://students.sfu.ca/calendar/for_students/grading.html
- Stern, D., J.R. Stone, C. Hopkins, M. McMillion and H. Cagapang (1992, September). Quality of Work Experience as Perceived by Two-Year College Students in Co-op and Non-co-op Jobs. *Journal of Co-operative Education*, 28(1), pp. 6-11. Retrieved from <http://www.ceiainc.org/journal.asp?PageID=225&Action=Search§ion=search>
- St-Onge, Marie-Pierre, K.L. Keller, and S. B. Heymsfield, (2003). Changes in childhood food consumption patterns: a cause for concern in light of increasing body weights. *American Journal of Clinical Nutrition*, Vol 78 (6), 1068-1073, Retrieved from <http://www.ajcn.org/content/78/6/1068.long>
- Tinklin, G. L., N. E. Fogg and L. M. Wakefield, (1972, February). Convenience Foods: Factors Affecting Their Use Where Household Diets are Poor. *Journal of home economics*, Vol 64 (2), pp. 26-28. Retrieved from http://hearth.library.cornell.edu/cgi/t/text/text-idx?c=hearth;idno=4732504_64_002
- Edudemic (2010, May 6). Whittemore School of Business and Economics, University of New Hampshire "UNH Study: Social Networking Does NOT Hurt Your GPA" Retrieved from <http://edudemic.com/2010/05/unh-study-social-networking-does-not-hurt-your-gpa/>

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