An Analysis of Chapel Attendance

by

Marilee Rose Rickett

Submitted in partial fulfillment of the requirements for graduation as an Honors Scholar at Point Loma Nazarene University, San Diego, California, May 15, 2010.

Approved by _____
Dr. Greg Crow, Mentor

Approved by _____
Dr. Maria Zack, Mentor

April 17, 2010

Committee Members:

_____
Rev. Mark Carter

Introduction:

According to its Mission Statement, “Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith.” It is not just an academic community but is instead a flurry of academia in the framework of a “vital Christian community” (Pointloma.edu). One of the institutionally implemented practices for fostering this Christian community is chapel. At PLNU, chapel offers an opportunity for students across the campus “to explore ways to align their hearts and minds to that of Christ” (Pointloma.edu). Since chapel is such an integral component to the Point Loma community, attending is a requirement for undergraduate students. Full time students (with 12 or more units) with freshman or sophomore standing must attend 36 of the 44 chapels offered in a given semester, and students with junior or senior standing are required to attend 28 chapels. Over time, many hypotheses have been generated regarding student chapel attendance, such as when during the semester students fulfill their chapel requirements or which types of chapels seem to have the highest attendance. It is the goal of this project to take a closer look at student chapel attendance to discover if any patterns or trends exist in student attendance. Chapel attendance data that has been collected since Fall 2006 is organized and analyzed for this purpose. Supplementary information about each individual student, including chapel requirement, gender, and pseudo-cohort, is used to analyze attendance within certain groups.

Data:

This project began with the customary cleaning and organizing of three main data sets. The original data included (1) descriptive chapel data from 2006-2009, (2) chapel attendance

data from 2006-2009, and (3) chapel requirement data from 2006-2009. The original data was generated by the office of Spiritual Development and housed by Information Technology Services at PLNU. It is important to note that all personal information about individual students was removed. Faux IDs were provided for each student as a means of distinguishing individuals and linking them to other information, but all names and other distinctive characteristics were excluded.

The descriptive chapel data included a list of all the chapels from Fall 2006 to Spring 2009. It included the date, day of the week, and a brief description of each chapel. Since the nature of this project is to look at the types of chapels students attend, it is extremely important to have accurate records of what happened at each chapel, including the primary speaker or the main focus of the chapel. In order to ensure that the information was correct, the subject and speaker for each chapel were checked and confirmed via listening to chapel archives available online and chapel recordings obtained directly from Media Services at PLNU. In addition, five more categorical descriptors for each chapel were formulated. These are: communion, spiritual renewal week, student led, gender of speaker, and dynamic. “Communion” referred to whether or not taking communion was a part of the chapel on a given day. “Spiritual renewal week” indicated if the said chapel was part of the bi-annual week devoted to spiritual emphasis. “Student led” indicates that a chapel was primarily run by student speakers, student hosts, or was sponsored by students. The gender of the speaker was noted. The categories are: male speaker, female speaker, or a mixture of both males and females who were part of the main chapel program. Finally, the categorical descriptor “dynamic” is defined as an interactive chapel, a non-traditional chapel, or one in which there is not just a speaker speaking to the audience. After listening to each chapel recording, Chapel descriptors which applied to each individual chapel

were recorded. Finally, the information was then double checked and corroborated with records kept by Spiritual Development to ensure there were no major differences in the descriptors of chapel events.

The chapel attendance data set included attendance records for each student for every chapel from Fall 2006 to Spring 2009, and consisted of over 600,000 lines of data. The sheer size of this data set made it extremely cumbersome to analyze and the format of it was less than practical. Thus it was imperative to create a data table that was easy to read and navigate and reflected each individual's chapel attendance over the course of a given semester. However, original records gave information about the chapels for which students received credit, not necessarily the chapels students attended. Due to the nature of this project, it was necessary to distinguish between the chapels for which students received credit without being present and those which the students actually attended.

The reorganization of the data required data manipulation using functions in Microsoft Excel. To verify that the manipulations of the data correctly reflected the original information, periodic random samplings of individuals were performed and results were manually checked against the original data. The students in the sample were limited to those that had attended two or more chapels attended over the course of the academic year to ensure that if there were errors, they would be found. The final table included all faux IDs in a vertical column (each representing an individual student), chapel dates running horizontally, and an indicator as to whether that individual attended a specific chapel or not.

The chapel requirement data was the last of the original data sets. It added important information about individual students including: chapel requirements for a given semester and

whether or not a petition to reduce the number of required chapels had been granted. This information was used as another categorical descriptor of the students.

These three data sets were then cleaned and combined. Information gained from the original data sets included individual attendance records, individual requirement records, total chapels attended for a given semester, and whether or not the student had been granted a petition to lower or remove their chapel requirement. This data set was then augmented by including information from research projects completed by Alana Nichol and Sarah Lauff, PLNU graduates from 2009. These two projects provided additional descriptors for each student. The information from these projects that proved to be especially helpful included: cohort information, pseudo cohort information, major, transfer information, admission year, admission session, and study abroad information. Before continuing, some information on cohorts and pseudo-cohorts needs to be explained.

A cohort is a classification for a student telling his or her time of entry into the university. For example, a student who entered the university as a sophomore in the fall semester would have a cohort listing of “SOFA”. Some other cohorts are as follows: FFFA (first-time freshman entering in the fall), FFSP (first-time freshman entering in the spring), FRSP (student with freshman standing entering in the spring), JRFA (student with junior standing entering in the fall), etc. This information gives us a quick glimpse of the student at their time of entry. Unfortunately, it also separates the students into more distinct categories than is desirable for our purposes. A pseudo-cohort, on the other hand, indicates the student’s entrance point into the university had he or she been a first-time freshman. For example, if a student transferred in as a junior in the spring of 2005, her pseudo-cohort would be “FA2003”; she would have entered the university in the fall of 2003 as a first-time freshman. A sophomore transferring to the university

in the fall of 2004 would also have a pseudo-cohort of FA2003, because, as with the previous example, he would have entered the university in the fall of 2003 as a first time freshman. This classification allows us to place transfers, returning students, and students who have attended the university since their freshman year in a single category, simplifying the analysis process. For our purposes, the pseudo-cohort classification is used extensively (Nichol).

In each of their research projects, Nichol and Lauff both had a broad spectrum of information about individual students at PLNU. In both of these projects, faux IDs were provided to ensure student anonymity. By linking the faux IDs provided to Nichol and Lauff to the faux IDs provided for this project, the results of their research could be used to gather more information and give insight about each student studied in this context. In addition to the supplementary data provided by past students, new information was also provided by Information Technology Services indicating the gender of each student, adding a vital descriptor used in analyzing student groups.

After looking at the original and supplementary data and pulling information pertaining to this project, analysis and basic counting was done on the data. Although information was provided for 6 semesters, Fall 2006 to Spring 2009, this research focuses specifically on the 2006-2007 school year, including Fall 2006 and Spring 2007. Lauff's research on cafeteria patterns and attrition of freshman students pertained specifically to the 2006-2007 academic year; having this project focus on the 2006-2007 year opens the possibility of adding chapel attendance as another dimension in looking at attrition of freshman students. While that is outside of the scope of this project, it is possible in the future.

The original data on chapel attendance contained records for 3,035 individuals. Information from Nichol's data was used to determine which of these 3,035 individuals were enrolled in PLNU and attending classes on site for the 2006-2007 academic year. Nichol's data is one of the most comprehensive, extensive, and accurate look at PLNU students to date. For these reasons, her data was used as a primary source to determine which individuals to include and exclude in analysis: 498 individuals were not present in Nichol's data and had no chapel requirement on record; 25 individuals were present in the data, but excluded from her analysis for a variety of reasons including never having attended the university, having no records at the university, and being a non-degree seeking individual; 51 individuals were not present at PLNU during the 2006-2007 academic year; 138 individuals were not present at PLNU for Fall 2006; 249 individuals were not present at PLNU for Spring 2007. Excluding these records, 2,323 and 2,212 individuals are left to be considered in analysis for the Fall 2006 and Spring 2007 semesters, respectively.

Analysis:

Figure 1 shows the number of attendees at each chapel over the course of the Fall 2006 semester.

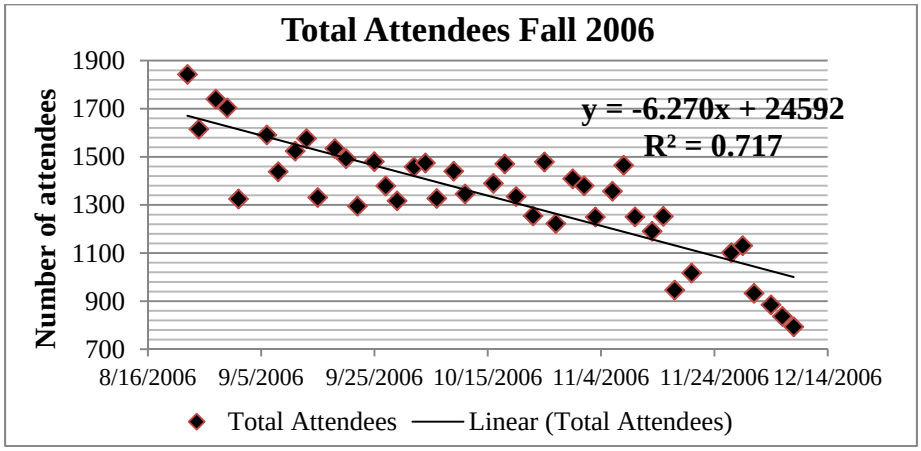


Figure 1

Plotted with a least squares regression line, we see that r^2 has a value of 0.717, giving us a correlation indicating that the line provided correctly estimates the values on the graph 71.7% of the time (Moore). This is a very strong relationship, demonstrating that the date is a major factor in determining the number of chapel attendees for the total population of students. The number of chapel attendees is decreasing linearly over the course of the semester; thus, there is not a sharp, staggering decline in attendance at the end of the semester, as was previously hypothesized. Figure 2 shows the number of attendees at each chapel for the Spring 2007 semester.

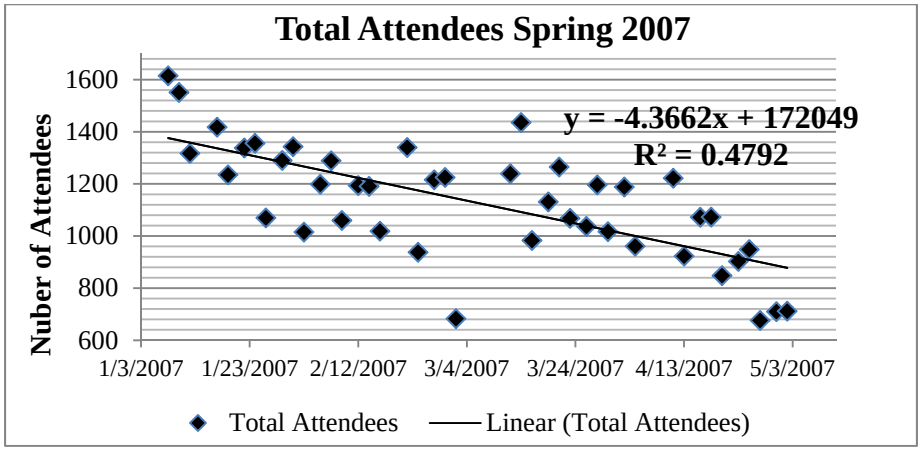


Figure 2

The spring semester does not seem to be as predictable as the fall semester. In this case, r^2 has a value of 0.4792. Therefore, variation in the number of attendees can be attributed to the date in only 47.9% of the chapels. However, with a population size of 44 (the number of chapels in the spring semester), we find that r^2 is statistically significant, although it is less predictable than was seen for the fall semester (Moore). While it is clear that the number of attendees is decreasing over the course of the semester, it does not do so in as strongly of a linear manner as in the fall.

Next, the demographics of chapel were analyzed: specifically the percentage of attendees based on gender and class standing. Figure 3 shows a graph of the chapel attendees for Fall 2006 based on gender.

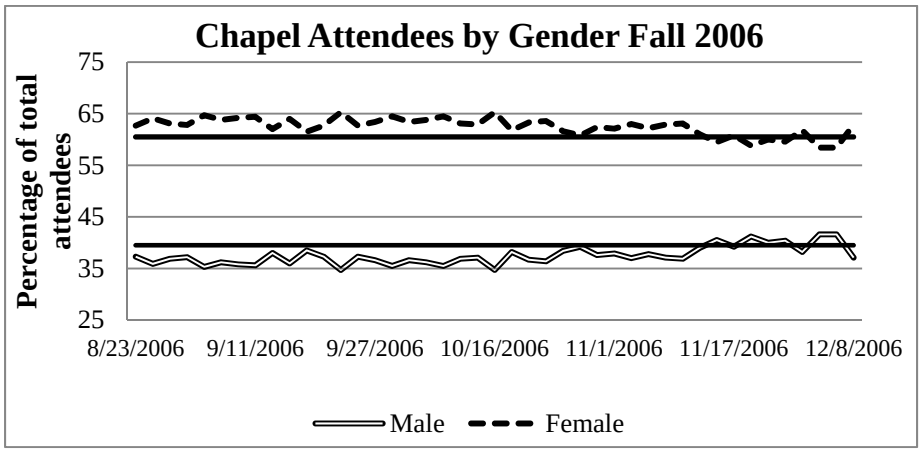


Figure 3

For this specific semester, 60.5% of the population was female and 39.5% was male. It would thus be expected that about 60% of the total chapel attendees on any given day would be female, and about 40% would be male. We see in the figure that this ideal is not quite reality. For the first three quarters of the semester, females make up between 60 and 65% of total chapel attendees, while males make up between 35 and 40%. Due to this slight discrepancy in demographics between real values and expected values, we see that for the last quarter of the semester, the female percent dips slightly lower than 60% and the male percent goes slightly above 40%. This indicates that in general, males put off their required chapel attendances until the end of the semester while females complete their requirement earlier. Figure 4 shows a graph of the percentage of chapel attendees for Spring 2007 based on gender.

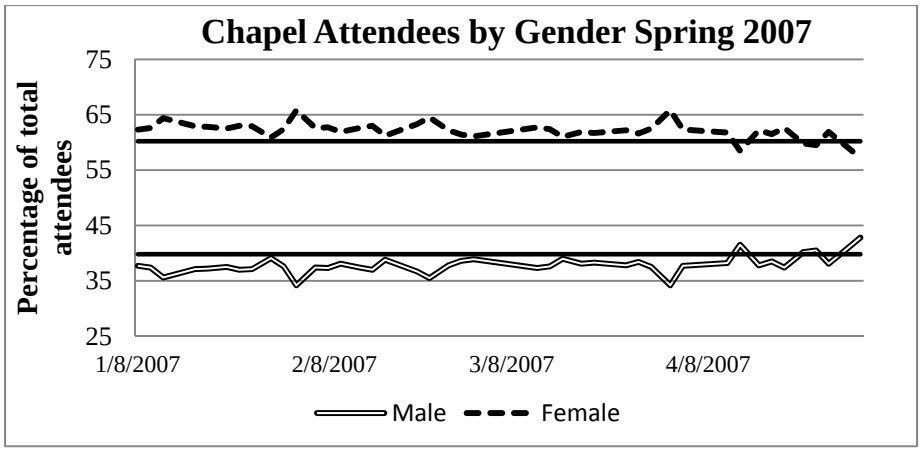


Figure 4

The percentage of male and female students differed insignificantly between the fall and spring semesters: females made up 60.2% of the population and males 39.8%.We see the same type of pattern in the spring as in the fall: for the first three quarters of the semester, males stay at or below their expected percentage and females stay at or above their expected percentage. For the last quarter of the semester, the male percentage begins to rise above their expected 39.8%, while the female percent dips below 60.2%. This occurrence stems from the same reasoning proposed for the fall semester: females are better at fulfilling their chapel requirement early in the semester, while males wait until the end of the semester.

Next we have information on chapel attendance within pseudo-cohorts (Nichol). For the 2006-2007 academic year, 9 distinct pseudo-cohort groups were present on campus: FA1998, FA1999, FA2000, FA2001, FA2002, FA2003, FA2004, FA2005, and FA2006. However, students in pseudo-cohorts between FA1998 and FA2002 made up only a small fraction of the total student population in the 2006-2007 academic year and generally were students with a reduced chapel requirement or no requirement at all. To keep the analysis as clear as possible, the pseudo-cohort groups between FA1998 and FA2002 were excluded from analysis among the groups. Thus, the information on attendance deals only with the following pseudo-cohorts:

FA2003, FA2004, FA2005, and FA2006. These pseudo-cohorts will now be referred to in terms of class standing to clarify understanding: FA2003 as “Seniors,” FA2004 as “Juniors,” FA2005 as “Sophomores,” and FA2006 as “Freshman.” Figure 5 shows a breakdown of the percentage of attendees based on pseudo-cohort for Fall 2006 and Figure 6 shows the information for Spring 2007.

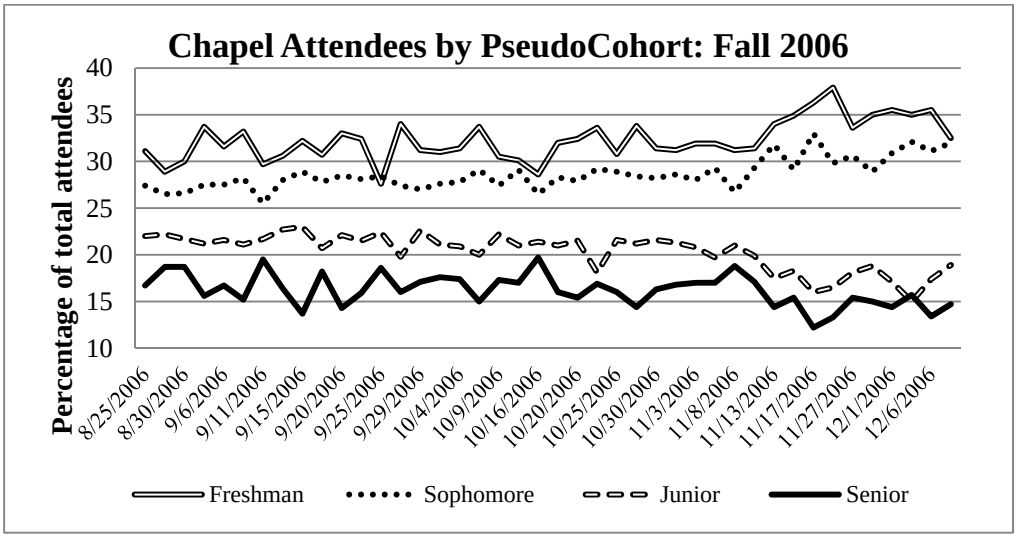


Figure 5

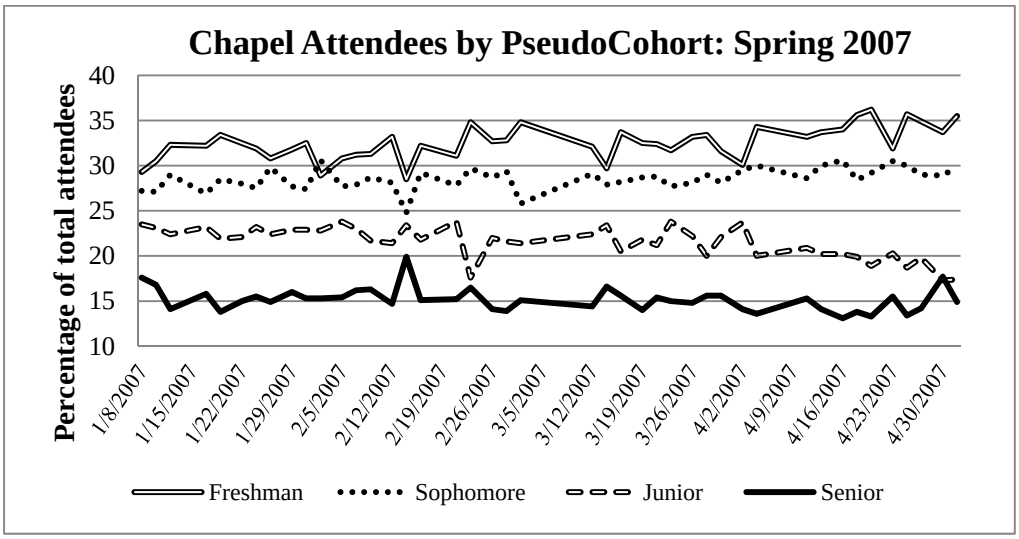


Figure 6

There is obvious variation between the pseudo-cohorts in both semesters, and at first glance, they seem to follow similar trends in the fall and the spring. A normal distribution is necessary for a paired-samples t-test, used to compare the mean values of two different groups. Quantile-quantile (Q-Q) plots were used to determine whether or not the data was normally distributed. After plotting Q-Q plots for each pseudo-cohort in SPSS, only the freshman fall semester, freshman spring semester, and senior spring semester data were found to be normally distributed; consequently, paired sample t-tests could not be run to determine the presence of statistical significant differences among the pseudo-cohorts between semesters, except for the case of the freshman (Weinberg and Abramowitz). These plots can be found in Appendix A. A paired-samples t-test was run, comparing the percentages of freshman attending chapel in the fall to the percentages in the spring. With a significance value of $p = .327$, we find there is no significant difference in the percentages between semesters at the .05 level. Thus, in the case of the freshman, their attendance patterns in the fall are found to be essentially the same in the spring.

Although the lack of normal distributions in the data prevented accurate testing on some information, by observing the data distribution in the graph in figures 5 and 6, some interesting behavior can be noted. The rise and fall in the percentages of the Freshman/Sophomore and Junior/Senior cohorts is intriguing. Toward the end of the semester, the percentage of freshman and sophomores in chapel increases, while the percentage of juniors and seniors decreases. The behavior can be seen most dramatically in Figure 5, but is still observable in Figure 6. Upperclassmen seem to fulfill their chapel requirement earlier than underclassmen. One explanation could be that in the course of their years at PLNU, upperclassmen have found value in fulfilling their chapel requirements early, leaving more time for studying or other commitments at the end of the semester. Another explanation could be that upperclassmen

attend chapel as regularly as they did as freshman and sophomores at the beginning of the semesters, but due to their decreased requirement, they may fulfill their requirement earlier than expected. There could be many other explanations for this occurrence. By looking further into when exactly requirement records are met over the course of the semester for individual students and even possibly conducting a student survey of chapel habits, more light can be shed on this data.

Having a better idea of student attendance patterns over the course of the 2006-2007 academic year, we began looking at specific types of chapels to determine if patterns differed based on the type of chapel in question. First we examined the day of the week to determine if there was a significant difference in chapel attendance depending on the day of the week for the Fall 2006 semester. As was done with the data separated by pseudo-cohort, it needed to be determined whether the data was normally distributed for each separate day of the week. Using Q-Q plots in SPSS, the data was found to be nearly normally distributed for Monday, Wednesday, and Friday. Running paired-samples t-tests for the pairs of Monday-Wednesday, Monday-Friday, and Wednesday-Friday, it was determined that in each of these pairings, the means are significantly different. The first pair, Monday-Wednesday, had a significance value of $p = .001$; the second pair, Monday-Friday, had a significance value of $p = .001$; the third pair, Wednesday-Friday, had a significance value of $p = .001$. So, at the .05 level, we found that the number of chapel attendees was significantly different depending on the day of the week for the Fall 2006 semester. In a similar fashion, chapel attendance was found to be significantly different depending on the day for the Spring semester as well, with significance values of $p = .013$, .000, and .004 for the Monday-Wednesday, Monday-Friday, and Wednesday-Friday pairings,

respectively (Weinberg and Abramowitz). SPSS data printouts for this information can be found in Appendix B.

In both semesters it was found that chapel had the highest attendance on Wednesdays. This turned out to be true not just for the general student body, but also within demographic groups. For men, women, and all individual pseudo-cohort groups a higher percentage of students attended chapel on Wednesdays, in both Fall 2006 and Spring 2007.

Questions have been raised and conjectures have been made as to whether students attend a chapel based on the gender of the speaker. For Fall 2006, there were 23 male speakers, 6 female speakers, and 15 occurrences where there was not a single speaker. Because there were so few female speakers, determining if there were differences in attendance of chapels where a male spoke versus a female was not possible. For Spring 2007, there were 21 male speakers, 10 female speakers, and 11 dual gender chapels. The number of attendees for each of these chapels was standardized and then followed with sequential paired-samples t tests. At the .05 level, no significant difference was found in the number of attendees for chapels in which a male or female spoke.

The student population as a whole did not seem to differ in chapel attendance based on the speaker's gender. However, the case may be different for specific student demographics, specifically within the male and female student populations. Due to the small number of female speakers in Fall 2006, only data from Spring 2007 was analyzed. The male student population and their attendance based on the gender of the speaker was found to have a significance value of $p = .142$, indicating that there was no significant difference between attendance for male speakers and female speakers for Spring 2007. For the female demographic, comparing their attendance

for a female speaker versus a male speaker, a significance value of p =.006 was found, indicating a statistically significant difference in attendance depending on the gender of the speaker at the .05 level. In fact, it seems that female students slightly favored male speakers for the Spring 2007 semester. SPSS data output for this information can be found in Appendix B.

Some hypothesis had suggested that students have a preference for male speakers over female speakers, but these results prove otherwise. Male attendance is not significantly different based on the gender of the speaker. Female attendance is significantly different based on the gender of the speaker, but they seem to prefer male speakers over females.

Conclusion:

Through this research, some clarification and understanding has been brought to the subject of chapel and Point Loma Nazarene University: Chapel attendance for the total student population decreases in a somewhat linear fashion indicating that the best predictor for student attendance is time in the semester; females complete their chapel requirements before male students; upperclassmen fulfill their attendance requirement early in the semester, while underclassmen are more likely to attend chapel in the last quater of the semester; students in every demographic studied attend chapel on Wednesdays more than any other day; male attendance does not depend on the gender of the speaker, but female attendance does—showing a slight preference for male speakers over female speakers. In the future, more school years can be included in analysis to examine the presence of trends and patterns. The information provided about chapel attendance of certain groups and cohorts of students can be used as another variable in looking at attrition and freshman retention rates.

References

Pointloma.edu. 2009. Point Loma Nazarene University. <http://www.pointloma.edu>.

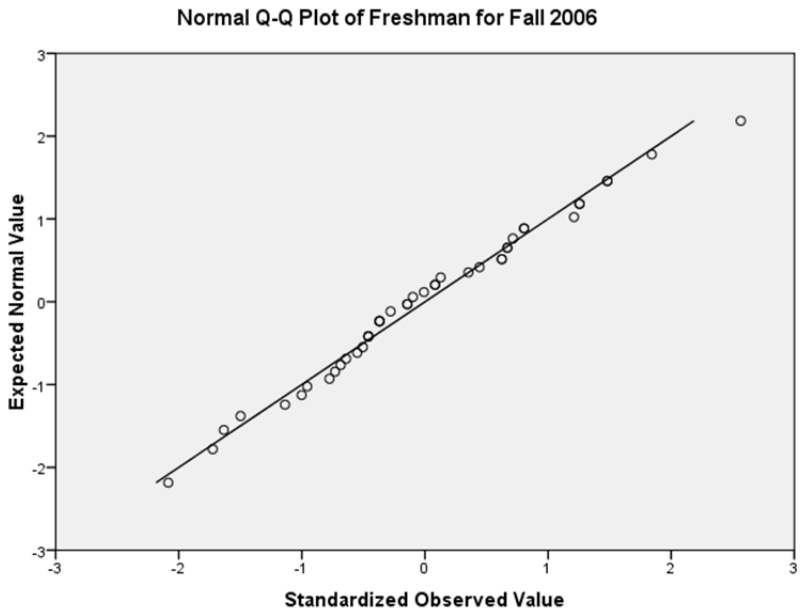
Lauff, Sarah. “Institutional Research: Freshman Retention and Cafeteria Patters.” Senior Honors Thesis, 2009.

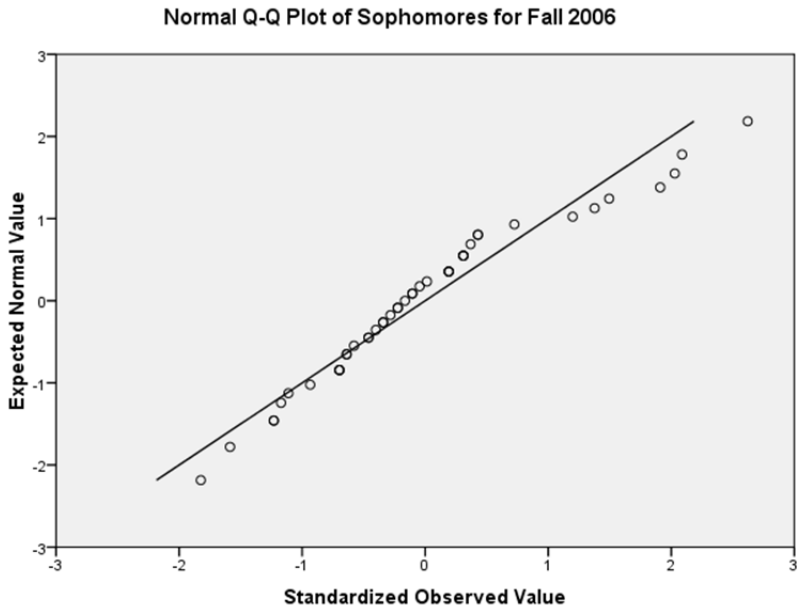
Nichol, Alana. “Student Entry, Exit, and Reentry Points at PLNU.” Senior Honors Thesis, 2009.

Moore, David S. The Basic Practice of Statistics. 4th ed. New York: Freeman, 2007.

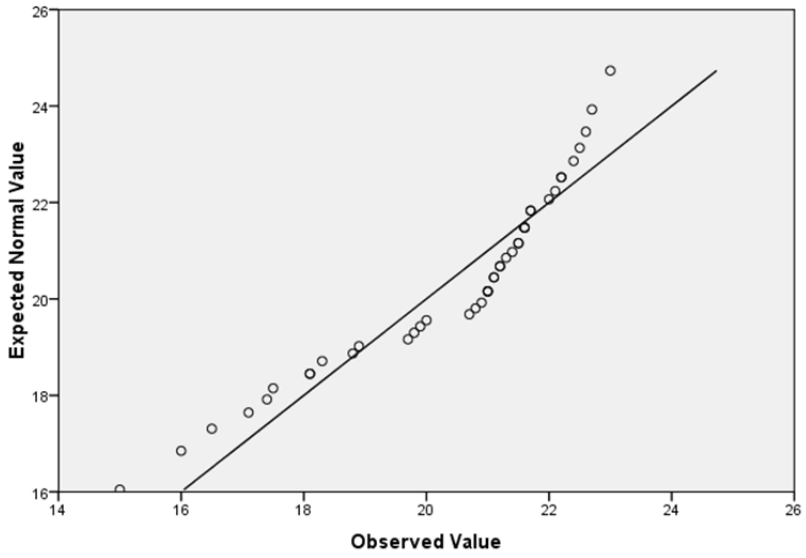
Weinberg, Sharon Lawner and Sarah Knapp Abramowitz. Statistics Using SPSS: An Integrative Approach. 2nd ed. New York: Cambridge University Press, 2009.

Appendix A

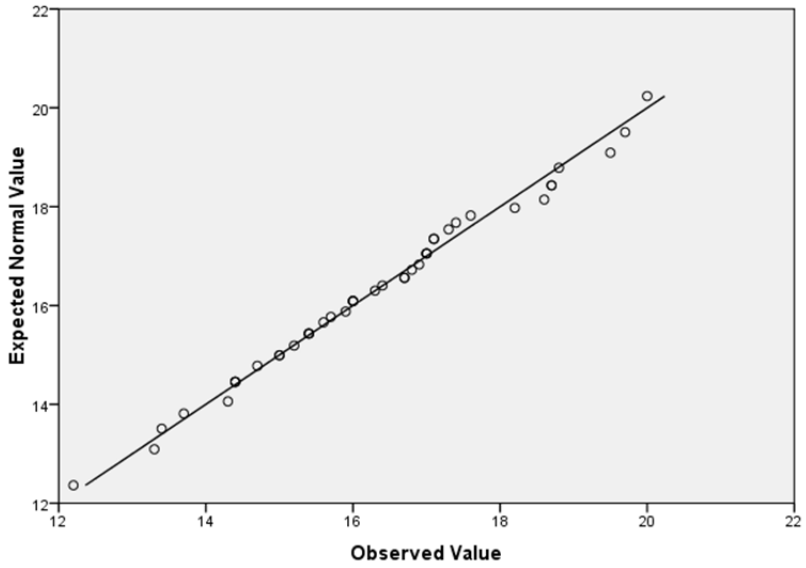

Normal Q-Q Plot of Freshman for Fall 2006
Expected Normal Value
Standardized Observed Value
3
2
1
0
-1
-2
-3
-3
-2
-1
0
1
2
3

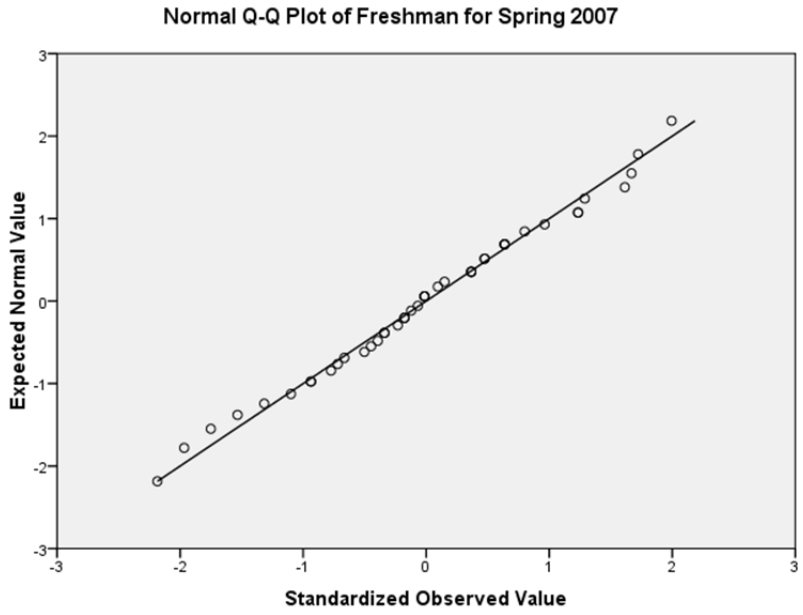

Normal Q-Q Plot of Sophomores for Fall 2006
Expected Normal Value
Standardized Observed Value
3
2
1
0
-1
-2
-3
-3
-2
-1
0
1
2
3

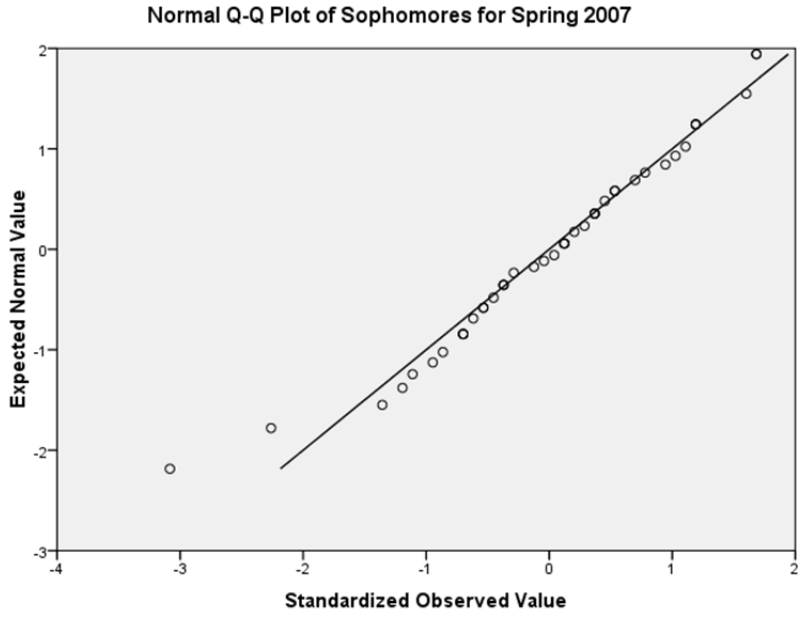
Normal Q-Q Plot of Juniors for Fall 2006

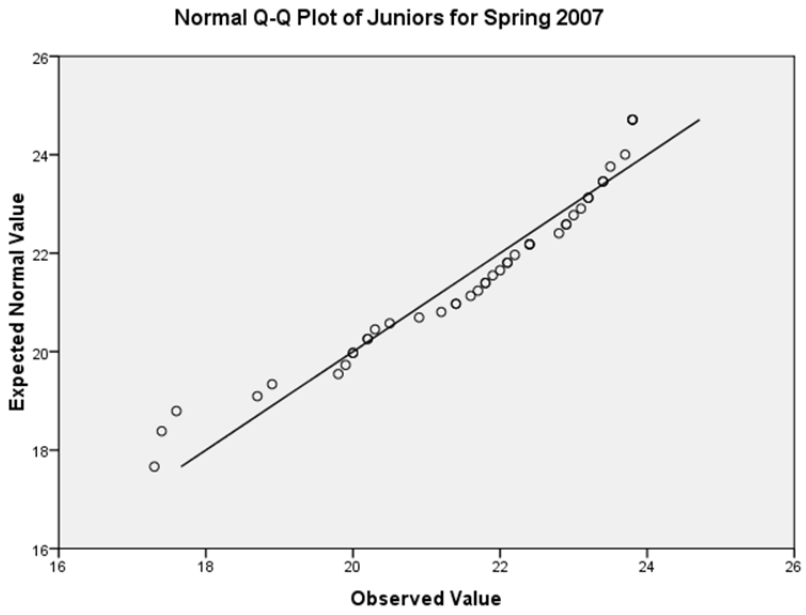


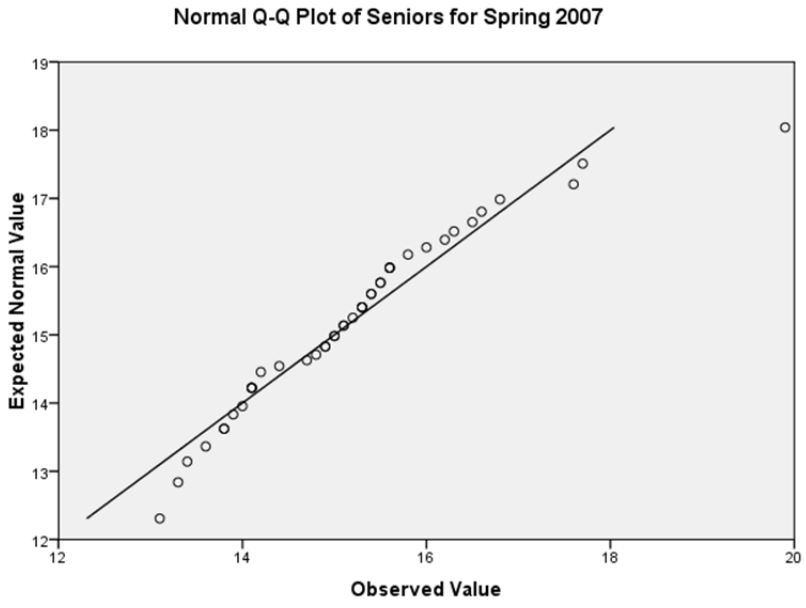
Normal Q-Q Plot of Seniors for Fall 2006




Normal Q-Q Plot of Freshman for Spring 2007
Expected Normal Value
Standardized Observed Value
3
2
1
0
-1
-2
-3
-3
-2
-1
0
1
2
3


Normal Q-Q Plot of Sophomores for Spring 2007
Expected Normal Value
Standardized Observed Value
2
1
0
-1
-2
-3
-4
-3
-2
-1
0
1
2


Normal Q-Q Plot of Juniors for Spring 2007
Expected Normal Value
Observed Value
16
18
20
22
24
26


Normal Q-Q Plot of Seniors for Spring 2007
Expected Normal Value
Observed Value
12
13
14
15
16
17
18
19
20

Appendix B

Paired Samples Test

Freshman

Fall 2006 vs. Spring 2007

	Paired Differences						
			99% Confidence Interval of the Difference				
	Mean	Std. Deviation	Lower	Upper	t	df	p-value
Freshman Fall 2006 Freshman Spring 2007	-.30698	2.02853	-1.14162	.52767	-.992	42	.327

Paired Samples Test

Days of the Week

Fall 2006

	Paired Differences						
			95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Lower	Upper	t	df	p-value
Monday vs. Wednesday	-128.78571	118.34836	-197.11803	-60.45340	-4.072	13	.001
Monday vs. Friday	100.21429	83.12658	52.21843	148.21014	4.511	13	.001
Wednesday vs. Friday	229.00000	131.81397	152.89288	305.10712	6.500	13	.000

Paired Samples Test

Days of the Week

Spring 2007

	Paired Differences						
			95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Lower	Upper	t	df	p-value
Monday vs. Wednesday	-127.76923	157.60296	-223.00774	-32.53072	-2.923	12	.013
Wednesday vs. Friday	286.71429	135.62813	208.40494	365.02364	7.910	13	.000
Monday vs. Friday	150.46154	151.44340	58.94521	241.97787	3.582	12	.004

Differences in Chapel Attendance Based on Gender of Speakers: Spring 2007

Male and Female Populations

Paired Samples Test

	Mean	Std. Deviation	95% Confidence Interval of the Difference		t	p-value
			Lower	Upper		
Female Population: Male vs. Female Speaker	.05988	.05291	.02203	.09773	3.579	.006
Male Population: Male vs. Female Speakers	.03511	.06890	-.01418	.08440	1.612	.142