The Impact of Class Scheduling on Academic Performance: A Study of First-Year Computer Engineering Students at Cebu Institute of Technology University

Jundith D. Alterado, Cebu Institute of Technology - University, Philippines
Johnalyn L. Figueras, Cebu Institute of Technology - University, Philippines

The Asian Conference on Education 2024
Official Conference Proceedings

Abstract
This study examines the significant influence of class scheduling on the academic performance of first-year engineering students at Cebu Institute of Technology University (CIT-U). Using data from grades and attendance records of 60 students enrolled in the computer programming course, this paper examines the effect of class schedule on academic performance among students in morning classes that start at 7:30 AM until 10:30 AM and afternoon classes that start from 12:00 PM to 3:00 PM. A between-subject research design using a two-sample, one-tailed t-test was applied on the dataset to achieve the research objectives. The result reveals that students in afternoon classes achieve significantly higher grades than the morning classes. Additionally, a moderate correlation was found between attendance and grades, indicating that regular attendance positively influences academic performance. These findings highlight the critical role of class scheduling in enhancing students' academic success and suggest that optimizing class schedules could improve both well-being and performance at Cebu Institute of Technology - University.

Keywords: Class Scheduling, Academic Performance, Two-Sample One-Tailed t-Test, Correlation

Introduction

Time, an ever-precious resource, often proves elusive in our daily lives. Whether allocated for sleep, travel, socializing, meals, or studying, time consistently feels insufficient. This sentiment resonates particularly strongly among educators and students, navigating jam-packed school days teeming with diverse activities and obligations. In countries such as Taiwan and China, where school days stretch between 8 to 10 hours, and in the Philippines, where the average school day spans from 7:30 AM to 5:00 PM, the significance of time management in academic settings becomes glaringly evident. However, amidst these demanding schedules lies a critical question: Does starting early in the morning truly enhance academic performance, and how does the timing of the day impact students' learning and class attendance?

For so long, the potential impact of the timing of class commencement on the students' academic performance has been one of the ongoing concerns in academic circles. It is a subject of debate and scrutiny that involves educational establishments from elementary schools to universities, educators, policymakers, and researchers. Every educational institution aims to raise their students' learning, and the researcher believes that understanding the influence of class start time on students' performance is crucial for designing effective educational policies and practices. This research hopes to delve into this crucial aspect of educational dynamics, aiming to uncover the relationship between class start time and students' academic achievements, specifically their grades and class attendance.

The scheduling of classes is not merely a logistical consideration but holds significant implications for students' cognitive functions, attentiveness, and overall academic engagement. In recent years, there has been a growing body of research shedding light on the multifaceted influences of class timing on various aspects of student learning and well-being. However, the specific influence of class start time on the students' grades and attendance remains a complex and underexplored domain warranting rigorous investigation.

At the core of this study lies the recognition that the students' biological rhythms, also known as circadian rhythms, play an important role in determining their readiness to engage in learning activities at different times of the day. Adolescents experience a phase delay in their circadian rhythms during puberty, leading to a natural preference for later bedtimes and waking times (Carskadon, 2011). Consequently, early morning classes may coincide with a period of reduced alertness and cognitive functioning, potentially hindering students' ability to engage effectively in learning activities during these hours (Eide & Showalter, 2012).

Furthermore, the timing of classes can intersect with various socio-economic and cultural factors, further shaping its impact on students' academic performance. For instance, students from low-income households may face additional challenges related to transportation and work commitments, which can compound the effects of early morning classes on their academic success (Wolfson & Carskadon, 1998). Understanding these contextual subtleties is essential for designing interventions that address the diverse needs of students across different socio-economic backgrounds.

While some studies have indicated a positive association between later school start times and improved academic outcomes (Hinrichs, 2011), the conclusion remains mixed and context dependent. Individual sleep patterns, academic workload, and school culture may influence

the observed effects, emphasizing the need for a comprehensive, multi-dimensional research approach (Thacher, 2008).

Given this context, this research aims to contribute fresh insights into the influence of class start time on students' academic performance. This study aims to clarify the core reasons and influences shaping this relationship by combining findings from previous research with new data from first-year computer engineering students at CIT-University.

Ultimately, the findings of this research hold implications for educational policy and practice, informing interventions aimed at optimizing students' learning experiences and enhancing their academic achievements. By fostering a deeper understanding of the interplay between class timing and student outcomes, educators and policymakers can work towards creating learning environments that are conducive to academic success and supportive of students' holistic well-being.

Methodology

This research will use a quantitative approach to examine the relationship between class start times and students' academic performance, focusing on grades and attendance. For students' grades and attendance records analysis, the study will use correlation and regression techniques to determine whether class start times significantly influence academic outcomes. This research design approach aims to provide insights into how the timing of classes impacts students' attendance and academic performance, contributing to a deeper understanding of time-related factors in educational success.

Research Questions

This research will address the following questions derived from the problem statements. These questions aim to guide the study and provide the structure for data collection and analysis.

RQ1. Does the time in which the class starts affects the grades of CIT-University 1st Year Engineering students?
Ho: The time in which the class starts has no effect to the grades of CIT-University 1st Year Engineering students.
Ha: The time in which the class starts affects the grades of CIT-University 1st Year Engineering students.

RQ2. Does the time in which the class starts affects the absences of CIT-University 1st Year Engineering students?
Ho: The time in which the class starts has no effect to the absences of CIT-University 1st Year Engineering students.
Ha: The time in which the class starts has affects the absences of CIT-University 1st Year Engineering students.

RQ3. Do the students' absences have an effect to the grades of CIT-U 1st Year Engineering students?
Ho: The students' absences have no effect to the grades of CIT-University 1st Year Engineering students.

Ha: The students' absences affect the grades of CIT-University 1st Year Engineering students.

RQ4. Do classes hold in the morning yields lower grades than classes in the afternoon?
Ho: Classes which starts in the does not yield lower grades than classes held in the afternoon.
Ha: Classes which starts in the does not yield lower grades than classes held in the afternoon.

Data Gathering

The study uses a dataset from the Cebu Institute of Technology—University in Cebu City, Philippines. Specifically, it will utilize class records of first-year students enrolled in "Computer Programming I." The classes will be categorized into two major time periods: Morning (7:30 AM to 10:30 AM) and Afternoon (12:00 PM to 3:00 PM). The assessment of the student's academic performance includes students' grades (0-100) and attendance, measured by the total number of absences.

Elimination of Outliers.

Before sampling, each group of data (class) will undergo a preprocessing step to eliminate outliers using the quartile method. The method involves calculating the first (Q1) and third (Q3) quartiles of the dataset, then determining the interquartile range (IQR) as the difference between Q3 and Q1. Outliers are identified as data points falling below $Q1-1.5\times IQR$ or above $Q3+1.5\times IQR$, and these will be removed to ensure the data used for analysis is accurate and representative, leading to more reliable results.

Probability Sampling.

The researcher selected a random sample of 60 students from each class start time period using simple probability sampling. This method ensures that every student in each class has an equal chance of selection, minimizing bias and enhancing the generalizability of the results. The sample size of 60 students per class time was chosen to provide adequate representation across different start times and to obtain unbiased insights into students' academic performance.

Statistical Analysis

This research will utilize various inferential statistical methods to analyze the relationship between the variables: time of day (morning and afternoon), grades, and absences. The methods include correlation analysis to study the relationships between variables, t-tests or ANOVA to compare means across time periods, and regression analysis to examine how time of day affects grades and absences. By applying these methods, the study aims to uncover significant patterns and trends, providing a deeper understanding of how the timing of classes influences academic performance and attendance.

Strategy for Testing Hypothesis 1.

To examine whether class start time affects the grades of first-year engineering students, the study will use a between-subjects design. The independent variable is the class start time

(morning or afternoon), and the dependent variable is students' grades. The study will use a two-sample, one-tailed t-test to reject or accept the null hypothesis for the comparison.

Strategy for Testing Hypothesis 2.

The study employs a between-subjects design to determine whether the time of day when the class begins has an impact on the attendance of first-year engineering students. The independent variable is class start time (morning or afternoon), while the dependent variable is student attendance. A two-sample, one-tailed t-test will analyze whether to reject or accept the hypothesis.

Strategy for Testing Hypothesis 3.

A correlation analysis will examine the relationship between student absences and academic performance and use the linear regression method to assess whether a student's absences significantly influence a student's grades.

Strategy for Testing Hypothesis 4.

To determine if the classes held in the morning yield lower grades than classes held in the afternoon, this research would compare the mean average grades of the two time periods.

Results and Discussion

Statistical Analysis

Testing Hypothesis 1.

Ho: The time in which the class starts has no effect to the absences of CIT-University 1st Year Engineering students.

Ha: The time in which the class starts affects the absences of CIT-University 1st Year Engineering students

Table 1: Two-Sample t-Test of Morning vs. Afternoon Class Grades

	Morning	Afternoon
Mean	78.0820635	83.22853535
Variance	111.09514	74.59734893
Observations	60	60
Hypothesize Mean Difference	0	
df	114	
t Stat	-2.9254189	
P(T<=t) one-tail	0.00207593	

t Critical one-tail	1.65832997
P(T<=t) two-tail	0.00415187
t Critical two-tail	1.9809923
Analysis	Reject Null

Table 1 shows t-stat > $-t$-critical (two-tail), indicating a significant difference in average grades between morning and afternoon classes.

Testing Hypothesis 2.

Ho: The time in which the class starts has no effect to the absences of CIT-University 1st Year Engineering students.

Ha: The time in which the class starts affects the absences of CIT-University 1st Year Engineering students.

Table 2: Two-Sample t-Test of Morning vs. Afternoon Class Attendance

	Morning	Afternoon
Mean	0.3666667	0.15
Variance	0.6768362	0.23135593
Observations	60	60
Hypothesize Mean Difference	0	
df	95	
t Stat	1.7610791	
P(T<=t) one-tail	0.0407213	
t Critical one-tail	1.6610518	
P(T<=t) two-tail	0.0814427	
t Critical two-tail	1.985251	
Analysis	Do not Reject Null	

Table 2 shows t-stat < $-t$-critical (two-tail), indicating no significant difference in average grades between morning and afternoon classes.

Testing Hypothesis 3.

Ho: The students' absences have no effect to the grades of CIT-University 1st Year Engineering students.

Ha: The students' absences have an effect to the grades of CIT-University 1st Year Engineering students.

Table 3: Correlation Analysis Between Absences and Grades

	Absences	Grades
Absences	1	
Grades	-0.5	1
Analysis	Negative Moderate Correlation	

Table 3 shows a moderate correlation between student absences and grades, with the negative sign reflecting an inverse relationship.

Table 4: Regression Statistics of Data

	Values
Multiple R	0.471
R Square	0.222
Adjusted R Square	0.209
Standard Error	9.377
Observations	60

Table 4 result shows an R-squared value of 0.222, which is moderately acceptable. This means 22.2% of the variation in grades is explained by the independent variable, absences.

Using ANOVA analysis to further validate the significance of the above results.

Table 5 (a), (b): ANOVA Analysis Result

(a)

	df	SS	MS	F	Significance F
Regression	1	1454.823	1454.823	16.546	0.000
Residual	58	5099.790	87.927		
Total	59	6554.613			

(b)

	Coefficients	Standard Error	tStat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	80.2952	1.3272	60.4993	4.18E-54	77.6350	82.9519	77.6385	82.9519
Grades	-6.0358	1.4839	-4.0676	0.00015	-9.0061	-3.0655	-9.0061	-3.0656

Table 5 tells that the Significance F value, which reflects the reliability of the result, must be below 0.05 to confirm statistical significance. With a Significance F value close to 0, the results are statistically significant. Furthermore, the coefficients show that each additional unit of absences is associated with a 6.04 (rounded) decrease in grades.

Testing Hypothesis 4.

Ho: Classes which starts in the does not yield lower grades than classes held in the afternoon.

Ha: Classes which starts in the morning yields lower grades that classes held in the afternoon.

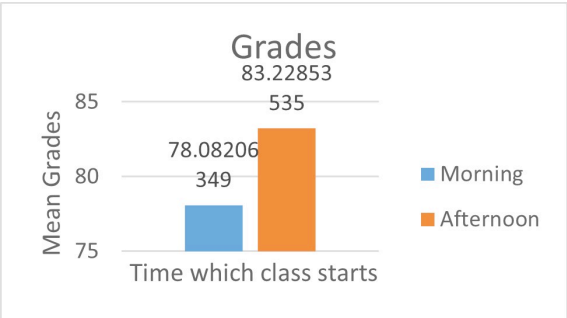

Figure 1: Mean Grades of Morning vs. Afternoon Classes

Figure 1, a bar graph, illustrates that, on average, students in morning classes tend to have lower grades compared to those in afternoon classes. This suggests that factors like class timing influence the performance difference between the two groups.

Conclusion

In conclusion, the timing of classes significantly impacts the grades of first-year engineering students at Cebu Institute of Technology—University. Students attending afternoon classes achieved higher grades with a notable difference in the results compared to the morning classes. While class timing has little effect on student absences, attendance moderately correlates with grades, indicating that regular attendance positively influences academic performance. Hence, these findings show the critical role of class scheduling in enhancing students' academic performance and success. Future research could expand the scope by exploring the long-term impact of class scheduling on student performance across different academic years and programs.

Acknowledgements

I would like to express my sincere gratitude to Engr. Johnalyn Figueras, my advisor, for their invaluable guidance and unwavering support throughout the course of this research. I am also grateful to Cebu Institute of Technology—University for their assistance and encouragement. Additionally, I would like to thank my family and friends for their support and understanding during this project.

References

Adams, J. S. (1965). Inequity in social exchange. In L. Berkowitz (Ed.), Advances in Experimental Social Psychology (Vol. 2, pp. 267–299). Academic Press.

Borbély, A. A. (1982). A two process model of sleep regulation. Human Neurobiology, 1(3), 195–204.

Carskadon, C. A. (2011). Sleep in adolescents: The perfect storm. Pediatric Clinics of North America, 58(3), 637–647.

Carskadon, M. A., & Dement, W. C. (1981). Cumulative effects of sleep restriction on daytime sleepiness. Psychophysiology, 18(2), 107–113.

Coleman, J. S. (1988). Social capital in the creation of human capital. American Journal of Sociology, 94, S95–S120.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268.

Eide, E. R., & Showalter, M. H. (2012). Sleep and student achievement. Eastern Economic Journal, 38(4), 512–524.

Hansen, M., Janssen, I., Schiff, A., Zee, P., & Dubocovich, M. (2005). The impact of school daily schedule on adolescent sleep. Pediatrics, 115(6), 1555–1561.

Hinrichs, P. (2011). When the bell tolls: The effects of school starting times on academic achievement. Education Next, 11(4), 68–75.

Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. Educational Psychologist, 38(1), 1–4.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78.

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. Review of Educational Research, 75(3), 417–453.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. Cognitive Science, 12(2), 257–285.

Thacher, P. V. (2008). University students and the "all nighter": Correlates and patterns of students' engagement in a single night of total sleep deprivation. Behavioral Sleep Medicine, 6(1), 16–31.

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. Child Development, 69(4), 875–887.