

# Class Time of Day: Impact on Academic Performance



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## 1 Introduction

This paper examines the relationship between the time of day for course scheduling and academic success, controlling for course characteristics and instructor variability. Student academic achievement can be impacted by a variety of uncontrollable factors. The ability for students to schedule classes at specific times throughout the day should enable students to align their preference for morning, afternoon, or evening classes with their predicted academic success in the course. Students who are “morning people” who register for morning classes should perform as well as students who prefer afternoon or evening classes. Ideally, offering the same course at various times throughout the day should allow for the student academic success rates independent of the class time of day.

Prior research has shown variability concerning the impact of the start time of instruction on cognitive performance. A study of high school students indicated that later high school start time led to higher reading test scores for females and that longer sleep led to greater academic success [6]. College students who follow irregular sleep schedules resulting in sleep loss decrease their acquisition and retention of course material [1]. The presence of next-day classes reduced alcohol consumption among college students [2]. Students were found to perform better in the afternoon than in the early morning, suggesting that morning classes hampered student performance [7], and students were found to have earned higher grades in

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classes that start later in the day [3], suggesting that later classes improved student performance. A small positive time of day effect was found to impact student grades [4]; however, morning versus evening classes did not affect test performance [5]. Previous studies show contradictory indications of class time of day on student performance prompting evaluation of a statistics course offered over 13 years to see if the time of day that the course was offered had an impact on student performance.

## 2 Methodology

The methodology of this study was to compare student grades (as percentages out of 100) for differing class time of day course offerings controlling for course content and course instructor.

The course studied was entitled “Using the Computer as a Research Tool.” The course covers 18 chapters of statistical analyses using the IBM SPSS Statistics software program. The course also covers a short section on report writing using word processing via Microsoft Word and data analysis with graphics via Microsoft Excel to provide students with the skills necessary to write a research paper.

Student grades were compiled from 13 years of data. The data include 38 distinct sections of the course, offered in the fall and spring semesters. Three instructors taught the course; however additional analysis was conducted to determine the effect of the difference in instructors. All three instructors in this research study employed standard handouts and similar designs in all homework assignments and examinations. The number of student grades included in the study was seven hundred and eighty-eight (788).

## 3 Results

The first hypothesis studied whether there was a significant difference in student grades between two class times: 10:10 a.m. to 11:05 a.m. and 11:15 a.m. to 12:10 p.m. An independent samples *t*-test (see Table 1), using student grades as the dependent variable, found that there is no difference in student grades across these two class time periods (sig. 0.984).

The second hypothesis studied whether there was a significant difference in student grades for the three instructors that participated in the study. A one-way analysis of variance test (see Table 2), using student grades as the dependent variable, found that there is a significant difference in student grades based on instructor (sig. 0.000). Further analysis, using the Bonferroni multiple comparisons Table, found that one instructor’s student grades were significantly different from the other two instructors (sig. 0.000); two of the instructors’ student grades were not significantly different from each other (sig. 1.000). The instructor found to be

**Table 1** Independent samples *t*-test

Group statistics		N	Mean	Std. deviation	Std. error mean
Percentage	Time of class 10:10–11:05	257	0.82257	0.130124	0.008117
Grade	11:15–12:10	312	0.82281	0.150423	0.008516

  

		Independent samples test								
		Levene's test for equality of variances		<i>t</i> -test for equality of means						
		<i>F</i>	Sig.	<i>t</i>	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
									Lower	Upper
Percentage	Equal variances assumed	0.949	0.330	-0.020	567	0.984	-0.000240	0.011930	-0.023672	0.023192
Grade	Equal variances not assumed			-0.020	565.627	0.984	-0.000240	0.011765	-0.023347	0.022868

**Table 2** ANOVA with Bonferroni multiple comparisons

ANOVA						
Percentage grade						
	Sum of squares	df	Mean square	F	Sig.	
Between groups	1.579	2	0.790	34.104	0.000	
Within groups	18.174	785	0.023			
Total	19.753	787				
Post hoc tests						
Multiple comparisons						
Percentage grade Bonferroni						
(I) Instructor name	(J) Instructor name	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Instructor 1	Instructor 3	0.100925*	0.013302	0.000	0.06901	0.13284
	Instructor 2	0.010541	0.022831	1.000	-0.04423	0.06531
Instructor 3	Instructor 1	-0.100925*	0.013302	0.000	-0.13284	-0.06901
	Instructor 2	-0.090384*	0.020674	0.000	-0.13998	-0.04078
Instructor 2	Instructor 1	-0.010541	0.022831	1.000	-0.06531	0.04423
	Instructor 3	0.090384*	0.020674	0.000	0.04078	0.13998

\*The mean difference is significant at the 0.05 level

statistically different from the other two instructors will be referred to as the *unique* instructor resulting in further instructor analysis and control.

The third hypothesis studied whether student grades were significantly different for the following two class times, 10:10 a.m. to 11:05 a.m. and 11:15 a.m. to 12:10 p.m., for those students who took the course from the unique instructor. An independent samples *t*-test (see Table 3), using student grades as the dependent variable, found that there is no difference in student grades across these two class times (sig. 0.132), when only the unique instructor, with grades different from the other two instructors, is considered.

The fourth hypothesis studied whether student grades were significantly different for morning sections of the class versus afternoon and evening sections of the class (all three instructors included). Morning sections were defined with starting class times before 12:00 noon; afternoon and evening sections were defined with starting class times after 12:00 noon. An independent samples *t*-test (see Table 4), using student grades as the dependent variable, found that there is a significant difference in student grades across the two groups (morning sections and afternoon sections) (sig. 0.001). Students in the morning sections earned significantly higher grades (mean of 82.3%) than students in the afternoon and evening sections (mean of 77.4%).

The fifth hypothesis studied whether student grades were significantly different for morning sections of the class versus afternoon and evening sections of the class



**Table 4** Independent samples *t*-test

Group statistics		<i>N</i>	Mean	Std. deviation	Std. error mean					
Percentage	a.m. versus p.m.	568	0.82272	0.141618	0.005942					
Grade	a.m. sections	123	0.77380	0.160703	0.014490					
	p.m. sections									
Independent samples test										
		Levene's test for equality of variances		<i>t</i> -test for equality of means						
		<i>F</i>	Sig.	<i>t</i>	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
Percentage	Equal variances assumed	3.348	0.068	3.388	689	0.001	0.048917	0.014438	Lower	Upper
Grade	Equal variances not assumed			3.123	165.477	0.002	0.048917	0.015661	0.020568	0.077266
									0.017996	0.079838

for those students who took the course from the unique instructor. An independent samples *t*-test (see Table 5), using student grades as the dependent variable, found that there is a significant difference in student grades across the two groups (morning sections and afternoon sections) (sig. 0.001), when only the unique instructor's grades were considered. Students in the morning sections earned significantly higher grades (mean of 79.7%) than students in the afternoon and evening sections (mean of 73.6%).

The sixth hypothesis studied whether student grades were equal for morning sections of the class versus afternoon sections of the class for those students who took the course from the two instructors with statistically similar grades (i.e., not including the unique instructor). An independent samples *t*-test (see Table 6), using student grades as the dependent variable, found that there is no significant difference in student grades across the two groups (morning sections and afternoon/evening sections) (sig. 0.717), when only the two instructors' grades were included.

## 4 Conclusions

There is no significant difference in student grades among the morning sections of course offerings with class starting times of 10:10 a.m. versus 11:15 a.m. Although registration data indicates that students prefer the 11:15 a.m. class over the 10:10 a.m. class, the results indicate no significant difference in performance between the two morning classes. When considering course offerings in the morning vs. the afternoon/evening sections, the results indicate that, when all three instructors are included, student grades are significantly higher for those students in the morning sections of the class versus those in afternoon and evening sections of the class. However, the unique instructor may impact the performance difference in morning versus afternoon/evening classes since no significant difference was found for the courses taught by the two other instructors.

The results of analyzing the difference in instructors revealed a significant difference in student grades among instructors, more specifically between the unique instructor and the other two instructors. The unique instructor that participated in the study had significantly different student grade percentages than the other two instructors. Although all three instructors used the same class format including design of homework assignments and examinations, the individual instruction impacted student performance as measured by student grades. When only the two instructors with similar grades are included, there is no significant difference in student grades for those students in the 10:10 a.m. versus 11:15 a.m. sections and no significant difference in student grades for those students in the morning sections of the class versus those in afternoon and evening sections of the class. The results of this study show that student performance is not impacted by the time of day that a course is offered.

**Table 5** Independent samples *t*-test

Group statistics		<i>N</i>	Mean	Std. Deviation	Std. Error Mean					
Percentage	a.m. versus p.m.	374	0.79698	0.148808	0.007695					
Grade	a.m. sections	87	0.73598	0.168533	0.018069					
	p.m. sections									
Independent samples test										
		Levene's test for equality of variances		<i>t</i> -test for equality of means						
		<i>F</i>	Sig.	<i>t</i>	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
Percentage	Equal variances assumed	1.823	0.178	3.356	459	0.001	0.061002	0.018176	Lower	Upper
grade	Equal variances not assumed			3.106	119.118	0.002	0.061002	0.019639	0.025284	0.096719
									0.022115	0.099888



**Table 6** Independent samples *t*-test

Group statistics		<i>N</i>	Mean	Std. deviation	Std. error mean
Percentage	a.m. versus p.m.	194	0.87235	0.111192	0.007983
Grade	a.m. sections	36	0.86522	0.089865	0.014987
	p.m. sections				

  

Levene's test for equality of variances		<i>F</i>	Sig.	Independent samples test					
				<i>t</i> -test for equality of means					
				<i>t</i>	df				
				Sig. (2-tailed)	Mean difference				
					Std. error difference				
					95% confidence interval of the difference				
					Lower				
					Upper				
Percentage	Equal variances assumed	0.110	0.741	0.363	228	0.007128	0.019634	-0.031559	0.045815
grade	Equal variances not assumed			0.420	56.879	0.007128	0.016972	-0.026860	0.041116

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