Longer Classes Versus More Frequent Classes: Which Wins? Evidence from a Liberal Arts College

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Abstract: *Colleges and universities have to stagger their classes across different times and days to make the best use of their existing buildings. Some of these class meetings are for different lengths of time and meet a different number of days per week. In addition, students and faculty have increased demand for courses that meet fewer days per week. There is some concern that classes that meet more often are better suited for student learning than others. However, this paper finds that, after controlling for the class time and course fixed effects as well as faculty and student fixed effects, there is no statistical difference between student learning in two days and three days classes. Thus, for colleges similar to the one in this study there does not appear to be a trade-off between the frequency of course meetings and student achievement as measured by grades.*

JEL Codes: I20, I21, I23, A22, Z18

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1. Introduction and Background Information

Two-days-a-week classes have become more common in the recent decades, compared to the traditional three-days-a-week classes. Two-days-a-week classes are longer than three-days-a-week classes. So the amount of total weekly class time stays the same across different types of classes. While the change does not impact the total number of minutes a course meets in a given week, the different structure is potentially attractive to at least some students, professors, and administrators for a number of reasons.

Meeting less frequency each week, albeit for longer time, has some benefits. The additional time in two-days-a-week classes allows more flexibility in lesson plans, quizzes, in-class exercises, and exams. If faculty compress all their teaching into two days, it may allow greater research productivity by having long segments of time available for research on three business days per week, thus potentially allowing them to fulfill research expectations. This may benefit faculty through tenure reviews, promotions, and salary raises and administrators through increased research productivity, which is often a component of college rankings systems. Administrators may also value two-days-a-week classes if they allow the university to reduce operational costs by having classes on fewer days (David, 2008). Similar motivations led some public K-12 school systems to implement four-day school weeks (Anderson and Walker, 2015).
Two-days-a-week classes may also be easier for students to fit into their complex schedules. Classes that meet fewer days per week are less likely to conflict with other classes or work commitments. Moreover, given that two-days-a-week classes are longer and contain more information, students are more likely to attend each class meeting. Thus, it may help alleviate student absenteeism. However, there are concerns that a compressed class such as two-days-a-week classes may lead to reduced learning and lost information. Three-days-a-week classes meet more often for less time and so they may be more impactful in student learning by allowing more frequent meetings and reducing mental fatigue. Previous research has evaluated the benefits and costs of different methods of structuring the timing of courses at both secondary and postsecondary levels. Colleges compress courses in a range of ways including: two-days-per-week, summer classes which are typically compressed into only a few weeks, and compressed semesters ranging from two to eight weeks.

At the middle school and high school level block scheduling started as a way to improve academic outcomes and became more popular in the 1990's. There are various types of block scheduling, but each type is based on having longer classes less frequently. More than half of the high schools in the United States are under block scheduling (Rettig and Canady, 1995). A large number of studies have pointed to the benefits of longer, uninterrupted classes under block scheduling (for example Veal and Schreiber, 1999).[1] However, there is mixed evidence about school performance in standardized tests and in class attendance under block scheduling. Lewis

[1] Hughes (2004) compares the grade point average of students from a large high school in Spartanburg, South Carolina that has transitioned completely from a tradition schedule to a block schedule and finds a positive relationship between block scheduling and student achievement. Zepeda and Mayers (2006) analyzed 58 studies on the effect of block scheduling in high school and found a positive effect on student grade point average and the school climate across all these studies.

and Cobb (2003) found that student outperform students in tradition scheduling regardless of the type of block scheduling.[2] Edwards (1995) found that most teachers reported significant improvement in their teaching effectiveness after the first semester under the block scheduling. Student achievement also improvement under block scheduling. Cobb, Abate, and Baker (1999) found mixed, but generally positive results under block scheduling.[3] Students under block system have a higher semester and cumulative grade point average. Male students do even better than female students under the block semester, even though both genders show improvement. Khazzaka (1997) found that block scheduling improved student grades, attendance, and discipline. Moreover, according to surveys of students, teachers, and administrators in this study, each group expressed significant positive benefits under block scheduling. Rice, Croninger, and Roellke (2002) used data from National Education Longitudinal Study, 1998 and found mixed evidence in support of block scheduling.[4] Outside of block scheduling, Anderson and Walker (2015) examine the effect of shortening the school week to only four days. Using school-level data from Colorado, they find a positive relationship between the shorter week schedule and student achievement in mathematics and reading.

At the college level, there is limited evidence about the effectiveness of two-days-per-week classes when compared to three-days-per week classes. Dills and Hernandez (2008) – who examined data from a large public university – observe that three-days-a-week classes are better for student achievement, as measured by grades, compared to two-days-a-week classes. Joyce et. al (2015) compare a two-days-per-week section of a Principles of Microeconomics course within the business school at Baruch College with a compressed section which met only once per week. They find that students in the compressed section do worse on the midterm, but the difference in achievement on the final exam is not statistically significant.

Our paper contributes to this literature by examining evidence from a small, highly selective liberal arts college. Our analysis includes course, faculty, department, and student fixed effects. We find that there is no statistically significant difference in student achievement between the more traditional three-days-a-week classes and two-days-a-week classes. This has important implications for colleges and universities, particularly those who are considered selective and relatively small in size. Many institutions are facing the constraints of classroom scheduling, need for innovative pedagogy and individualized instruction, and faculty preferences and tenure requirements for more research. The need to adopt two-days-per-week schedules to accommodate these pressures will increase. Our results suggest that colleges, which increase

[2] They compare student achievement across two types of block scheduling (full block or 4x4 scheduling and AB block scheduling) and a traditional scheduling using a matched sample design. Low-achieving students did best under AB block scheduling.

[3] While student achievement in advanced mathematics courses were not different under block scheduling, students do less well under block scheduling than in traditional schedule for standardized mathematics tests. There was no statistically significant difference in reading and writing tests scores.

[4] While longer class periods encourage teachers to use a variety of instructional methods and more individualized instruction, students perform less well on the tenth-grade mathematics exams under block scheduling, after controlling for the effects of other variables.

their offering of two-day-a-week classes in place of three-day-a-week classes, do not face a trade-off of lower achievement and potentially reduced graduation rates.

2. Data and Descriptive Statistics

We obtained data from a private selective liberal arts college on the condition of anonymity. The data spans from 1996-97 to 2007-08 and include all the records of student grades in that period. The data also include student characteristics, course characteristics, and faculty characteristics.

In our analysis, we measure student achievement with the individual grades students receive in the course. The grades are assigned on a scale from 0 to 4.33 with an A+ worth 4.33 grade points, an A is 4.0 grade points, and so on. Table 1 shows the descriptive statistics of the quantitative variables. Grade point average of students across the sample is 3.23. The data include SAT Math and Verbal scores, two measures of student preparedness prior to enrollment at the school. As Table 1 shows, the mean SAT Math score is 676 and the mean SAT Verbal score is 674. These SAT scores reflect the highly selective nature of this liberal arts college. Table 1 also reports the average class size across the observations in the sample. The class sizes are fairly small with an average of 20.9 students per class in the sample.[5]

<<INSERT TABLE 1 HERE>>

The data also include variables associated with the students' demographics and standing at the university. Table 2 shows the descriptive statistics of categorical variables including gender of the student, academic standing at time of the class, and the semester when the course is taken. Male students comprise 53.56 percent of the sample, while female students make up the remaining 46.44 percent. Due to normal student attrition and students with more advanced standing studying abroad, students earlier in the academic career earn a larger share of the course grades. In addition, students with advanced standing may complete independent studies or an honors theses and these are excluded from the data due to their irregular meeting schedules. In the sample, 28.72 percent of the grades are earned by students with freshman standing at the time of the course, followed by 26.95 percent by sophomores, 22.91 by juniors, and 21.42 percent by seniors. As is relatively common at liberal arts colleges, the academic year at the institution in the study includes two regular semesters and a short semester where students enroll in only one class. 42.98 percent of the grades were earned in the Fall semester, 42.27 percent were earned in the Spring semester, and 14.75 percent were earned in the Short semester.

Most of the classes in this time period of the data met either two days or three-days-a-week. Some classes met for one day, four days, and five days a week, but they were few in numbers. 51.07 percent of students earned their grades in three-days-a-week classes, while 29.3 percent of students earned their grades in two-days-a-week classes. Four days and five days a week classes

[5] Note that the mean reported here is calculated at the student observation level and therefore places larger weights on large class sizes. If the mean was calculated at the course section level, the average class size would be significantly smaller.

are typically introductory language or mathematics courses.

<<INSERT TABLE 2 HERE>>

3. Empirical Strategy

In order to study the influence of the frequency of course meetings on the grade that the student receives, we estimate the regression equation represented by equation (1).

(1) $Grade_{isdft} = \alpha_1 + \beta_1 Meeting\ Frequency_{sdft} + B_2 X_i + \beta_3 Section_{sdft} + \gamma_d + \varphi_f + \rho_t + \xi_s + \mu_{isdft}$

We estimate variations of the model specified in equation (1) for the grade earned in a class by individual *i* in section *s* in department *d* with faculty member *f* in term *t*. *Meeting Frequency* denotes the number of times per week a particular class met. β_1, the vector of coefficients corresponding to the number of class meetings per week, represents our primary coefficients of interest. In addition, *X* represents a vector of student characteristics including gender, SAT Math and Verbal scores, and their class standing when enrolled in the course section. *Section* is a vector of course section characteristics other than the *Meeting Frequency*. These section characteristics that have been found to be predictors of grades including the time of the day the course meets (Dills and Hernandez 2008) and the class size (Diette and Raghav, 2016; Monks and Schmidt, 2011)

In all the regression specifications, we include year fixed effects, ρ_t. We add year fixed effects to control for any year specific trend in grades such as grade inflation over time. The year here refers to the academic year and not the calendar year. In some specifications, we also control for department fixed effects, γ_d. Different departments may have different grading norms. Furthermore, these standards may be used to manage demand for the courses and major (Diette and Raghav, 2016). Also, the subjective versus objective nature of the material covered across different disciplines is associated with higher grades for relatively more subjective course content (Achen and Courant, 2009). We include faculty fixed effects, φ_f, in some specifications to control for differences in faculty characteristics that may affect both student achievement and grading practices. Lastly, to control for unobserved individual student characteristics such as motivation or preparedness, we include student fixed effects, ξs. μ_{isdft} is the idiosyncratic error of the regression equation.

One potential concern is self-selection of different types of students into course sections with a different number of class meetings week. For example, if some students select into two-day-per-week courses knowing that they perform better in courses, then our estimated coefficients will be biased. We address these potential concerns with two different estimation strategies. The first strategy takes advantage of a feature of the course registration system at this particular institution. In courses with multiple sections, students sign up for the course but they are

assigned to the specific section by an algorithm. Within these sections, assignment to two-days-per-week versus three-days-per-week is plausibly close to random. In this strategy, we limit the analysis sample to only those courses with multiple sections in the same semester and include course fixed effects. Our second strategy to address concerns of unobserved student characteristics is to use student fixed effects. With the student fixed effects specification we are able to include the full analysis sample.

4. Results

Table 3 provides the estimated coefficients for the number of class meetings per week from linear regressions with grade points as the dependent variable for only those course with multiple sections, where students were randomly assigned by the Registrar's office. The first column reports a specification that includes department fixed effects, the second column's specification includes faculty fixed effects, and the third column reports both faculty and department fixed effects. As mentioned above, all specifications include both year and course fixed effects. The classes that meet three-days-a-week are used as the baseline or reference category. There is no statistical difference between student grades in two-days-a-week and three-days-a-week classes across all three specifications.

<<INSERT TABLE 3 HERE>>

Table 4 provides the estimated coefficients for the number of class meetings per week results of linear regressions for all courses using the same specifications as reported in Table 3. While these specifications may be biased if there is selection into course sections based on the number of meetings, we see that there are no statistical differences in student achievement, as measured by grades, in courses that met three-days-a-week versus those that met two-days-a-week.

<<INSERT TABLE 4 HERE>>

Lastly, in Table 5, we turn to the results when provide the regression output of linear regressions where we also control for student fixed effects. Again, we observe that there are no statistically significant differences in student grades in classes that met three-days-a-week and from students' grades in classes that met two-days-a-week.

<<INSERT TABLE 5 HERE>>

5. Conclusion

The estimates of this paper has shown that there is no statistical difference between two-days-a-week courses and classes that meet three-days-a-week. This is an important and comforting discovery for university administrators, faculty members, and students. While three-days-a-week classes are still the most common, twice a week classes have increased their presence. Twice a week classes have advantages of providing more flexibility by creating less conflict with other classes and providing students and faculty members with more flexibility in managing their weekly schedule. Moreover, two-days-a-week classes, being longer, have certain pedagogical advantages such as more flexibility in lessons, lectures, class activities as well as longer in-class exams. Three-days-a-week classes have the advantage of meeting more often. That helps in student learning and retention. University administrators would be pleased to know that one type of classes are not necessarily better than the other.

Our findings vary from the results for the large public university studied in Dills and Hernandez (2007). One potential explanation for the difference in findings may be the typical class size at the respective institutions. The school in our study has a very small average class size which may allow instructors to take greater advantage of longer course meetings with innovative pedagogies that work best in small settings. Additional research is needed to understand how these effects differ by size and selectivity of the institution.

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Table 1: Descriptive Statistics of Quantitative Variables

Variable	Mean	Standard Deviation
Grade Point	3.23	0.748
SAT Math	676	57.9
SAT Verbal	674	62.5
Class Size	20.9	10.8

Notes: 125,533 observations

Table 2: Frequency Distribution of Categorical Variables

Variable	Frequency	Percent
Gender		
Female	58,299	46.44
Male	67,234	53.56
Academic standing		
Freshman	36,058	28.72
Sophomore	33,827	26.95
Junior	28,757	22.91
Senior	26,891	21.42
Semester		
Fall	53,956	42.98
Spring	53,066	42.27
Short	18,511	14.75
Number of Days Class Met		
One Day	2,336	4.02
Two Days	17,031	29.3
Three Days	29,687	51.07
Four Days	7,233	12.44
Five Days	1,839	3.16

Notes: 125,533 observations

Table 3: Regressions with Courses with Multiple Sections

	(1)	(2)	(3)
One Day	0.153*	-0.019	-0.019
	(0.090)	(0.104)	(0.104)
Two Days	-0.009	-0.006	-0.006
	(0.010)	(0.013)	(0.013)
Four Days	-0.018	0.087	0.087
	(0.060)	(0.064)	(0.064)
Five Days	-0.061	-0.001	-0.001
	(0.046)	(0.052)	(0.052)
Faculty Fixed Effects	No	Yes	Yes
Department Fixed Effects	Yes	No	Yes
Year Fixed Effects	Yes	Yes	Yes
Course Fixed Effects	Yes	Yes	Yes
Observations	58,126	58,126	58,126
R-squared	0.136	0.174	0.174

Notes: Grade point is the dependent variable. All regressions are linear. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The baseline category for number of days is classes that meet three days.

Table 4: Regressions with All Courses

	(1)	(2)	(3)
One Day Classes	0.021	-0.006	-0.006
	(0.019)	(0.021)	(0.021)
Two Days Classes	-0.009	-0.001	-0.001
	(0.007)	(0.007)	(0.007)
Four Days Classes	0.008	0.034	0.034
	(0.022)	(0.023)	(0.023)
Five Days Classes	0.010	-0.000	-0.000
	(0.021)	(0.022)	(0.022)
Faculty Fixed Effects	No	Yes	Yes
Department Fixed Effects	Yes	No	Yes
Year Fixed Effects	Yes	Yes	Yes
Course Fixed Effects	Yes	Yes	Yes
Observations	125,533	125,533	125,533
R-squared	0.169	0.198	0.198

Notes: Grade point is the dependent variable. All regressions are linear. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The baseline category for number of days is classes that meet three days.

Table 5: Regressions with All Courses and with Course and Student Fixed Effects

	(1)	(2)	(3)
One Day Classes	0.029*	0.015	0.015
	(0.017)	(0.019)	(0.019)
Two Days Classes	-0.007	0.001	0.001
	(0.005)	(0.006)	(0.006)
Four Days Classes	0.029	0.047**	0.047**
	(0.020)	(0.020)	(0.020)
Five Days Classes	0.027	0.019	0.019
	(0.018)	(0.019)	(0.019)
Faculty Fixed Effects	No	Yes	Yes
Department Fixed Effects	Yes	No	Yes
Year Fixed Effects	Yes	Yes	Yes
Course Fixed Effects	Yes	Yes	Yes
Student Fixed Effects	Yes	Yes	Yes
Observations	125,533	125,533	125,533
R-squared	0.464	0.492	0.492

Notes: Grade point is the dependent variable. All regressions are linear. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. No student-level characteristics are included in the regression specification as it includes student fixed-effects. The baseline category for time is 1 pm. The baseline category for number of days is classes that meet three days.