

Traditional/Block Scheduling, Gender, and Test Scores in College Biology Course

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Abstract

Block scheduling is the reallocation of a school day into longer class sessions to allow for more active teaching strategies and active engagement of students, in the effort to increase student performance. Various types of block scheduling exist. Traditional scheduling is when the school day is divided into six to eight sessions, with each session lasting from approximately 40 to 51 minutes. This paper seeks to find if test scores in a college biology course are significantly affected by high school scheduling type, gender, and the combined effects of both.

A Review of the Literature

Several studies have investigated the effect of gender on student test scores/achievement, and also the effects of instructional time on test scores/achievement. This study seeks to determine if there is an effect of both gender and scheduling style on test scores in an introductory college biology course. Instructional time is a key resource in education, and is assumed to be central in producing high levels of student achievement (Karweit, 1984). The productivity of instructional time depends not only on the amount of time students are in the classroom, but also on how this time is utilized. It can therefore be determined, in comparison, if the type of scheduling the students have had in high school affects their future academic performance in college.

Block scheduling involves extending class periods beyond the traditional 40 to 50 minutes per class session. Some studies suggest

that block scheduling can increase active teaching strategies, provide greater opportunity for student-directed instruction, and improve student performance. Although there has been a positive correlation between block scheduling and improved test scores in high school (Veal, 2000), other research suggests that traditional scheduling types have higher test scores (Bateson, 1990; Gore, 1996; Raphael, Wahlstrom, & McLean, 1986). The long term effects of block scheduling have not been studied extensively; most of the research attempts to correlate high school scheduling types with tests administered during a student's high school academic career, such as ACT, SAT, or graduation exit exams. Carryover of academic achievement into college, as determined by scheduling type in high school, should be addressed.

Project Factors Influencing College Science Success, FICSS, a research study designed and implemented by the Science Education Department of the Harvard-Smithsonian Center For Astrophysics, was a comprehensive study of the success of students in college, based on many elements of their high school experience, one subset being the difference of scheduling styles. Their data came from students entering college in the fall semesters of 2002 and 2003 (Maltese, et al, 2007). FICSS discovered that even when correcting for pedagogic methods there was no significant difference found between students from traditional scheduling high school and those using one of the two primary block scheduling models (4x4 and A/B) on success in introductory college science courses (Dexter, Tai, & Sadler, 2006).

Gender has also been implicated in student performance in various science classes. Research suggests that there is a difference between the sexes in how they learn; testing abilities between the sexes has also been found to be significantly different (Hanson, 1994), with female minorities scoring lowest on achievement testing in high school. Other studies suggest that although females may score somewhat higher on certain types of science achievement questions, males scored higher on other types of questions and these differences are found to be insignificant (Klein et al., 1997). There is some evidence that environmental factors and self-perception also play a major role in both who chooses to continue in the sciences and how they perform in introductory college courses (Hazari, Sadler, & Tai,

2008). However, there seems to be no significant research regarding how various scheduling styles affect college science scores between genders.

In 2009, a study was created to further explore whether or not high school scheduling types had shown progress in relation to teaching pedagogy to show a significant improvement with block scheduling versus traditional scheduling. This study was designed to determine if college success, as measured by grades achieved on the first two formal tests in an introductory biology class, is influenced by gender and high school scheduling type. If there are significant differences in scheduling type and college biology grades, then steps may need to be taken to ensure that entering college freshmen have had the most effective scheduling type in order to succeed in college. Gender differences in relation to scheduling types and classroom success, if found to be significant, may require further study to determine the possible cause(s) and potential solutions so that all may achieve success with equality.

The main research questions which guided my analysis were:

1. Does high school scheduling type (block versus traditional) affect test scores in an introductory college biology course?
2. Does gender affect test scores in an introductory college biology course?
3. Is there a combined effect of scheduling type and gender on test scores in an introductory college biology course?

Methods

Participants

An introductory biology course at a Midwestern university was utilized for this study. Seventy-four students were surveyed, both for their gender, and for the type of high school scheduling they experienced. Twenty-nine males and 45 females participated. Out of the 74 students, 45 reported the traditional type of scheduling in high school, 29 reporting block scheduling, and 1 reporting a different scheduling type.

Instruments and Procedure

These surveys were administered using an “iclicker”, a hand-held device with which students can answer multiple-choice type

questions during class meetings, and the results can then be immediately tabulated and downloaded by the instructor. The first question was with regards to gender, the second question gave four different types of scheduling choices: 4x4 (block), AB (block), traditional, and other. For this study, “other” was removed (selected by one student). In an effort to decrease confusion and allow students to effectively select their type of schedule, four choices were given. Each type of block schedule was verbally, and in writing, explained to the students, along with explanations of what was meant by traditional scheduling. The two block scheduling choices were then compiled into one group for comparison.

The comparison measure we decided to use was the student grades from Exam One and Exam Two which were averaged together. Each exam consisted of 50 questions and was administered electronically using “inQsit”. Exams consisted of multiple choice, matching, identifying, or true/false questions. The student scheduled their own time to take the exams in a proctored computer lab.

Data Analysis

The average of the exam grades were downloaded and matched with the student’s gender and scheduling style using Excel. Their identification was physically removed from the data and destroyed. A 2X2 Factorial ANOVA in SPSS was utilized to analyze the results. Cohen’s “large” effect size suggestion of having 18 people per group, with an alpha=.05 was suggested; however, not all groups reached this level.

Results and Discussion

Descriptive Statistics

gender M1 F2	schedule; T1 B2	Mean	Std. Deviation	N
1	1	.7592	.11273	13
	2	.7500	.09230	16
	Total	.7541	.10016	29
2	1	.7000	.11846	32
	2	.7662	.12258	13
	Total	.7191	.12208	45
Total	1	.7171	.11870	45
	2	.7572	.10522	29
	Total	.7328	.11458	74

From the data table above, the average test scores, standard deviation, and number in each of the groups (gender by schedule type) are displayed. From this data, the block-scheduled women group had higher test scores than traditional scheduled women, and overall, block-scheduled students had higher means than traditional-scheduled students. However, these differences have not been shown to be significant, as can be seen from the following calculation;

Source	Type II Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.063*	3	.021	1.634	.189	.065
Intercept	35.755	1	35.755	2794.643	.000	.976
GENDER	.007	1	.007	.586	.447	.008
SCHEDULE	.013	1	.013	1.023	.315	.014
GENDER * SCHEDULE	.023	1	.023	1.794	.185	.025
Error	.896	70	.013			
Total	40.700	74				
Corrected Total	.958	73				

Since alpha is .05 and the hypothesis was that there was no effect on college grade outcome due to high school scheduling type for either gender the effect of gender, $F(1, 70)=.586, p=.447$ is not significant on test scores, the effect of scheduling type $F(1, 70)=1.02, p=.315$ is not significant, and the combined effect of gender and scheduling on test scores $F(1, 70)=1.79, p=.185$ is also found to be not significant. These findings suggest that, overall, there is no significant effect of gender, scheduling type, or a combined effect of gender and scheduling type, on the test scores in an introductory college biology course.

Conclusions

The first question this paper set out to explore was the effect of block scheduling on college biology test scores. Analysis revealed that no major differences existed between the two groups of students who responded to the survey: those with traditional versus blocked high school schedules had no significant difference in their test scores in the biology class.

The second question set out to explore the effect of gender on

test scores. Analysis revealed that although men scored higher than women, this difference was non-significant.

The third question sought to explore if there was a difference between male-blocked, male-traditional, female-blocked, and female-traditional type of students. The significance values for these groupings revealed no significant difference in gender with scheduling type and test scores.

There are multiple potential reasons for these results. First, there are different types of block schedules, and these types can affect student learning by how the teacher may utilize the time within the class period. For purposes of this study, AB block and 4x4 block types were lumped together as a single group. AB block is $\frac{1}{2}$ year in one class, with the other $\frac{1}{2}$ of the school year in another class; class times are extended, and by the end of the year, all subjects are “covered”. However, there may be retention problems with, for example, a student who has science in the A, or first $\frac{1}{2}$ of the year, and they may forget most of the material by the time they go to college, due to a longer lapse of time between the subject in high school and college.

Perhaps, even though a school may have block scheduling, there is no significant difference in the way the instructor is teaching the class; some teachers may have continued to teach their classes in the traditional way under a blocked schedule. Some suggest that scheduling type be matched to an instructor’s teaching style (Thomas, 2001), although that seems cumbersome.

This data serves to confirm elements of the FICSS data, in that I found no significant correlation between the type of scheduling a student was involved with in high school and their ability to do well in college introductory science classes. On top of their data, I have also shown that there does not seem to be any significant importance as to the type of scheduling that is preferable for a specific gender.

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