

Class Schedule and Performance: Does Time of the Day Affect Students' Learning?

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Abstract— Learning can be attributed to several factors that may affect students' performance. Several researches indicate that class scheduling has an impact on academic achievement in an educational setting. This action research focuses on the potential effect of morning and afternoon schedule in the course Systems Analysis and Design of the Third Year Bachelor of Science in Information Technology students in terms of their performance in class. Several researches cited indicate that learning occurs when a student is taught at their preferred time of the day. In addition, the researcher used Test of Significant Difference between the performance of students in the morning and afternoon Session. Based on the study conducted, one contributing factor that affects the learning of students is their schedule. Students' schedule has an impact on their class engagement and performance in class. This research proves that students' performance in the morning session performed well compared to those in the afternoon session.

Index Terms— class schedule; SAD; student performance; sessions; time

I. INTRODUCTION

As the old saying goes, time is what we want most but what we use worst. Whether it's for sleeping, travelling, chatting, eating or studying, it often appears like there is simply never enough time. This is really accurate especially among teachers and students, as they ascent through school days packed with more activities and responsibilities. That is why, the researcher believed that time in an educational institution is an intricate issue. This is true because the amount of instruction time spent by both the teachers and students in their class are hard to determine if the students' academic performance is at stake.

As every educational institution aim to raise student academic performance level, it is essential to understand the relationship between the learning time and academic achievement of the students. Thus, does time of the day really affect the learning of the students? This is one of the most common question that schools must know to be able to bring out the best in every student in terms of their academic performances during their class. By knowing

so, the school will produce quality graduates that will be part of the workforce of the different industries to help improve the country's economy.

Students are the life of all the schools, colleges and universities across the globe. The students' performance plays a very significant role in the society for them to be globally competitive graduates that will soon be the manpower of the world, thus, being responsible in the economic and social development status of their country. Students' performance is based on the academic achievement of the student which consists primarily of quizzes, recitation, projects and examinations. Academic performance of the students should also be the concern of the industries in the labor market. As cited by Norhidayah, Kamaruzaman, Syukriah, Najah & Azni (2009) in their research study, most of the researches done in other countries used GPA as a measurement of academic performance. They used GPA because they are studying the student performance for a particular semester. Some other researchers used test results since they are studying performance for the specific subject. Students' performance is mainly the concern of every employer for the graduates to be hired in the so-called real world. Thus, students should place the greatest effort in their academic performances.

Research is needed to determine the best time-of-day for certain core subjects as a whole. Schools are always looking for innovations that increase productivity with little to no increase in inputs. Time of the day affects students' productivity and efficiency. ¹[1] In order for learning to take place, student engagement must be paramount and provide optimal opportunities for students to utilize their personal learning, for modalities may hinge on physical readiness as well. ² [2]

¹ Pope, Nolan G., "How the Time of Day Affects Productivity: Evidence from School Schedules," *The Review of Economics and Statistics*, Volume XCVIII, March 2016

² Shoupe, G. A. and Wile, A. J., "Does Time-of-Day of Instruction Impact Class Achievement?", *Perspectives in Learning: A Journal of the College of Education & Health Professions Columbus State University*, Volume 12, Issue 1, Spring, 2011

Students' learning is based on several factors such as instructors' mastery of the subject students' interest to the subject, class schedule, and the attendance in class of both the students and instructor. In this research, the researcher has focused on the effect of learning based on their class schedule. Specifically, does the learning in morning session differ to the afternoon session? One way to make this assessment is to find out what the students think about the value of block scheduling on their own learning. Another way is to compare the students' performance between the morning and afternoon class at the end of the semester. The researcher chose to do the latter and find out how well the students performed in class if assigned either morning or afternoon session.

Since the researcher believed that there is the possibility that class schedule affects the students' academic achievement, this research study focuses mainly on the performance of the students enrolled in the course Systems Analysis and Design at Laguna State Polytechnic University – San Pablo City Campus – College of Computer Studies during the Academic Year 2016 – 2017. To measure the students' academic performance, the researcher used data from their quizzes, recitation, project, attendance and final exam of the students during the whole semester.

The main aims of the study are (1) to determine if there is a difference between students scheduled in the morning and afternoon session in terms of their academic performance; (2) to help the faculty in-charge in creating schedule for IT professional subjects for the next academic year based on the students' performance; and (3) to document the findings and further analyze the performance of students between morning and afternoon sessions.

Class schedule in Laguna State Polytechnic University – San Pablo City Campus has a block class scheduling method. Block scheduling is a form of scheduling that is commonly being used in higher educational setting in the Philippines. Each class is scheduled for a longer period of time (e.g. 60 minutes instead of 30-45 minutes). A single class will meet either for a number of days or daily classes rotates through a changing daily cycle. Instructors and students are selectively placed at a certain time of the day. In the College of Computer Studies, the course Systems Analysis and Design is scheduled for four (4) sections (3A, 3B, 3C and 3D) in two sessions, morning and afternoon. For the morning class, Bachelor of Science in Information Technology 3A and 3D is scheduled, while Bachelor of Science in Information Technology 3B and 3C was in the afternoon session. This type of scheduling is convenient on the part of the scheduler and the instructors. In addition, this works also for the scheduling of rooms in the college.

Systems Analysis and Design is one of the professional subjects in the program Bachelor of Science in Information Technology. It is designed for the students to

analyze data flow systematically, transform and store data into output information in the context of a particular business. It is being taught to analyze, design and implement improvements in the support of users and the functioning of business that can be accomplished through the use of computerized information systems. According to Ramakrishnan (2012), Systems Analysis and Design (SAD) is a broad term for describing methodologies for developing high quality Information System which combines Information Technology, people and Data to support business requirement. The SAD technique is not only limited to IT systems and can be used to create just about anything. [16]

II. STATEMENT OF THE PROBLEM

This research aimed to examine the potential effect of morning and afternoon schedule in the course Systems Analysis and Design of the Third Year Bachelor of Science in Information Technology students at Laguna State Polytechnic University – San Pablo City Campus in terms of their academic performance in the class.

III. SIGNIFICANCE OF THE STUDY

In general, instructors can use this research as basis in determining the reasons why students have poor and/or good performance in class. It is also a great avenue for the person in-charge in creating students schedule. Specifically, this research is important to the following:

College Dean. Results of this research can be of great help in developing the class schedule. It would serve as a guide for the college Dean to consider on which the students can perform better.

Subject Instructor. This research will help the subject instructors to understand the students' performance inside the classroom. This can also be helpful in planning what appropriate methods can be used for the students to perform better during class hours.

Students. This will be a great avenue for the students to perform well in class for the reason that the instructors are more prepared inside the class considering the schedule of the subject.

Future Researchers. This study may serve as valuable resource of data while conducting their studies.

In sum, this research may help to develop a conceptual framework for guiding efforts to improve students' academic performance, as it relates to the appropriate scheduling of the subject.

IV. LITERATURE REVIEW

As mentioned in the introduction, students' performance can be based on many different factors. Many researchers discussed the different factors that

affects the student academic performance in their research. These studies were performed to examine what are those factors that has a big influence on the students' academic excellence specifically with regards to the schedule of their classes. Also, the researchers believed that there are two types of student learners; (1) morning and (2) afternoon people. In this study, the researcher examined the impact of students' academic performance having morning and afternoon schedule.

Several studies have found out that students perform better during a particular time of the day. Researches that was conducted in the United Kingdom determining whether college students performing at a preferred time of day would show better achievement in morning, intermediate or evening hours. Students who are scheduled in the morning outperformed those who chose the afternoon session in terms of performance. However, scores for students in the morning and afternoon schedule were not significantly different. Based on the National Education Commission on Time and Learning (2005), the impact of class time lengths on student achievement appears to be a complex issue with no definitive answers. A major theme across many of the studies reviewed is that the amount of instructional time is not so important as how that time is spent.

According to Baker (2004), as cited by Duran (2015), time can be interpreted as a resource and, as such, the amount of time devoted to the education of student is often examined as a separate and central resource in the educational process.

According to Retting, Michael, a professor in Emeritus James Madison University, time is one of those factors that influence students' achievement. He stresses that the school should strive for a school schedule that is flexible enough to provide more learning time to improve the performance of the students. A study conducted by psychologists, Serge Onyper and Pamela Thacher at St. Lawrence found some statistical data proving a correlation between class time and performance. She concluded that "for every hour of class that you have later, you get about a .02 difference, so three hours of difference between class start times will result in a .06 difference in grades" (Reimold 1).

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Research has indicated that due to changing sleep patterns during adolescence, academic gains can be

achieved by starting school.³[1] Some have interpreted the finding that later school start times increase students' academic performance as implying that given a school start time, students perform better in the afternoon than in the morning.⁴ [3] However, this hypothesis has not been tested empirically.

In a study by Lynch (1981), he found out that the greatest influence on reduction of absenteeism resulted from matching the time preferences of students with their English course schedules. Absenteeism as cited in the introduction is one of the many factors that affect student performance.⁵ [4]

Most of the researchers found out that students' schedule plays a significant role in students' achievement. When students were taught at times matching their learning style preferences, scores were significantly higher on achievement tests. If time is viewed as a resource and can be influenced to support high quality instruction, preferred time of the day is much more likely to result in improved learning.⁶ [5]

In the study of Norhidayah, Kamaruzaman, Syukriah, Najah & Azni (2009), there are several ways to determine student academic performance which are cumulative grade point average (CGPA), grade point average (GPA), tests and others. And he also cited in Ervina and Othman study in 2005, that in Malaysia, researchers evaluate the student academic performance based on CGPA. [6] Other researchers assessed the performance of the students through the previous year result or the outcome of a particular subject (Tahir, S., & Naqvi, S. R., 2006; Tho, 1994). [7]

Several studies have already conducted to weigh up if academic schedules really affect the academic performance of the students. Several factors can be considered to be able to formulate conclusions about this position. In the study conducted by Arnold, D. E. (2002) he compared traditional and block scheduling and examined if these scheduling can affect the academic performance of the students. [8] The results states that comparisons showed no significant increase in students' test scores over time associated with the alternating schedule. Although school leaders may find some improvement in the initial year of implementation, improvements may be negated by decreased

³ Pope, Nolan G., "How the Time of Day Affects Productivity: Evidence from School Schedules," *The Review of Economics and Statistics*, Volume XCVIII, March 2016

⁴ Carrell, Scott E., Teny Maghakian, and James West, "A's from Zzzz's? The Causal Effect of School Start Time on the Academic Achievement of Adolescents," *American Economic Journal: Economic Policy* 3, pp. 62-81, 2011

⁵ Lynch, P. K., An Analysis of the relationships among academic achievement, attendance, and the learning style time preferences of eleventh and twelfth grade students identified as initial or chronic truants in a suburban New York School District, 1981

⁶ Johnston, H., Research brief learning time and student achievement," *Education Partnerships Inc.*, retrieved from <http://www.educationpartnerships.org>, 2009

improvement rates in later years. Even in the new platform to deliver lectures and lessons which is through online scheduling is vital part to see whether it is effective or not. Like in the study of Baker (2019) et al. in which they conducted an experimental analysis of a time management intervention in the schedule lecture watching in online classes and tests if there is improvement with the students' academic performance. Results indicate the intervention had positive effects on initial achievement scores; students who were given the opportunity to schedule their lecture watching in advance scored about a third of a standard deviation better on the first quiz than students who were not given that opportunity. These effects are concentrated in students with the lowest self-reported time management skills. [9]

In addition, Henebry, K. (1997) also conducted a study "The Impact of Class Schedule on Student Performance in a Financial Management Course". The study analyzes student performance in classes scheduled 1 day a week, 2 days a week, and 3 days a week. The results indicate that students have a better chance of passing the course when a class schedule meets more than once a week. [10] Meanwhile, Klein, J. (2004) conducted a study "Planning middle school schedules for improved attention and achievement" The present study examines the relationship between time of day and scholastic performance in middle school. The progress of 850 seventh and eighth grade students in academic subjects taught at different hours of the day was studied. Mean achievement, as expressed in final grades, rose moderately from morning lessons to those conducted at later hours. Significant but temporary declines in achievement were observed immediately after the 10:00 recess and again during the 13:00 lesson. Variance within classes increased sharply during the day. [11]

Though, not all students are performing at a common time. And also, schools like Laguna State Polytechnic University – San Pablo City Campus are not set up to match every student's preferred schedule. Thus, there is a need for this kind of research showing the best time for a particular subject to be scheduled with the best time for the active participation and learning of students.

V. METHODOLOGY

This research focuses mainly on the performance of the one hundred ten (110) students enrolled in the subject, Systems Analysis and Design based on their final grades. The participants in the study were students from the College of Computer Studies of Laguna State Polytechnic University – San Pablo City Campus taking up Bachelor of Science in Information Technology enrolled in the subject Systems Analysis and Design. The students are currently in their third year in the University.

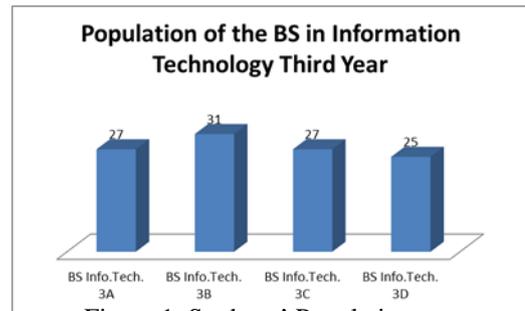


Figure 1. Students' Population

As seen in Fig. 1, there were four (4) sections (3A, 3B, 3C and 3D) enrolled and each section comprised of twenty-seven (27), thirty-one (31), twenty-seven (27) and twenty-six (26) students, respectively. Bachelor of Science in Information Technology 3A and 3D is scheduled in the morning session while Bachelor of Science in Information Technology 3B and 3C was in the afternoon session.

For this research, the researcher used data from the quizzes, recitation, project, attendance and final exam of the students during the First Semester 2016-2017.

The length of the study was done within two (2) semesters. In semester one (1), data was obtained from the instructors' class record consisting of the students' quizzes, recitation, project, attendance and final exam. Data gathered were from the records of the students having morning and afternoon sessions. In semester two (2), assessment and analysis of the data gathered were conducted.

In addition, the researcher used Test of Significant Difference between the performance of students in the morning and afternoon Session. The t test is one type of inferential statistics that is used to determine whether there is a significant difference between the means of two groups. In other words, we used a t test to compare the performance of the students. With a t test, we have one independent variable and one dependent variable. The independent variable (schedule) and the dependent variable would be the performance or grades of the students.

Test of Significance have been used as a reliable statistical tool in very different researches. Like in the study of Bakan (1966), in which he used test of significance in a Psychological research. The result of his study states that the test of significance does not provide the information concerning psychological phenomena characteristically attributed to it; and a great deal of mischief has been associated with its use. [12] Meanwhile, Fan, J., & Lin, S. K. (1998) conducted a study with the application of test significance in curving data. They have examined that if new statistical challenge includes testing whether there is any statistically significant difference among these sets of curves. In their study, they have proposed some new tests for comparing two groups of

curves based on the adaptive Neyman test and the wavelet thresholding techniques. In addition, there are some studies that uses test of significance associated with another statistical tool. [13]

A study conducted by Wakeling, I. N., & Morris, J. J. (1993) used test of significance for partial least squares regression. Partial least squares (PLS) regression is a commonly used statistical technique for performing multivariate calibration, especially in situations where there are more variables than samples. Choosing the number of factors to include in a model is a decision that all users of PLS must make, but is complicated by the large number of empirical tests available. [14] Even in the study conducted by Ohno, Y., Aoki, K., & Aoki, N. (1979) entitled “ A Test of Significance for Geographic Clusters of Disease” wherein an approach for assessing the deviation from chance expectation of the geographic pattern actually observed on the map is described. A simple chi-square test is proposed, and its validity is substantiated by a Monte Carlo approach, which is derived analytically as a special case of Knox's test for space-time clustering. [15]

In this era of globalization and technological revolution, education is considered as a first step for every human activity. It plays a vital role in the development of human capital and is linked with an individual’s well-being and opportunities for better living (Battle & Lewis, 2002). It ensures the acquisition of knowledge and skills that enable individuals to increase their productivity and improve their quality of life. This increase in productivity also leads towards new sources of earning which enhances the economic growth of a country (Saxton, 2000). There are variables inside and outside the school that needs to be considered by the educators. These variables are inside and outside school that affect students’ quality of academic achievement. These factors may be termed as student factors, family factors, school factors and peer factors (Crosnoe, Johnson & Elder, 2004). Theory of Educational Productivity by Walberg (1981) determined three groups of nine factors based on affective, cognitive and behavioral skills for optimization of learning that affect the quality of academic performance: Aptitude (ability, development and motivation); instruction (amount and quality); environment (home, classroom, peers and television) (Roberts, 2007). Whether the method of teaching being used is traditional or outcome based education, the need to evaluate the effect of the methods used to the student achievement is still necessary. Related literatures mentioned in this study have established their arguments as to whether schedule has impact to the academic performance of the students. Arguments that is acceptable in their own premises. Measuring of academic performance of students is challenging since student performance is product of socio-economic, psychological and environmental factors. All of the research reviews support the hypothesis that student performance depends

on different socio-economic, psychological, environmental factors.

VI. RESULTS AND DISCUSSIONS

The purpose of this research is to find out how well the students performed in class if scheduled either morning or afternoon sessions. Below are figures that describe the findings for each class having morning and afternoon sessions.

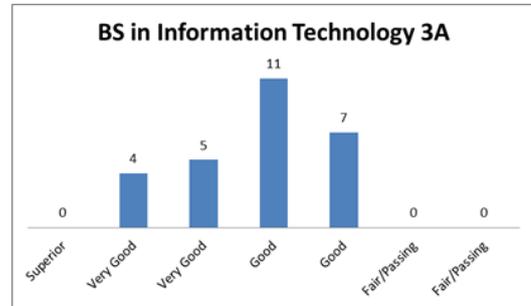


Figure 2. Final Standing of BS in Information Technology 3A

Fig. 2 shows the performance of BS in Information Technology 3A having a morning schedule in the subject Systems Analysis and Design.

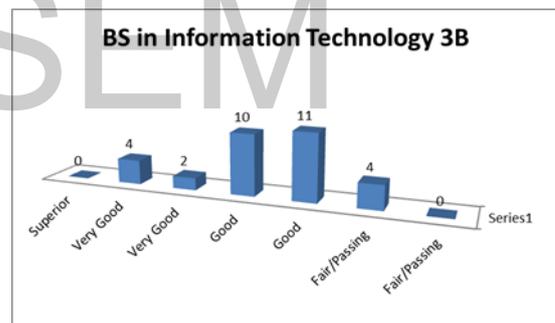


Figure 3. Final Standing of BS in Information Technology 3B

Fig. 3 shows the performance of BS in Information Technology 3B having an afternoon schedule in the subject.

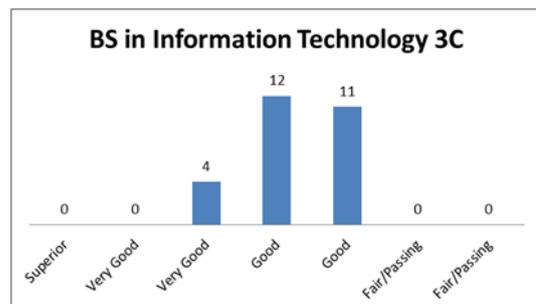


Figure 4. Final Standing of BS in Information Technology 3C

Fig. 4 shows the performance of BS in Information Technology 3C having an afternoon schedule in the subject Systems Analysis and Design.

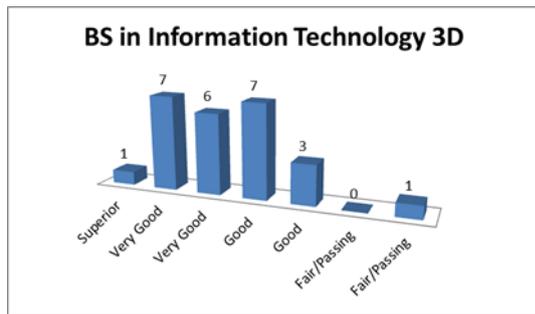


Figure 5. Final Standing of BS in Information Technology 3D

Fig. 5 shows the performance of BS in Information Technology 3D having a morning schedule in the subject Systems Analysis and Design.

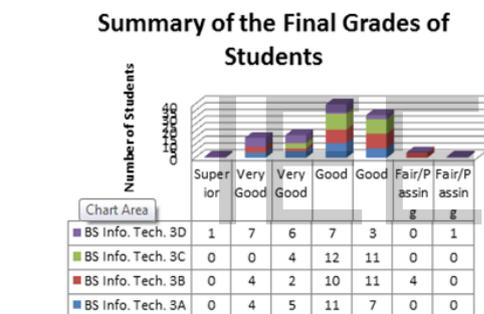


Figure 6. Summary of the Final Standing of Students

Fig. 6 summarizes the performance of BS in Information Technology 3A, 3B, 3C and 3D having morning and afternoon schedule in the subject Systems Analysis and Design.

TABLE I. TEST OF SIGNIFICANT DIFFERENCE BETWEEN THE PERFORMANCE OF STUDENTS IN THE MORNING AND AFTERNOON SESSIONS

SESSIONS	N	Mean Rank	Sum of Ranks
Morning	53	46.30	2454.00
Afternoon	58	64.86	3761.00
Total	111		
Mann-Whitney U		1023.000	
Wilcoxon W		2454.000	
Z		-3.158	
Asymp. Sig. (2-tailed)		.002	

The nonparametric test of significant difference was used to compare the performance of the two groups of

respondents since the distribution of data was found to be significantly different from a normal distribution (KS Z = 1.36, Asymp sig = .045). The table shows that there is significant difference between the performance of the students in the morning and afternoon sessions (U = 1023.000, Asymp sig = .002). This suggests that the students attending classes in morning perform relatively better than those students in the afternoon.

VI. RESULTS AND DISCUSSIONS

By using the appropriate statistical tool, it is found that there is significant difference between the performance of the students in the morning and afternoon sessions. Based on their individual performance, most students in the morning session actively participated well inside the class. This could be so since those students in the morning session often have an active participation and can function efficiently and effectively during class discussion. Having the early morning commitment was an enticement for students to go to bed earlier and refrain from engaging in social activities that would otherwise impact their performance and ability to pay attention in their class in the next day. It may also contribute to the reason that the mental alertness of student starts to increase upon waking up that is why they are more alert and determined in the morning. Therefore, it can be said that the time of the day affect the learning of the students.

VII. RECOMMENDATION

Based on the findings of this study, one recommendation that can be done for better performance of the students during class is to make the Information Technology Core and Professional Subjects scheduled in the morning. This will help both the student and instructors to have a fruitful and dynamic interaction inside the classroom. And also, to better assist the students in striving for their academic excellence, it is recommended to do a research based on the other factors that was mentioned in this study. In addition, there are many factors that is also needed to be considered in determining the student performance. As mentioned by the researcher, mastery of the subject students', interest to the subject matter, and the attendance in class of both the students and instructor should also be given the consideration.

ACKNOWLEDGMENT

This research paper is an action research to determine if there is a significant effect on the performance of the students depending on their class schedule. This can be of great help to consider in making class schedules.

The researcher would like to extend his sincerest thanks to the Third Year Bachelor of Science in Information Technology (AY 2016-2017) students who became part of this study. Also, to the Dean of the College and everyone who helped in this research paper.

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