

Enhancing Attendance and Student Exam Score Based on Mobile Attendance Application

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ABSTRACT

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In today's digital era, it is possible to use the latest technology to improve student attendance and performance. The purpose of the present study is to determine the relationship between absenteeism and academic performance among Calculus students, as well as to measure the impact of class absence on the student's final exam scores. Based on this, the use of appropriate strategy was employed, which is the mobile attendance application to reduce absenteeism among students in higher educational institution. The selection of sample was based on cluster sampling, involving the selection of 87 repeater students. The data collected were analyzed using quartile regression and independent sample t-test. The result of the findings revealed that the class absence has an impact on the student's final exam scores. This is because, if the student was absences by 1 class, the final exam score is expected to decrease on average by 1.89%. Hence, findings show that the percentage of absences for the students with manual attendance was higher than the percentage of absences for the students with mobile attendance application. The application can help to reduce absenteeism by reminding students about recent attendance records.

Keywords: attendance; mobile application; regression; quantile; t-test

1. INTRODUCTION

Student irregular attendance has been a major concern regardless in Malaysia or other countries. Attendance in classrooms is made compulsory to ensure continuity in the student's learning process. This is because there is often a clear correlation relation between student's attendance and overall academic performance. Several studies have proven that successful students in academic performance is based on attendance in classes or lectures [1]-[5]. Mohamed [6] indicated that consistent class attendance is a key factor in the academic success of students and class absenteeism no doubt negatively impacts student's ultimate course result. Subramaniam et al. [7] also noted that the reduction of the percentage of student absenteeism to the class will invariably improve student achievement. While the study by Valentin [8] concluded that class attendance is a significant and positive predictor of course grades.

The aim of the present study is to determine the relationship between absenteeism and academic performance among Calculus students in order to measure the impact of class absence on the students' final exam scores. Based on this, the use of an appropriate strategy, such as the mobile attendance application to reduce absenteeism among students in Malaysian public higher education institutions was employed. Additionally, the effectiveness of this mobile attendance application in reducing absenteeism was inspected as well. This was done by using the mobile attendance application as a monitoring tool to measure the class attendance, thereby reminding

the students every week about their percentage of absence. It also alerts the lecturers to keep up with the students' class attendance records regularly. Finally, the present study attempts to determine whether the application can help to reduce absenteeism or not by reminding students about recent attendance records.

2. LITERATURE REVIEW

Nurhafizah et al. [9] found that academic performance was significantly affected by absenteeism. In particular, their study report shows that once the students do not attend the Calculus class, there will be a reduction of 2.124% in the final exam scores of the student. One related study by Farid [10] also found that GPA decreases by 0.033 with each unit increase in absenteeism. Cruz [11] also revealed that absences in nature (e.g. illness, personal absence, religious holiday) had an impact on certain graded components of the clerkship.

Conversely, Cretchley [12] found that mathematics students who attended a sufficient number of classes got an average score of 63.6% while others got 54.3%. This idea is supported by Purcell's [13] study which proved that for each 10% increase in class attendance, there was about a 3% increase in examination performance. Chen and Lin [14] further confirmed that class attendance has a positive and significant impact on exam performance. They noted that there is a 7.66% improvement in exam performance when students attend their lectures. Overall, their research result indicated that class attendance and academic ability of a student positively correlated with student performance in academics.

In addressing the problem of absenteeism, the educational institution must look for a better solution to prevent absenteeism among students and take effective measures to control absenteeism. Measuring student's attendance is a challenging and time taking process for the instructor. This is because the traditional attendance system is done manually by passing around the attendance list for the students to sign, whereby it is not easy to process the data being collected. As such, in order to be more efficient in managing students' attendance, a lot of researchers have proposed a method for measuring attendance. This involves managing the attendance using mobile phones to be easier and interactively accessible to record the students' attendance [15]. Mobile attendance application is a software developed for daily class attendance information of a student [16]. According to Asir et al. [17] mobile application for student attendance gives a prior information to students as soon as their attendance goes below the specified percentage through an alert message. This was supported by Hoda et al [16], who proved that the output of using mobile-based attendance system via QR code will determine the number of students' absences weekly or monthly and also helps the faculty members manage attendance easily and efficiently. In placing more emphasis, Md Milon Islam et al. [18] claimed that the Smartphone-based Student Attendance System will significantly develop the conventional procedure of student attendance framework in the university.

Furthermore, Valentin [8] proposes a novel method for measuring class attendance by using location and Bluetooth to collect data from smartphone sensors. Based on measured attendance data of nearly 1,000 undergraduate students, the result showed that early and consistent class attendance strongly correlates with academic performance. Besides that, there are various student attendance developed using different technologies. For example, student attendance application was designed using Near Field Communication (NFC) technology for smartphone, as proposed by Cengiz [19] in which the attendance information saved in the mobile device can

be transferred to the host computer and statistics as well as the reports of the student can be obtained. Another technology found by Rajan [20] is RFID (Radio Frequency Identification) based attendance systems, which is used to solve problems where it is necessary to automatically take, record the movement and locations of students in a university classroom. The advantage of the system-based attendance is that it will be taken and checked quickly as well as accurately, while also the time of the course is used efficiently.

In an attempt to control the problem of absenteeism, the present study adopts an approach proposed by Stuphen [21], called Continuum Approach to increase attendance. This will be modified to suit students' enrollment in the Calculus course. Stuphen has outlined some approaches to increase attendance namely; Prevention Early Intervention, targeted intervention and Legal intervention. Using this approach, the instructors-maintained records on class attendance regularly and received recognition feedback from the student on their behavior. In such way, the attendance information of the students can be sent via notification quickly and accurately. However, most research studies have not examined the effectiveness of class attendance monitoring tools by using mobile attendance applications in dealing with absenteeism of students. In order to improve the accuracy of class estimation, the present study demonstrated the connection between attendance and performance. This was via an attendance awareness of student participation notification to instructors. The findings show that measuring class attendance by mobile attendance applications for student attendance is good and efficient. This is due to the fact that it shows a very positive relationship between student attendance and academic performance.

3. METHODOLOGY

The present research focused on engineering students who repeated at least once, the Calculus courses (Calculus I, Calculus II and Advanced Calculus) in one of the Malaysian public higher educational institutions. A "repeater" is a student who took a course more than once in order to improve his/her grade from a fail to a pass. The selection of sample was based on cluster sampling, involving the selection of 87 repeater students out of a total of 128 repeaters. The number of sample size was determined using sample size table by Krejcie & Morgan [22]. In order to examine the effectiveness of mobile attendance application, the students were divided into two groups. One group used mobile attendance application in the class and the other groups employed a manual attendance via a spreadsheet.

3.1 Data Analysis

The present study employed the use of two important data among two groups of students; (i) the percentage of class absence, and (ii) the final exam scores. The data collected were analyzed using quartile regression analysis and independent sample t-test. The quartile regression analysis aim is to measure the impact of class absences towards students' final exam score.

This was introduced by Koenker and Bassett [23], and gradually becoming more popular three decades later amongst researchers as an alternative to MLR, when the assumption of ordinary least squares was not satisfied. As such, the approach overcomes the disadvantages of the MLR method by Kudryavtev [24]. Equation (1) and (2) was used to calculate the quantile regression coefficients by considering quantile approach and regression equation by Pires [25].

$$\hat{\beta}(\tau) = \operatorname{argmin}_{\beta(\tau)} \left\{ \sum \tau |y_i - \bar{y}_i| + \sum_{i < \bar{y}_i} (1 - \tau) |y_i - \bar{y}_i| \right\} \quad (1)$$

Where

$$\bar{y} = \hat{\beta}_0 + \sum_{i=1}^k \hat{\beta}_i x_i \quad (2)$$

where x_i x_i are independent variables (percentage of absenteeism) and $\hat{\beta}$ $\hat{\beta}_i$ are the regression coefficient.

Coversely, performance indicators were used to measure the accuracy and error of the quantile regression model. Three performance indicators were used to determine the best model, which are (i) normalized absolute error (NAE), (ii) root mean square error (RMSE), and (iii) index of agreement (IA). The equations used were reported by Wan Mohd Rosly et al. [26].

In terms of the second objective of the present study, which is to examine the effectiveness of mobile attendance application, the independent sample t-test was used to determine whether there are differences in the mean percentage of absence between a group with the mobile attendance application and another group with the manual attendance. This parametric test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. The independent samples t-test requires the assumption of homogeneity of variance, which means that both groups have the same variance. The use of Statistical Package for Social Sciences (SPSS) conveniently includes a test for the homogeneity of variance, called Levene's Test, to show that an independent samples T test was run. The hypotheses for Levene's test are:

Ho: The population variances of group 1 and 2 are equal

H1: The population variances of group 1 and 2 are not equal

This implies that if the null hypothesis of Levene's Test is rejected, it suggests that the variances of the two groups are not equal; and means that the homogeneity of variances assumption is violated. The hypotheses for the independent t-test can be expressed as:

Ho: The difference of the means is equal to zero

H1: The difference of the means is not equal to zero

4.0 RESULT AND DISCUSSION

Table 1 shows that most of the repeated students involved were male (87.36%) compared with 12.64% of female. This is made up of 40 of them using manual attendance while the other 47 students using mobile attendance application in the class.

Table 1: Percentage of gender and groups of students

		N	Percentage
Gender	Female	11	12.64
	Male	76	87.36
Group	Manual Attendance	40	45.98
	Mobile Attendance Application	47	54.02

Table 2: Bar Chart of Mean for Percentage of Absences and Final Exam Score

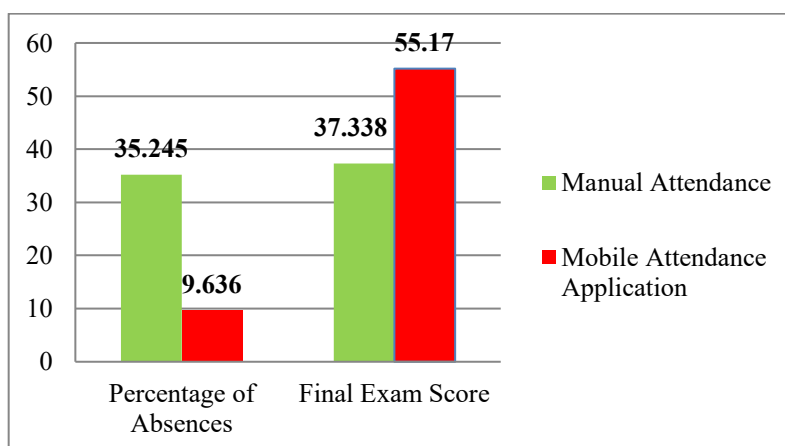


Table 2 shows the mean for percentage of absences and final exam score between the groups of students with manual attendance and that of students using mobile attendance application. The mean of percentage of absences for the students with manual attendance (35.245%) was higher than the mean of percentage of absences for the students with mobile attendance application (9.636%). The mean showed an increment of attendance in the class when applying mobile attendance application. In addition, the bar chart in Table 2 showed that the mean final exam score for the students with manual attendance (37.338%) was lower than the mean final exam score for the students with mobile attendance application (55.17%). The figures showed that the performance students with mobile attendance application in the class are better compared to students with manual attendance. This finding is in line with Akhtar et al. [27] who used teaching system for monitoring student participation and identified predictors of success. They found that most of the students demonstrated a consistently high level of attendance with more than 85% maintaining an attendance record of above 70%. The finding also showed that there is significance in attendance (using system) on final outcome ($p=0.000$). A majority of students with low attendance did not achieve higher grades. Furthermore, Prema Nedungadi et al. [28] found that classroom monitoring, supportive environment to teachers and community engagement improved with the integration of monitoring apps along with the social media tool of WhatsApp.

Table 3: Independent t-test

	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	T	df	Sig. (2-tailed)	95% Confidence Interval of the Difference		
						Lower	Upper	
Percentage of absences	17.187	0.000	11.852	85	0.000	21.3126	29.9050	
			11.343	58.23	0.000	21.0898	30.1278	

Table 3 above shows that the t-test assumes the variances in two groups are roughly equal. Based on the results, it showed that there was significant difference in mean percentage of absence (t-test = 11.852, p-value < 0.05) between students applying manual attendance and that of mobile attendance application. The results indicated that students who apply manual attendance in the class have higher percentage of absences compared to the students with mobile attendance application in the class. This is consistent with the study carried out by Abd Rahni et al. [29], which found that the system or technology will ease the instructor to monitor the student attendance and, thus increase student attendance which will further improve their performance.

More so, performance indicators were used to select the best quantile for the determination of the impact of class absence on students' final exam score as shown in Table 1. From three performance indicators applied; (i) NAE, (ii) RMSE, and (iii) IA, it was discovered that 0.5 quantile gave better fit than other quantiles. Therefore, 0.5 quantile was used to represent the best model in the present study.

Furthermore, the coefficient of quantile regression model was -0.53 which means that when the student is absent by 1%, the final exam score is expected to decrease on average by 0.53%. In average, 1 class absence equals to 3.57%, when student is absent by 1 class (3.57%), the final exam marks is expected to decrease on average by 1.89% This result is in agreement with the previous findings by Marburger [30] which indicated that the overall study absenteeism will reduce the mean score by 2.3%. The evidence from the present study provides significant effect between absenteeism and academic performance.

Table 4:

	Y=A+BX		Performance Indicator		
	Constant	B	NAE	RMSE	IA
0.1	45.75	-0.78	0.402	22.752	0.577
0.2	49.72	-0.63	0.287	17.039	0.630
0.3	52.47	-0.57	0.246	14.734	0.650
0.4	54.5	-0.60	0.237	14.135	0.670
0.5	58	-0.53	0.227	13.031	0.674
0.6	59.85	-0.44	0.236	13.510	0.626
0.7	67.00	-0.54	0.269	15.521	0.638
0.8	69.58	-0.51	0.304	17.543	0.599
0.9	73.50	-0.46	0.377	21.218	0.553

5. CONCLUSION

The purpose of the present study is to measure the impact of class absence on the students' final exam scores. As such, an analysis was carried out by using quantile regression. In order to encourage class attendance, the use of the mobile attendance application in the class was employed to examine the effectiveness of mobile attendance application in reducing absenteeism. The finding revealed that the class absence has an impact on the student's final exam scores. It shows that if the student is absent by 1 class, the final exam scores is expected to decrease on average by 1.89%. It is hoped that the present study would create awareness to students about the effect to their academic performance if they do not attend class.

Conversely, with regards to determine the effectiveness of mobile attendance application in reducing the absenteeism, it is concluded that the percentage of absences for the students with manual attendance was higher than the percentage of absences for the students with mobile attendance application. This suggests that mobile attendance application is effective as a monitoring tool to record the attendance of students. This is based on the fact that the performance of students with mobile attendance application in the class is better compared to students with manual attendance. Therefore, it can be suggested that, one way to reduce absenteeism is through technologies, such as mobile attendance application to be used as a monitoring tool in measuring the attendance of students. The application can help to reduce absenteeism by reminding students of their present or current attendance records.

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