CONTINUOUS ASSESMENT AS A MEDIATING VARIABLE BETWEEN CLASS ATTENDANCE AND STUDENTS' PERFORMANCE

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Abstract

In higher education, besides final examination, students' performance will also be measured throughout 14 weeks of lecture that contains tests, projects, quizzes and assignments as their continuous assessment. In UiTM, the continuous assessment for statistical subject is in range of 40% to 60% that contributes to their performance. This percentage is considered high and students cannot neglect this factor if they want to get good grades. With this belief, the effect of continuous assessment as mediating variable to determine relationship between final examination performance and students' classroom participation throughout one semester in UiTM Kuala Terengganu among Diploma of Computer Science (CS110) students and Bachelor of Business Computing (CS244) students from Faculty of Computer Science and Mathematics who undertook a statistics course will be studied. Positive correlation was reported indicating that there exists positive relationship between classroom attendance and final examination grades. Students then were grouped into two groups according to the '80% rule'. Furthermore, Sobel Test indicates that there exists mediating effect of continuous assessment between class attendance and final mark. As a conclusion, participation and understanding the lecture in a statistics class is an important indicator that contributes to their performance.

Keywords: Student performance, Learning statistics, Continuous assessment, Correlation, Mediating variable

1.0 INTRODUCTION

Students are expected to attend all meetings of the classes in which they are enrolled in. It is a common belief that in higher education, attendance is a significant contributor to course grades; however, this is not always the case. Some students may learn promptly from being in class and listening to lectures, whereas others may only derive little advantage from them. Reports from studies done in an undergraduate student populations propose a positive correlation between classroom attendance and academic performance (Davenport 1990; McCutcheon 1989).

Students' class participation and engagement takes a significant role over today's higher education. The association between students' class attendance and academic performance had been the subject of several studies in a wide variety of courses. Reports from previous studies had proven that attendance is a significant variable which affects academic outcomes. Schmidt (1983) proposed that time spent going to lectures contributed to a successful achievement in a Macroeconomic Principles course. Jones (1984) tested the relationship between absences and grades in 496 undergraduate psychology students and found that low class attendance seemed to cause lower grades but low grades also appeared to cause more frequent absences from class suggesting that classroom attendance and grades can interact to produce a decrease in academic achievement in some students. These findings was supported by Romer (1993) which proved that there exist strong relationship between attendance and performance among students who took Intermediate Macroeconomics course.

Kirby and McElroy (2003) studied the relationship between class attendance and grade by controlling other factors in the first year economic courses in University College Cork and found that class attendance and tutorial attendance has a positive effect on grade. In addition, a study to investigate the relationship between class attendance and grades achieved by students taking an Introductory Science Courses was performed by Moore et. al. (2003) proves that attending class enhances student's chances to score a high grade in these courses. Furthermore, Colby (2005) analyzes the effect of attendance in the performance of 178 freshmen and the results showed a positive relationship between those two variables. Purcell (2007) carried out a regression analysis to examine the impact of lecture attendance towards examination performance among civil engineering students at University College Dublin and the results showed that there is a strong correlation between the two variables. Chen & Lin (2008) also found that class attendance had produced a positive and significant impact on students' exam performance.

A study had been done by Landin and Pérez (2015) where relationship between class attendance of students of History of Pharmacy course at Santiago de Compestela University (Spain) and their academic performance was studied. Results were that there exists positive relationship between attendance and academic achievement. Moreover, relationship between attendance and performance among three groups of students in a Finnish university had been studied by Lukkarinen, Koivukangas, & Seppälä (2016). The first group is those who drop out before the final exam, the second group are those who need to attend class and exam and the third group are those who study independently and attend the exam. It is revealed that attendance is positively and significantly related to performance for group two. According to Durden and Ellis (1995) in their study with economics students, attendance remain as one of the important factor that contributes to students' performance.

However, few findings are casting uncertainty about the role that class attendance plays in academic accomplishment (Craig 1990; Hammen and Kelland 1994; Massingham and Herrington 2006; S. Moore, Armstrong, and Pearson 2008). Eisen, Schupp, & Isseroff (2015) found that there is no statistically significant relationship between class attendance and student performance after adjusting for control variables such as gender and age. Cortright, Lujan, Cox, & DiCarlo (2011) studied the impact of attendance on examination achievement by taking differentiating gender. The study revealed that female student's examination marks are influenced by their attendance. Meanwhile, no significant difference was found for male students.

Another important variable that affects students' performance are their continuous assessment. When assessment is carried out in a classroom in an ongoing or continual way by the teacher it is called continuous assessment (Plessis et al. 2003). It is used to find out how much student has acquired in terms of knowledge and learning skills (Vergis and Hardy 2009). In this process, observations are made time to time to collect data to determine the level of students' knowledge, understanding and performance. It is done by giving tasks to students based on what they have learnt in the classroom. Teacher observes the marks obtained by

students to decide about the level of their performance and how much they understand in class. Continuous assessment is part and parcel of instructional process that has to be taken as a key tool in educational quality assurance endeavour (Abejehu 2016). This means that the data collected from students' academic achievement is used as a continuous basis in a systematic way, to take significant decisions on what should happen. Furthermore, Iqbal, Samiullah, and Anjum (2017) concluded that continuous assessment had positive effects on students' achievement. Continuous assessment has an impact on both the student's results and their methodologies of learning. (Rezigalla et al. 2014).

These discoveries bring up the issue of whether non-appearance in lectures significantly affects continuous assessment and final marks. Several factors can influence the level of participation in class, including university culture, workload, teaching methods and the teacher. Although a student must be present to participate in a lecture, the importance of its attendance is not so clear. It is likely that some students are not presence in class in view of that they would learn nearly nothing if they did because the teaching is of low quality or because they have already grasp the subject or because they can learn the material better by spending the same time studying in other approach. It is also possible for students to mistakenly believe that attendance is not important to learning or because they put only little emphasis on study.

2.0 PURPOSE OF THE STUDY

Statistics is a broad discipline of mathematics but in an applied setting. In statistics class, calculations and table-reading will be involved so by simply being in class, students are more capable of learning statistics and absorbing the information given. The lecturer can demonstrate different ways on how to solve a problem and encourage them to come up with their own creative solutions. The more strategies and approaches that students are exposed to, the deeper their conceptual understanding of the topic becomes. In UiTM, students' performances are evaluated by continuous assessment that comprises of tests, projects, quizzes and assignments and final examination. The continuous assessment is measured within 14 weeks of lecture and play as an important variable to determine students' final grades. A student who skips statistics class regularly is at a disadvantage for they missed several materials that had been covered. Furthermore, the continuous assessment for statistical subject is in range of 40% to 60% that contributes to their performance. This percentage is considered high and students cannot neglect this factor if they want to get good grades. Therefore, this research seeks to find the answer to the following questions:

i.   Is there any relationship between classroom attendance and students' performance?
ii. To what extent does the influence of classroom attendance affect the students' performance?
iii. Does the final examination marks for students with class attendance more than 80% better compared to those with class attendance less than 80%?
iv. Does continuous assessment mediate the relationship between class attendance and student's performance?

The objectives of this study are:

i.   To assess the relationship between classroom attendance and student's performance who undertook a statistics course at Universiti Teknologi Mara Kuala Terengganu.
ii. To predict student's performance and their classroom attendance.
iii. To compare the final examination marks obtained between students with class attendance more than 80% and class attendance less than 80%.
iv. To examine the mediating effect of continuous assessment between class attendance and student's performance.

2.1 Conceptual Framework

Based on the above literature discussion, a proposed conceptual framework is formulated in Figure 1.
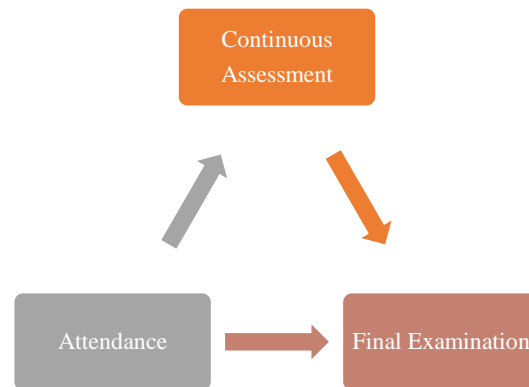

Figure 1: Proposed Conceptual Framework

Based on the above theoretical framework, class attendance is considered as the independent variable, final mark as the dependent variable and continuous assessment serves as the mediator.

1.0 METHODOLOGY

3.1 Data Collection

Census study was conducted among all 251 students who were enrolled in a statistical course at UiTM Terengganu Kuala Terengganu Campus. The data set includes 162 Diploma in Computer Sciences (CS110) students and 89 Bachelor of Information Technology (Hons.) Business Computing (CS244) students who undertook an Introduction to Probability and Statistics course during the semester of December 2016 to March 2017. All students who registered these course (STA116 and STA416) are considered as a sample. During the period, class attendance was recorded through sign in sheets passed around to the student in every lecture. Performance evaluation (quizzes and tests) was done throughout the semester and final exam was compulsory to complete this course.

3.2 Variables

Class attendance was recorded in each lecture for a period of 14 weeks. Every week, the students must attend the class twice a week, 2 hours per meeting equivalence to 4 hours per week. The total lecture hour allocated for each subject consists of 52 hours total.

Student's performance was obtained at the end of the semester after final examination completed. The lecturer will record and upload the marks in the UiTM marking system for each subject and each group. The total on-going assessment marks for STA416 course is 60% and the final examination is 40% whereas on-going assessment marks and final examination marks for STA116 course are 40% and 60% respectively. Since the total on-going assessment marks are different between both programs, all the values were converted into 100%.

2.0 RESULTS AND ANALYSIS

Table 1 shows the profile of the respondents. 55.0% of the respondents are female while the rest are male. 64.5% of the respondents are diploma students who undertook STA116 course and 35.5% of the respondents are bachelor students who undertook STA416 course.

Table 1: Frequencies of Respondent Profile

Characteristic	Value	Frequency	Percent
Gender	Male	113	45.0
	Female	138	55.0
Level	Diploma	162	64.5
	Degree	89	35.5
Course Code	STA116	162	64.5
	STA416	89	35.5

4.1 Descriptive Statistics

Based on Table 2, the average number of times student comes to class is 24 times, with average continuous assessment mark of 67.32% which deviates 18.19% from its mean. While, final examination marks deviates by 16.30% from its average of 69.79%.

Table 2: Descriptive Statistics

Item	Sample Size	Minimum	Maximum	Mean	Std. Deviation
Total Attendance	251	13.00	28.00	24.10	2.25
Continuous Assessment Mark	251	15.62	95.98	67.33	18.19
Final Exam Mark	251	12.50	100.00	69.79	16.27

4.2 Correlation and Regression Analysis

Correlation is then being analyzed to determine whether there is a significant relationship between class attendance and final examination marks. Pearson correlation is then being used since both attendance and final examination marks are quantitative variables.

Based on Table 3, it is observed that there is a significant relationship between number of class attendance with scores obtained in the final examination (p-value = 0.008) with weak positive correlation (r=0.168). R square indicates that 2.82% of the total variation in students' performance are due to class attendance.

Table 3: Pearson correlation between class attendance and final examination marks

r	r^2	Asymptotic Significance (2-sided)
0.168	2.82%	0.008 (significant)

Similarly, by looking at the scatter plot (Figure 4), it is shows that there is a positive linear correlation between class attendance and students' performance.
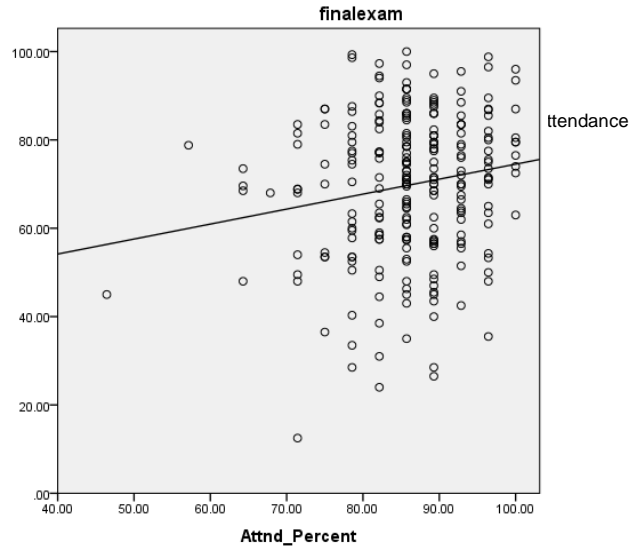
Figure 4: Scatter plot of final examination versus attendance percentage

Simple Linear Regression was then analyzed to summarize the relationship between class attendance and final examination marks.

According to Table 4, there is a significant positive relationship between the class attendance (β=1.21) and final examination marks with p-value=0.0008.

Table 4: Simple Linear Regression

Model	Unstandardized B	Coefficient Standard Error	Standardized Coefficient Beta	t	Significance
Constant	40.61	10.93		3.72	0.000
Class Attendance	1.21	0.45	0.17	2.68	0.008

4.4 Independent t-test

A requirement of class attendance practiced by UiTM whereby students with less than 80% attendance from the total contact hours without any reason are not allowed to sit for their final examination. To compare the final examination marks obtained between students with class attendance more than 80% and class attendance less than 80%, independent t-test was carried out since two groups are considered.

Before t-test is carried out, the assumption of equality of variance must not be violated which means that the variance of both groups is assumed equal. Levene's test checks whether the variance (variation) between the two groups (<80% and >80%) is the same. If the significance value of Levene's test is significant, the variance for the two groups are not the same. So, this study is expected to see an insignificant value of Levene's test to carry out independent t-test.

As observed in Table 5, the variance was assumed equal with a significant value of 0.137 at p=0.05. This means that the assumption of equal variances was not violated, and independent sample t-test may be further

analyzed. Independent sample t-test was carried out to compare the student's results between the two-attendance groups. The hypothesis of Independent t-test is:

Table 5: Levene's Test

	F-value	Significance
Equal variances assumed	2.229	0.137

H_0 = There is no difference in final exam marks between the two attendance groups
H_1 = There is a difference in final exam marks between the two attendance groups

Referring to Table 6, it is observed that there is a significant difference between the final examination marks scored by students who attended the class more than 80% and those who attended the class less than 80%.

Table 6: Results of Independent T-Test for comparison between the two attendance groups

t-value	Degree of freedom	Significance (2-tailed)
2.147	249	0.033

Students who are present in class more than 80% from their total contact hours have higher mean score (70.88%) compared to those who attended class less than 80% of their total contact hours as referred to Table 7.

Table 7: Summary Statistics

Summary	> 80%	<80%
Sample	201	50
Mean	70.88	65.40
Standard Deviation	15.62	18.14
Standard Error	1.10211	2.57

To sum up, students with more than 80% class attendance scores much better in their final exam when compared to the students with less than 80% class attendance.

4.5 Mediating Effect

A variable may be considered a mediator to the extent to which it carries the influence of a given independent variable to a given dependent variable.

Correlation
From Table 8, it is observed that there is a significant relationship between final mark and continuous assessment with positive moderate strength (r = 0.460), weak positive relationship between final mark with attendance (r = 0.168). While there is a negative linear correlation between attendance and continuous assessment (r = 0.148). In other words, if absenteeism increase, continuous assessment will decrease. In order to determine the mediator effect, regression among attendance (independent variable), final exam (dependent variable) and continuous assessment (mediating variable) must be carried out.

Table 8: Correlation value between variables

Correlation	Pearson Correlation, r	P-value
Final exam * Continuous Assessment	0.460	0.000
Final exam * Attendance	0.168	0.008
Attendance * Continuous Assessment	-0.148	0.019

Regression analysis between attendance and final exam

Based on Table 9, there is a significant relationship between attendance and final mark (p-value = 0.008)

Table 9: Regression analysis between attendance and final marks

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40.605	10.930		3.715	.000
	attendance	1.211	.452	.168	2.681	.008

Regression analysis between attendance and continuous assessment

Based on Table 10, there is a significant relationship between attendance and continuous assessment (p-value = 0.019)

Table 10: Regression analysis between attendance and continuous assessment

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	96.088	12.261		7.837	.000
	Attendance	-1.193	.507	-.148	-2.356	.019

Regression analysis between continuous assessment and final mark

Based on Table 11, there is a significant relationship between attendance and continuous assessment (p-value = 0.000)

Table 11: Regression analysis between continuous assessment and final marks

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	42.090	3.509		11.994	.000
	Continuous assessment	.411	.050	.460	8.174	.000

Regression analysis between attendance and continuous assessment with final mark

Based on Table 12, when both attendance and continuous assessment are put together in the model, we can see that both variable significantly influence the final mark.

Table 12: Regression analysis between attendance and continuous assessment with final mark

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1.979	10.611		-.187	.852
Attendance	1.740	.397	.241	4.383	.000
Continuous assessment	.443	.049	.496	9.022	.000

A variable may be considered a mediator to the extent to which it carries the influence of a given independent variable to a given dependent variable. In this paper, (1) attendance has significantly affects the mediator (continuous assessment), (2) the attendance significantly affects the final mark in the absence of the mediator and (3) the continuous assessment has a significant unique effect on the final mark. Therefore, we can say that there exists mediating effect of continuous assessment between class attendance and final mark.

4.6 Sobel Test

The **Sobel test** (1982) is basically a specialized t **test** that provides a method to determine whether the reduction in the effect of the independent variable, after including the mediator in the model, is a significant reduction and therefore whether the mediation effect is statistically significant.

By referring to the Sobel test result (Table 13), we can see that the mediating effect exists between attendance and final mark (p-value = 0.02). In other words, we can say that continuous assessment is the mediator between attendance and final mark.

Table 13: Sobel test value

Input:		Test statistic:	Std. Error:	p-value:
a -1.193	Sobel test:	-2.26219446	0.21674662	0.02368539
b 0.411	Aroian test:	-2.24687924	0.21822401	0.02464775
s_a 0.507	Goodman test:	-2.27782719	0.21525909	0.02273688
s_b 0.050	Reset all	Calculate		

5.0 DISCUSSION

Although a correlation was observed in this study as can be seen in Table 3 (r = 0.168; suggesting weak relationship between attendance and final examination marks), it is not a cause and effect relationship. The original data shows that there exist students with good attendance and still scored low marks in their final exam. The 80% rule indicated that the higher the percentage is, the lower the chances for students to receiving lower marks. No causality can be inferred from the weak correlation between attendance and final examination marks. It is likely that some students are not presence in class in view of that they can learn the material better by spending the same time studying in other approach such as online learning or blended learning. Online learning can be a useful way to educate students, but it needs oversight. Those that embrace the blended learning environment with tools like Khan Academy, Study Island, and the massive open online course movement will be well on their way to a lifetime of learning.

Even though 24% of the students in this study came to class less than 80% from their total contact hour, it does not prove that they had problem coming to class for they had valid reasons for not coming. Some students got sick and had medical certificate as proof, some students had lecture exemption for attending university programs and some had told verbally to their lecturer on the reason for not attending and was forgiven. By presenting evidence for not attending lecture, they will not be punished and get barred from sitting for their final examination even if their attending percentage was less than 80%. Despite the students with solid reason were forgiven for not attending lecture, they still were not present in class and had missed the materials that had been covered and it comes to their own initiative to learn back what they had missed. Somehow, this affects their performance in the scores of final examinations proven by the result in Table 6, where there exist different final examination marks between both groups compare. Above all, students with more than 80% class attendance scores better in their final exam in contrast to the students with less than 80% class attendance.

The effect of classroom attendance on final marks influenced by continuous assessment as the mediator variable was investigated. Students who comes to class consistently is expected to score better in their continuous assessment for they had captured most of what had been taught in the class. Furthermore, students who have higher continuous assessment marks are believed to have higher confidence to sit for their final exam and are expected to score better marks. From Table 13, we can say that there exists mediating effect of continuous assessment between class attendance and final mark. Hence, this proves that class participation is a significant variable in determining the students' performance.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Class attendance is assuredly a factor that affects continuous assessment and final performance of the students who undertook statistics subject. A step by step calculation solution is required in a statistical examination marks to get a good grade and high marks. Hence, students are expected to participate in class to understand how the calculation and the correct different ways on solving statistical problems be taught by the lecturer. Moreover, this study strongly supports the practice and policy of UiTM, which requires students to attend the class for at least 80% of their total contact hour.

Apart from this, improvements can be applied in the future to investigate impact of class attendance of students' performance. The result would be different if the study was conducted among three different absenting groups; where student who are absent in the 'beginning of the semester' are considered the first group, 'middle of the semester' are considered the second group, and 'end of the semester' are considered the third group. It is a predictable non-attending scenario since at the beginning of the semester, some students may face problems with the online registration whereas at the end of the semester, they may face workload pressure to complete assignments, quiz and tests, and presentation preparation.

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