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Research paper



The Impact of Wi-Fi usage on Students' Academic Performance

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Abstract

Students' academic performance is one of the main concerns that demand serious investment from the educational provider. One of the investments pertains to the technology support, namely, the Wi-Fi facility in the campus, aiming at providing students a meaningful learning experience. The study elaborated in this paper, sought explanation on the relationships between the Wi-Fi usage and the students' academic performance. Using a dataset from 147 Universiti Utara Malaysia (UUM) undergraduate students' Wi-Fi usage and their academic Cumulative Grade Point Average (CGPA), a Spearman correlation test was executed. The results indicate that Wi-Fi usage does not affect students' academic performance. Additionally, analyses on Wi-Fi hardcore users also found that the usage does not affect their academic performance. Based on website categories has been used by students, it was found that downloading and online games are the two web categories of usage affecting students' performance with CGPA between 2.00 to 2.99. Ways to better assist students to use Wi-Fi wisely to benefit their academic performance are also discussed.

Keywords*: *Wi-Fi, Internet Usage; Student Performance; Academic Performance.

1. Introduction

Internet technology is evolving from time to time and the latest is the development of Wi-Fi technology in the campus. The development of Wi-Fi technology has influenced the development of the country's education system. Nowadays, Wi-Fi has evolved to the extent where they have become an integral part of university students' lives.

The impact of Wi-Fi technology on students' academic orientation has fueled debate among scholars since decades ago. Many scholars argue that Wi-Fi technology greatly helps students in learning services provided within the campus [4,1,11,3]. For instance, studies suggest that students get a lot of information on academic information via the facility of Wi-Fi—student's productivity to gain knowledge increases when information is easy to access [4,1]. Through mobile devices, laptops and any resources that have access to the Internet, they can retrieve information and conduct learning activities via online, anytime and anywhere. All of these studies paved to a belief that Wi-Fi provides the much needed facilities and freedoms in the quest for information.

Another interesting argument is on how the wireless environment connects the whole campus efficiently hence increases the university's productivity. Sulaiman and Yaakub [11] said the implementation of wireless environments in campuses in areas such as teaching classes, administrative offices, and student accommodation created a virtually wired network that reciprocally increases the interdependency among the campus community in all academic affairs. This statement is supported by Lo and Fai-hang [3] who states that the wireless environment benefits not only the students but also the instructors. With the Internet access, students can follow and receive lessons not only within the prescribed class. With the Wi-Fi existence, teachers have more autonomy to facilitate interaction among students beyond the classroom time.

This is demonstrated in the study by Gururaj, Kumar and Lokesha [2] who found that Wi-Fi is powerful in enabling easier and faster communication especially in academic studies and student activities. In sum, the studies aforementioned establish a statement that Wi-Fi, as a medium for Internet access, benefits students in numerous ways.

Currently, academic performance analysis is becoming increasingly critical for educational institutions, schools, and universities [6]. Associated with academic achievement academic performance is widely accepted and used as an assessment indicator for the quality of education. For the last two decades, the Internet usage among students has been the most targeted research area in academic performance analysis [8,9]. There are many literature debating the development of student performance involving factors such as skills, CGPA and prior knowledge [5,7] using forecasting models. However, studies on the type or category of Wi-Fi usage on the students' performance are still sparse.

In light of this, the objective of this study is to investigate the Wi-Fi usage on students' academic performance within the context of web 2.0. The surge in Wi-Fi ownership among university students triggered an interest to embark on this study.

2. Literature Review

With increasingly high technology and mobile phones, the Internet's needs are also increasing. Many devices like iPads, tablets, e-readers and others may work with 3G; the majority requires a Wi-Fi connection for them to function at the maximum level. Studies show that up to 73% of teachers use mobile devices for teaching and learning but this can only happen if there is a strong Internet facility. There is a higher reliance on accessible Internet connections at higher education levels. A study conducted by Wakefield [14] in 2008 found that 90% of students believe that Wi-Fi is as important as education as a traditional classroom or typical computer.

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Wi-Fi is very important for university students living on campus and indirectly affecting student's life in term of sociality, academically and economically. Wakefield [4] survey found that 48% of students would choose Wi-Fi rather than other facilities. Surveys from International Association of Privacy Professionals [13] found that 75% of students agree that Wi-Fi access on their campus sites helped them get better grades.

In the same demeanor, Sturgeon, Allison and Miller [10] investigated the impact that the Wi-Fi labs had on students' performance. They revealed that students' performance increased by 84% compared to 64% for the previous year without the use of Wi-Fi. There was an average increase in student outcomes from 56% in 2003 to 71% in 2006 following the provision of such technology facilities. While this study proves Wi-Fi provision helps in improving students' performance, more detailed research and analysis are needed to identify the Wi-Fi effects on the entire student with actual data to reinforce the findings.

3. Methodology

This study employs a quantitative method in a research study. Based on the objectives, the current study will apply quantitative research approach using correlational method to determine the extent of a relationship between two or more variables using statistical data. This research will recognize trends and patterns in data and determine the relationship between two variables which are Wi-Fi usage and student performance based on their CGPA.

3.1. Sample and Data Collections

In seeking the answers on the relationships, this study employs a meta-analysis by using a secondary data treated as two types of variables: the students' usage of Wi-Fi as the independent variable; students' academic performance i.e their CGPA as the dependent variable. For Wi-Fi data usage, students log file data via UUMWifi and UUM-Guest Wi-Fi were obtained from Utara Malaysia Information Technology Center (UUMIT). While CGPA for the current semester was obtained from the Academic Affairs Unit (Hal Ehwal Akademik, HEA). These data are representatives of the information needed to support a statement and reinforce a decision.

The data stored in the different tables were entered into a single set. The processed data was used for the data mining process. Descriptive models were used to explore data patterns that could attract decision-makers while predictive models were used to predict new data based on existing data patterns. Among the Wi-Fi usage patterns that were to be identified are the frequencies of Wi-Fi usage and the frequency of websites being reached.

To examine the relationships and associations between Wi-Fi usage and students' CGPA, Spearman Rho correlation coefficients were executed on SPSS version 24.. Prior to hierarchical multiple regression analysis, preliminary analyses were first conducted to ensure that there was no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity.

4. Findings and Discussion

4.1. Respondent Background

This study only focused on undergraduate students from 2016/2017 session by which their CGPA (Cumulative Grade Point Average) for each semester was available, as opposed to students of Master's Degree and Doctor of Philosophy.

Initially, the data consists of 350 respondents. It was subjected to some cleaning procedures to ensure accuracy. Throughout the procedure, 37.43% was repetitive and unrepresentative data and 20.57% was incomplete. Once cleaned, a set of 147 respondents or 42% of the data were found suitable for further analysis (Table 1). With this final set of data, analyses were executed.

Table 1: Demography of the Respondents

Student Background	Frequency	Percentage
Student Citizen		
Malaysia	134	62.62
International	80	37.38
Current Education Status		
Bachelor	147	68.69
Master	30	14.02
PhD	37	17.29

4.2. Statistics and Analysis

The Spearman correlation was conducted to determine the relationship between UUM students' academic performance and their Wi-Fi usage. Throughout the analysis, the Spearman correlation coefficient, r, is -058 (p=.488) which suggests that there is no statistically significant correlation between the two variables.

Table 2: Correlation Coefficient of Wi-Fi Usage and CGPA

	Wi-Fi Usage	CGPA
Correlation Coefficient	1	-0.058
Sig. (2-tailed)	.	0.488
N	147	147

The researcher also extended the analysis by categorizing the Wi-Fi usage into eleven types of search experience. On average, 129 of the data is from the file system. It includes web updates, software updates and even any computer applications that require the Internet connection. While 80% of data is from the learning category, though only 6 frequencies out of 147 of students are doing this search, but the data required is very high compared to other data. The intended learning objectives are E-learning and other Learning Support System. Followed by downloading category with 35%, file transfer 29%, entertainment 27%. Next is the web browsing category with 13%, social media 12% is including Facebook, Instagram, Twitter, WhatsApp, Telegram and other application for communication. Then followed by P2P with 8%, 1% for online game, 0.8% for online shopping and the last category is email with 0.05%.

Table 3: Mean and Standard Deviation between CGPA and Wi-Fi Usage Level

WiFi Usage Purpose	N	Mean	Std. Deviation
File System	146	129.5631	88.9961
Learning	6	80.0167	151.601
Download	147	35.5998	63.6856
File Transfer	147	29.7432	44.6164
Entertainment	147	27.8478	47.8489
Web Browsing	147	13.6876	20.5523
Social Media	147	12.404	21.1611
P2P	125	8.0525	32.0862
Online Game	70	1.4511	2.4097
Online Shopping	26	0.8954	1.3014
Email	88	0.051	0.1823

4.3. Correlation Coefficient based on CGPA

Next is to examine the relationship between Wi-Fi usage and student performance based on the student's CGPA level. The student CGPA is categorized into three groups, the highest, medium and lowest level. Table 4 shows that for students in highest level with CGPA of 3.00 and over, the use of Wi-Fi does not affect them either from a negative or positive effect. There is no correlation for any of these categories of online activity, while students with a moderate CGPA ranging from 2.00 to 2.99, their academic performance was reported has significant with downloading and online games activities. While for students with the lowest CGPA

ranging from 0 to 1.99, the Wi-Fi is not significant with their CGPA.

Table 4: Correlation Based on CGPA

Wi-Fi Usage category	Highest CGPA (p)	Medium CGPA (p)	Lowest CGPA (p)
File System	0.255	0.467	0.208
Learning	0.297	0.501	0.391
Download	0.659	0.01**	0.329
File Transfer	0.849	0.518	0.787
Entertainment	0.948	0.55	0.156
Web Browsing	0.607	0.159	-
Social Media	-	0.635	-
P2P	0.613	0.141	0.329
Online Game	0.393	0.002**	-
Online Shop-ping	0.982	0.364	0.624
Email	0.112	0.102	0.908

4.4. Regression Analysis

Regression analysis is a robust and flexible procedure to analyze the relationship between dependent variables and one or more independent variables. In this study, regression was used to test the fitness of the model developed to test the relationship between Wi-Fi usage and academic performance. The following analysis shows how much variance in dependent variables is likely to be explained by independent variables.

Table 5: Regression Analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.364[a]	.133	.061	.56218

a. Predictors: (Constant), Online Game, Email, Learning, File System, Social Media, Entertainment, File Transfer, Online Shopping, Download, P2P, Web Browsing
b. Dependent Variable: CGPA

Based on Table 5, coordinated determinant coefficient or also known as R represents the value of .364. The score indicates that 36.4% change in dependent variable (student achievement-CGPA) can be explained by independent variables. The R Square value is 0.133 (13.3%) showing the relationship between dependent and independent variables for this study. The value suggests that there is a relationship between dependent and independent variables.

4.5. ANOVA

Table 6 : ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.479	11	.589	1.864	.050[b]
Residual	42.350	134	.316		
Total	48.828	145			

Drawing from the p-value = 0.00 <α = 0.05 as depicted in Table 6, we concluded that the model is appropriate and can be continued for hypothesis testing. We believe that the model is important because the value above entails a "strong" interaction between the two-way variables.

4.6. Coefficients

Table 7: Coefficients

Coefficients[a]					
Model	Unstandardized Coef-ficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.121	.138		22.546	.000
File Transfer	.000	.001	-.014	-.168	.867
Web Browsing	**-.008**	**.003**	**-.270**	**-2.987**	**.003**
P2P	.002	.002	.103	1.186	.238
File System	.001	.001	.089	.977	.330
Download	.000	.001	.028	.316	.752
Entertainment	-.001	.001	-.084	-.993	.322
Learning	-.001	.001	-.030	-.372	.711
Email	-1.312	1.208	-.090	-1.086	.279
Social Media	-.003	.002	-.120	-1.451	.149
Online Shopping	.085	.077	.094	1.106	.271
Game	-.013	.028	-.040	-.454	.651

a. Dependent Variable: PNGK

Based on the table above, the beta value for website browsing features is -0.008 which is significant at the .003 level. While the beta value for other categories is not significant (p = 0.00> α = 0.05).

4.7. Hypothesis Test

Hypothesis testing in statistics is a method to test the outcome of the survey or experiment to see if it has meaningful results. Basically it tests whether the decision is valid by thinking of the possibility that the decision happens by chance.

Table 8: Results of Hypothesis Tests

	Hypothesis	P-value	Significant
H1	I. There is no significant relationship between File Transfer and students' academic performance. I. There is significant relationship between File Transfer and students' academic performance	0.977	Not Significant
H2	I. There is no significant relationship between Learning and students' academic performance. II. There is significant relationship between Learning and students' academic performance.	0.711	Not Significant
H3	I. There is no significant relationship between Download and students' academic performance. I. There is significant relationship between Download and students' academic performance.	0.752	Not Significant
H4	I. There is no significant relationship between file transfer towards students' performance. II. There is significant relationship between file transfer towards students' performance	0.867	Not Significant
H5	I. There is no significant relationship between entertainment and students' academic performance. II. There is a significant relationship between entertainment and students' academic performance	0.322	Not Significant
H6	I. There is no significant relationship between web browsing towards students' performance. II. There is significant relationship between web browsing towards students' performance	0.003	Significant
H7	I. There is no significant relationship between social media towards students' perfor-	0.149	Not Significant

	mance. II. There is significant relationship between social media towards students' performance		
H8	I. There is no significant relationship between P2P towards students' performance. II. There is significant relationship between P2P towards students' performance.	0.238	Not Significant
H9	I. There is no significant relationship between game towards students' performance. II. There is significant relationship between game towards students' performance.	0.651	Not Significant
H10	I. There is no significant relationship between online shopping towards students' performance. II. There is significant relationship between online shopping towards students' performance	0.271	Not Significant
H11	I. There is no significant relationship between email towards students' performance. II. There is significant relationship between email towards students' performance	0.279	Not Significant

From the table above, only web browsing was found to be significant towards student's academic achievement at 0.01 (less than a 1% chance). While the other ten variables has no significant with students performance. The result could happen explain that web browsing is the category that effect on students' academic performance.

4.8. Hardcore Wi-Fi user

From the pool of respondents, it was identified that 58 of them were hardcore users. Based on Oxford Dictionary, hardcore is defined as having the most active, committed, or strict members of a group or movement. Based on the analysis, they have repeated records that every month they are among the top Wi-Fi users. From the correlation coefficient, there is no correlation between CGPA and Wi-Fi usage where the value of p= 0.975 and r=0.004. This means that high Wi-Fi usage does not influence students' academic performance. Relationship correlations are shown in Table 9.

Table 9: Correlation between Hardcore Wi-Fi Usage and CGPA

			CGPA	AVERAGE
Spearman's rho	CGPA	Correlation Coefficient	1.000	.004
		Sig. (2-tailed)	.	.975
		N	58	58
	AVERAGE	Correlation Coefficient	.004	1.000
		Sig. (2-tailed)	.975	.
		N	58	58

5. Discussion and Conclusion

Based on the objective, this study has been successful in identifying the pattern of relationship between Wi-Fi usage and the academic performance. The results show no significant relationships between Wi-Fi usage and students' academic performance. The results also support the study conducted by Ellore, Niranjan and Brown [15] who argue that the use of the Internet does not affect the performance of students, especially in academics.

Research on web category has been browsed by UUM students, the results show that the percentage of students using Wi-Fi for learning purposes is at the difficult level. Students only used the facilities provided for entertainment purposes such as streaming video, listening to radio online, writing blogs and others that are not related to learning. Students also focused on surfing websites and online chat using WhatsApp, Telegram and WeChat application and more focused on browsing social media sites like Facebook, Instagram and so on. The hypothesis testing found that there are significant relationships between three categories of usage, i.e, online games, web browsing and download, with academic performance. This means that these three categories of usage somehow have some influence on academic performance of the respondents as opposed to social media as agreed by Paul, Baker and Cochran [16].

As part of the research objectives, the relationship between groups of academic achievement with Wi-Fi usage was also investigated. Using the CGPA, the respondents were classified into highest, moderate and lowest. The results show that Wi-Fi usage does not have any significant relationship with the highest and lowest GPA. Wi-Fi only influences students with a moderate CGPA of CGPA of 2.00 to 2.99 for the current semester. Only download and online game categories negatively affect students with a moderate CGPA.

Another finding also suggest that test students who used the most frequent and highest-frequency of Wi-Fi in the web browsing category also affect their academic performance in negatively impacted. However, there is no relationship between low Wi-Fi user and students' performance from any category.

In conclusion, although there is no significant relationship between the use of Wi-Fi and the students' overall academic performance, a deeper scrutiny on the results show that certain types of activities on the Internet also affect the academic performance of students in particular.

The findings of this study will contribute to the benefit of education institutions in assessing the extent to which the Internet facilities posed impact on students' academic achievement. Based on the results, the organizations may take possible actions to make improvements or to impose any control measures for the purpose of learning. Besides, academic affairs and teachers benefit for identifying the effect of Wi-Fi usage on students' academic performance and if the necessary decision for blocking or making some limitation for usage of any websites during the certain period. Wi-Fi usage can provide a variety of benefits not only for organizations, trainers but also for students. In fact, using Wi-Fi at school, students can share documents quickly and easily, edit presentations in real-time, store project files in the cloud, and improve their teamwork skills. Wi-Fi in education also allows students to collaborate with friends from other universities. Nurturing teamwork value, while leverage the technology to develop these skills will provide more opportunities for the students to succeed in the professional world.

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