

# **INTERNET USAGE FOR ACADEMIC SUCCESS: FRIEND OR FOE?**

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## **ABSTRACT**

Educational usage is an important aspect of the Internet today. Students are ubiquitously seen spending significant hours straddling between completing their coursework online and other personal applications. It is only reasonable to ask if the level of Internet usage helps or hurts students in their pursuit of quality education. This paper looks at the interplay between student personal characteristics and the time spent on the Internet and makes specific conclusions on the linkages between student communication aptitude and academic success that one should take into account before adapting courses currently offered in standard lecture format to online courses.

## **INTRODUCTION**

The Internet pervades all aspects of society today. It is estimated that almost half of the world population use it for instantaneous access to a variety of applications including financial, manufacturing, health, travel, research and entertainment [1]. Over the last decade, the Internet has made great inroads in the way education is delivered. The old model of using direct manpower with academicians delivering lectures in small-sized classroom settings is being slowly but steadily replaced with online courses. The Internet is an attractive medium for many educational institutions since they can reach students far and wide and at the same time broadcast the same recorded lectures several times over to large student populations with a smaller budget compared to having a large pool of qualified faculty and physical infrastructure with classrooms, labs and libraries. Offering courses online that are in high demand such as those that form the core requirements for degree programs are particularly beneficial not only for these institutions but also for students who benefit from being able to access class materials repeatedly at the time and place of their choice. Several software enterprises have also sprouted around enabling the efficient delivery of online courses often referred to as Massively Open Online Courses (MOOC). Some examples are Coursera, edX, Khan Academy and Udacity [2].

Despite the enthusiasm and continued adoption of Internet for delivery of courses, there has not been convincing evidence that online courses can replace and achieve the same level of academic success as the old classroom delivery formats. In a study by Kolowich [3], it was found that an average of only 7.5% course completion rate were attained in Internet-based courses. This has seeded serious doubts among some of the educational pundits as to why many students are unable to attain academic success even when the online courses are created with stunning voice, visual and dazzling effects in par with that of entertainment industry. It appears the reason is most likely rooted in the mismatch between the student background characteristics such as their level of preparation in the subject matter, preferred ways to engage, and their own innate ability to chart academic success. This is in fact evidenced by the continued preference of students to register for courses offered in classroom settings despite the convenience of online courses because they seem to value face to face interactions with faculty and classmates as an important part of the overall university experience.

## **OBJECTIVE**

There are many possible student characteristics that can affect the level of Internet usage. Some examples are motivation, attention span and internal locus of control. In this research, we focus on the relationship between the student communication aptitude and Internet usage level and how this relationship affects academic success.

### **Communication aptitude**

Communication is fundamental to acquiring and disseminating knowledge. Communication can be classified into four types: oral, non-verbal, written, and mediated communication. Oral communication is done through spoken words and non-verbal through body language. Written communication is accomplished through articles, reports and books. On the other hand, Internet mediated communication takes place when information is exchanged through computers [4]. Online courses fall in this last category. Although the Internet provides a forum to bring together a classroom full of students from far away geographic locations, they do not provide as much of the freestyle environment for many of the same avenues of communication as the oral and non-verbal methods enable in a typical classroom with the teacher and classmates present at the same physical location.

This points to a need on the part of a student to have a certain level of communication aptitude while learning online to compensate for the absence of interactive oral and especially non-verbal messaging. Communication aptitude can be defined as a personal quality consisting of the willingness and ability to listen, initiate, engage and respond effectively with enthusiasm, eagerness, interest, respect and a good command of language and the computer medium [5,6]. In this study, it was measured using a survey questionnaire.

### **Internet usage**

Internet usage was measured as the number of hours the student spent on the medium during an average day studying for online coursework. It covers both the time spent specifically studying and the time spent on doing other unrelated activities such as socializing or just plain browsing for entertainment but all done within the duration of each study session. The reasoning for including the latter is that if the student were to take the same course in a classroom setting, the student may not have access to the Internet and hence opportunity to distract oneself. But if the student were to take the course online, the student is more likely in a setting that does not impose discipline and guidance from the outside. A student whose level of communication aptitude and locus of control are not high is more likely to be sidetracked due to poor comprehension of the online content or simply due to freedom of choice to do so. In such a case, the academic performance will be adversely affected even though the student believes he/she is focused.

### **Academic success**

Academic success was measured using the Grade Point Average (GPA). Generally, instructors compute GPA using a combination of several measures such as quizzes, exams, homework, projects and course participation level and weighting them appropriately. Hence, GPA is a fair indicator of academic success.

It is reasonable to assume that a student with good communication aptitude and good GPA record would have put in a respectable number of hours studying under a lecture-based course. Our research question here is to verify if this would extend to an Internet-based course. Hence, we focus on the relationships that communication aptitude and GPA have on Internet usage level.

## HYPOTHESES

The following null hypotheses were tested:

H<sub>1</sub>: Internet usage level is independent of communication aptitude.

H<sub>2</sub>: Internet usage level is independent of GPA.

H<sub>3</sub>: Internet usage level is independent of the interaction effect between communication aptitude and GPA.

## METHODOLOGY

### Survey instrument

A survey instrument was developed to quantify communication aptitude. The instrument was verified for content validity requirement. There were ten items in the survey each of which was a cafeteria style statement that described possible personal and behavioral characteristics related to communication aptitude. The participants of the study were asked to quantify them to the extent they matched on a self-reporting basis. For each statement, an interval scale of 1 to 5 was used with 1 representing a strong disagreement and 5 representing a strong agreement with 3 being neutral. A sample statement is: I am too shy to initiate a conversation online. To detect possible agreement bias, some statements were reverse scored. All scores were normalized to equivalent z-scores. The participants were also asked to fill in the average amount of time they spent studying online courses each day. This was used as a surrogate for Internet usage. The survey also gathered information on GPA.

### Sample

The participants were 124 undergraduate students majoring in business in a public university who were in their first or second semester. The median GPA was 2.83. GPA was used as a binary variable with values above median as 1 and those below as 0.

## STATISTICAL ANALYSIS

### Exploratory analysis

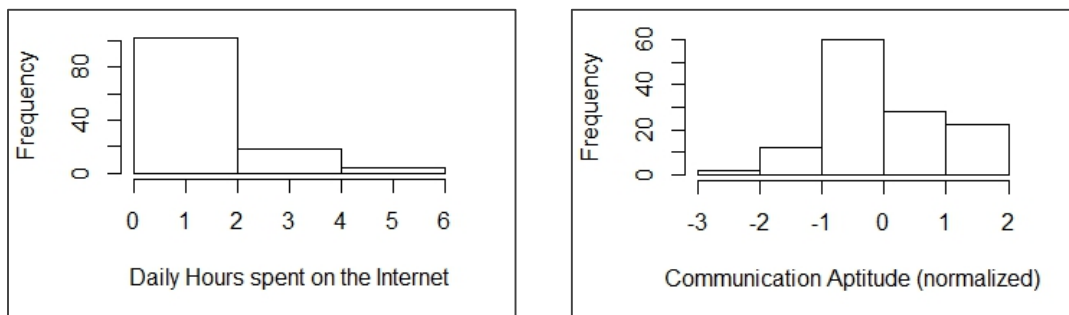


Figure 1

Histograms of Daily hours spent on online coursework and Communication aptitude

Figure 1 shows that daily hours had a positive skew. Most of the students spent less than two hours a day and very few spent more than four. Communication aptitude had a slight negative skew. As we normalized the data, its x-axis is centered on zero. There were a small number of students with very poor communication aptitude but most were in the middle and upper levels. Preliminary visual exploratory analysis supports good content validity for a population of university students in their first year.

## Modeling

We used two different modeling approaches in our statistical analysis: i) Polynomial regression, and ii) Generalized Additive Modeling (GAM) using natural splines (ns).

## RESULTS

### Polynomial regression

We ran the regression with communication aptitude as a linear, quadratic and cubic predictor separately. The GPA variable was also included each time with and without the interaction of communication aptitude. Figure 2 shows that the cubic model was the best fit with a p-value of  $3.576e^{-5}$ .

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Analysis of Variance Table

Model 1: HrsDay ~ -1 + CommunicationAptitude + GPA_Class + CommunicationAptitude:GPA_Class
Model 2: HrsDay ~ -1 + poly(CommunicationAptitude, 2) + GPA_Class + CommunicationAptitude:GPA_Class
Model 3: HrsDay ~ -1 + poly(CommunicationAptitude, 3) + GPA_Class + CommunicationAptitude:GPA_Class
  Res.Df  RSS Df Sum of Sq    F    Pr(>F)
1      120 93.863
2      119 93.863  1   0.0001 0.0001  0.9919
3      118 81.162  1  12.7010 18.4657 3.576e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Figure 2

Results of running polynomial regression with response Daily hours and predictors, Communication aptitude, GPA class and their interaction

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Coefficients:
              Estimate Std. Error t value Pr(>|t|)
Xpoly(CommunicationAptitude, 3)1  0.04271    1.95560  0.022  0.98261
Xpoly(CommunicationAptitude, 3)2  1.85029    1.43273  1.291  0.19905
Xpoly(CommunicationAptitude, 3)3  4.65382    1.49943  3.104  0.00239 **
XGPA_Class1                        1.49664    0.17237  8.683 2.41e-14 ***
XGPA_Class1:CommunicationAptitude  0.95699    0.29196  3.278  0.00137 **
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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.407 on 119 degrees of freedom
Multiple R-squared:  0.461, Adjusted R-squared:  0.4383
F-statistic: 20.35 on 5 and 119 DF, p-value: 1.23e-14
```

Figure 3

Summary statistics from polynomial regression

Figure 3 shows the estimated coefficients. Communication aptitude has thrice the influence compared to GPA and five times that of the interaction term on Internet usage. All three were significant with p-values below 0.00239. The overall model was significant with an adjusted- $R^2=0.4383$ ,  $F=20.35$  and  $p\text{-value}=1.23e^{-14}$ .

### Generalized Additive Modeling (GAM)

The result of fitting the GAM with Internet usage as the response variable using the natural spline functions of communication aptitude, GPA and their interaction as predictors is shown in Figure 4. The cubic model for communication aptitude variable was significant with a p-value of  $2.363e^{-6}$ . Even though

the GPA was not a significant predictor by itself, its interaction with communication aptitude was highly significant with a p-value of  $1.498e^{-6}$ .

Anova for Parametric Effects						
	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
ns(CommunicationAptitude, 3)	3	22.851	7.6169	10.860	2.363e-06	***
GPA_Class	1	0.823	0.8234	1.174	0.2808	
GPA_Class:CommunicationAptitude	1	18.022	18.0222	25.696	1.498e-06	***
Residuals	118	82.760	0.7014			

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 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Figure 4  
 GAM results for Communication aptitude, GPA and their Interaction

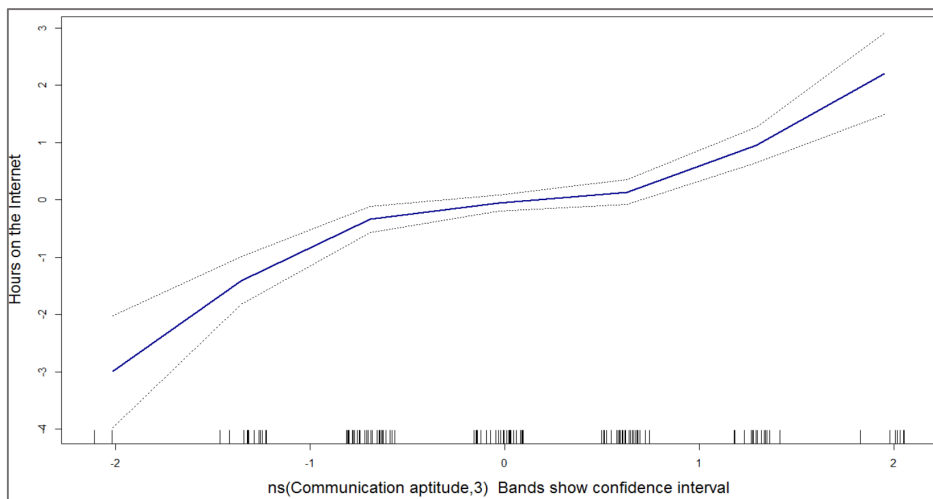


Figure 5  
 Fitted natural spline between Communication aptitude and Internet usage

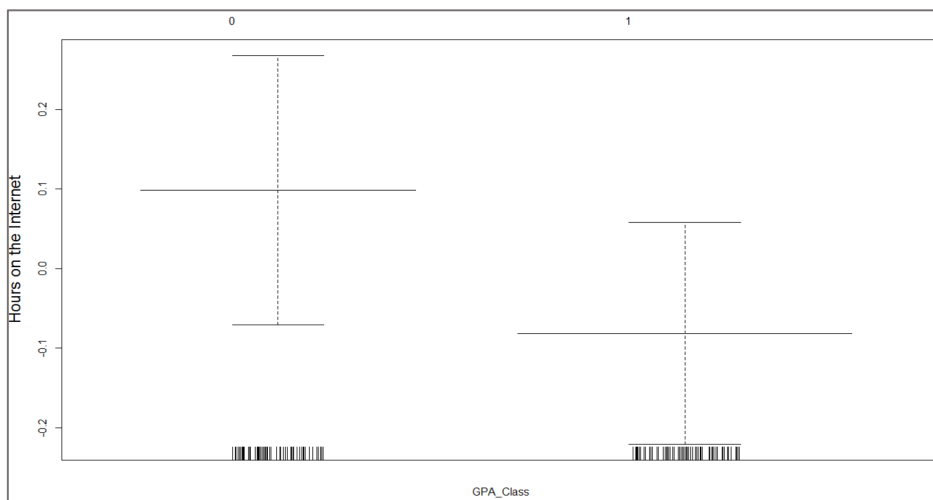


Figure 6  
 Difference in Internet usage between GPAs below (0) and above (1) median

Figure 5 shows that holding GPA constant, Internet usage rises fairly fast with rise in communication aptitude, hits a plateau around the middle values, then rises again. It is clear that when the communication aptitude scores are very low, the student Internet usage is also low. The reverse is also true at high communication aptitude levels. It is worth noting how smoothly the linear segments in the various communication aptitude intervals merge with each other. This is one of the benefits of using splines.

Figure 6 shows that a student with GPA below median spends more hours than one with higher than GPA median. But there is overlap which is in agreement with p-value 0.2808 in Figure 4. This is very reasonable to expect because, a student with higher GPA is more likely to be academically able and hence does not need to spend too much time at the course Internet site to understand the material. On the other hand, a student with low GPA may have to view the course Internet site repeatedly to understand due to a lesser educational capacity or poorer educational prerequisite preparation. It is also possible these students took to distracted surfing and hence ended up having a larger number of hours on Internet usage but with no improvement to show on the GPA.

### CONCLUSIONS

The following conclusions can be made with regard to the hypotheses we proposed earlier.

Hypothesis	Polynomial Regression	GAM
H <sub>1</sub> : Internet usage level is independent of communication aptitude.	Rejected	Rejected
H <sub>2</sub> : Internet usage level is independent of GPA.	Rejected	Not Rejected
H <sub>3</sub> : Internet usage level is independent of the interaction effect between communication aptitude and GPA.	Rejected	Rejected

It can be seen that for an online course to be successful, communication aptitude is an important prerequisite for a student to have. Utilizing Internet medium to offer courses without proper assessment of the match between student personal characteristics and rigor of the course content is likely to stifle academic success. A cookie cutter approach to offering courses online without proper forethought of the different ways students study and their preferences to communicate over the Internet may result in negative consequences. One size just does not fit all. When the fit is good, Internet usage can be a friend; else, it stands to become a foe in the pursuit of quality education.

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