A Statistical Study into The Student use of Internet Providers at Harrisburg University

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Abstract

This study aimed to find out what internet provider is used the most at Harrisburg University. The data set was collected through two online surveys, Google Forms and Survey Monkey, so all students could take the survey whether they lived on or off campus. We hypothesized that 65% of participants would report that they used Verizon. During analysis of our data, we observed that only 33% of students used Verizon and that XFinity was the most used Internet Provider with 36% of students reporting use.

Introduction

Students need internet access to participate in academic education. Recent studies have shown that students believed that using the internet allowed them to do research ahead of time, tackle several homework assignments, broaden the scope of reading and learning, promote self-learning, encourage, and increase peer learning, and improve exam preparation (Apuke & Iyendo, 2018). Today having internet access is essential, especially with virtual and asynchronous learning. According to Vogels et al. (2021), It was noted that internet access among college/university students has resulted in a huge and diverse source of knowledge.

An article entitled, "53% of Americans Say the Internet Has Been Essential During the COVID-19 Outbreak" from Pew Research Center, found that roughly (21%) one-in-five parents with homebound schoolchildren say that it is very likely their children will not be able complete their schoolwork because they do not have access to a computer at home Vogels et al. (2021). 22% also reported they needed public Wi-Fi to finish their schoolwork because there is not a reliable internet connection at home. Additionally, 29% of parents said that it was likely that their children will have to do their schoolwork on a cell phone. Internet access is important but is still not fully accessible despite changes in education and the workplace during these unprecedented times. In the U.S 28% of those who have a high-speed connection at home say they worry a lot about paying for this service over the next few months Vogels et al. (2021). Therefore, it is important for people to be able to find a plan that is affordable.

The source BroadBandNow, a company that simplifies data of the status of the United States broadband for the public, shows the top providers in the Harrisburg area. These four are XFinity, T-Mobile, Verizon, and Viasat (BroadBandNow, 2022). In order of most used to least,

XFinity in the Harrisburg area has 99.3% availability, their lowest internet plan starting at $29.99/mo. with a download speed of 200 Mbps. XFinity also offers students a $150 Visa Prepaid Card. Verizon Fios has 75.7% availability, with a price starting at $39.99/mo., with a download speed of 300 Mbps. Next, T-Mobile with a 34.3% availability, cost starting at $50/mo., with an average download speed between 35-115 Mbps. T-Mobile also offers students a $20 activation fee waiver and a $150 Visa Prepaid Card. Lastly there is Viasat, with a 100% availability starting at $49.99/mo. with a download speed of 12 Mbps (BroadBandNow, 2022).

For this project, we propose to survey 100 Harrisburg University students to find out which internet providers they use at home. We expect to collect our data through an online/physical survey. Our target population is all Harrisburg University students that have internet access at home. For this study, our data will be categorical because several types of internet providers will be categorized into their own group. Analyzing this sort of information is important because students should be provided with proper internet access at home to engage in academic activities. We hypothesize that 65% of students at Harrisburg University use Verizon as their internet home provider.

Methods

As a group, we decided that the best way to collect our data was to survey students at Harrisburg University online through Survey Monkey and Google Forms. We decided this was the best method of collecting data because all people could access the survey whether they commute or live on campus. The sample size of our survey is 100. We asked some basic demographic questions regarding age, gender, and class year. Then, we started to ask questions regarding what internet service provider the student used. We used questions such as "Do you commute or live on campus?", "What type of internet provider do you use to access the internet

at home?", and "How much do you pay monthly for your internet service". These types of questions are whether students are using HU's resources (internet) or if they are paying for their own, and whether there is a correlation between price, benefits, connection, or any other specific reason for their choice in internet provider. This will help determine which internet provider works best for most HU students. Our data will be tabulated and viewed in rows and columns, as well as displayed through pie charts, bar graphs, and tables.

Results

After surveying Harrisburg University students online, we have collected a total of 100 responses. The average age of people who took our survey were 18–20-year-olds at 73%. About 5% of our sample size was under 18 and 22% of our sample size were students 20 and older (Figure 1). When asked "Specify your gender?", our sample size of males and females who took our survey were almost even with males at 49% and females at 51%. Out of the 100 responses received, the most used internet provider was XFinity chosen by 36 students and Verizon being the second most used internet provider chosen by 33 students which is shown in figure 2. The least used internet providers were ViaSat, T-Mobile, and others. The least used internet providers all together equaled up to about 31% of our sample size. When asked "Do you live on campus or commute?", out of 100 respondents 54% of students stated that they stay on campus while the other 46% of students commute (Figure 3). The average price of what students pay for their internet services is $76 dollars (Table 1). On a scale of 1-10, the average of how satisfied students are with the speed of their internet is a 7.7(Table 2).

Statistical Analysis

For our qualitative project, we gathered information about what internet provider students at Harrisburg University use. Our specific question was: What type of internet provider do you use to access the internet at home? We guessed that Verizon would be the most popularly used internet provider, and our hypothesis was that 65% of students at Harrisburg University would report that they used Verizon. While our population was all students at HU, we took a voluntary response sample by sending out an online survey that they could respond to, and 100 students responded. Summarizing the information from those 100 students, we found that 33 students reported that they used Verizon as their internet provider. This means that my statistic, or sample percentage, was 33%. Because this statistic is based only on a sample of students at HU, we knew that this percentage represents only a portion of the population and is just one estimate for the population. We needed to calculate a margin of error to help account for the fact that the entire population of Harrisburg University was not used in gathering data. The margin of error for my sample is 9.2%. In conclusion, we are 95% confident that the true percentage of all students at HU who have reported their internet provider is Verizon is between 23.78% to 42.21%.

We used this interval to help me decide whether my original guess was reasonable or not. Because my guess of 65% does not fall within this confidence interval (between 23.78% and 42.21), that means that it was not a reasonable guess for the population percentage. Therefore, we expect that when we do my hypothesis test, we will reach a 'reject' conclusion.

When we conducted my hypothesis test, we obtained a test statistic of –6.71. This led me to a p-value of 0.0001. Because this p-value is lower than our significance level, 0.05, the original hypothesis was rejected. Therefore, with 95% confidence, we have evidence to conclude that the true percentage of Harrisburg University students who reported using Verizon as their internet

provider is significantly different from our guess of 65%. Our guess was found to be not reasonable. This conclusion was confirmed with the data found from the confidence interval. A confidence interval provides a list of reasonable values for a population parameter. Our guess of 65% fell outside of our confidence interval, which means that it was not reasonable. *Any* value within that confidence interval, therefore, should not be rejected when conducting a hypothesis test. In contrast, any guess that falls *outside* the confidence interval boundaries should lead to a 'reject' decision in a hypothesis test, because it shows that the guess is *not* on the list of reasonable values.

Qualitative Confidence Interval

1. **Parameter**: What is the true percentage students at Harrisburg University that use Verizon as their internet provider

2. **Statistic**: In a sample of 100 HU Students, 33 reported Verizon as their internet provider. This means that my statistic, or **sample percentage ($\hat{p}$), was 33%**.

3. **Margin of Error: 9.2%**

$$Z = 1.96 \qquad \hat{p} \text{ (p-hat)} = 0.33 \qquad \hat{q} = 0.67 \qquad n = 100$$

$$z\left(\sqrt{\frac{\hat{p}\hat{q}}{n}}\right) = 1.96\left(\sqrt{\frac{(.33).67)}{100}}\right) = 1.96(0.03205\dots) = 0.0921\dots = 0.092$$

4. **Confidence Interval:** $(23.78\%, 42.21\%)$

$$0.33 \pm 0.09216 = (0.2378, 0.4221)$$

5. **Conclusion**: We are 95% confident that the true percentage of students at Harrisburg

University who use Verizon as their internet provider is between 23.78% and 42.21%

Qualitative Hypothesis Test

1. **Parameter and Hypothesis**: What is the true percent of Harrisburg University students

who use Verizon as their internet provider. Hypothesis $(p_o) = 65\%$

2. **Test Statistic: -6.71**

$$p_o = 0.65 \qquad q_0 = .35 \qquad \hat{p} = .33 \qquad n = 100$$

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}} = \frac{0.33 - 0.65}{\sqrt{\frac{(.65)(.35)}{100}}} = \frac{-0.32}{0.04769\ldots} = -6.71$$

3. **P-Value: 0.0001**

$$P(z < -6.71) = .0001$$

4. **Decision Rule**: Is $.05 > .0001$? Yes, reject H_o

5. **Conclusion**: With 95% confidence, we reject the hypothesis we have evidence to conclude

that the true percentage of students at Harrisburg University is significantly different from

my guess of 65%. My guess is considered not reasonable.

Conclusion

The significance of this study and its findings should not be overlooked. Learning which

internet providers that Harrisburg University students use the most will help determine which

one to consider for future students and even outsiders who are looking for an internet provider to engage in that don't attend Harrisburg University. Studying this type of data is important since students should have adequate internet connectivity at home to participate in academic activities. Based on our calculations, our p-value was 0.0001. With 95% confidence, we reject the hypothesis that 65% of students use Verizon as their internet provider. We have evidence to conclude that the true percentage of students at Harrisburg University is significantly different from our guess of 65%, so our guess is considered not reasonable. We are 95% confident that the true percentage of students at Harrisburg University who use Verizon as their internet provider is between 23.78% and 42.21%.

Throughout the time spent collecting data we ran into a problem with how we were collecting data. We used the survey resource, Survey Monkey, but at the time we started using it we did not realize that to see more than 10 surveys we would have to subscribe. Because of this, we were unable to see the results of our survey, however, we still were able use Google Forms to survey 100 people. Another problem was seen within one or two answers we received for the question of "How much do you pay for your internet service". Some students replied that the cost was unknown, or they stated that they only use the Wi-Fi provided by Harrisburg University. A point of improvement of our study could have been creating more specific questions in our survey so there are fewer answers that deviate from the main purpose of the questions and to avoid confusion among our participants.

References

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Vogels, E. A., Perrin, A., Rainie, L., & Anderson, M. (2021, October 25). *53% of Americans say the internet has been essential during the Covid-19 Outbreak*. Pew Research Center: Internet, Science & Te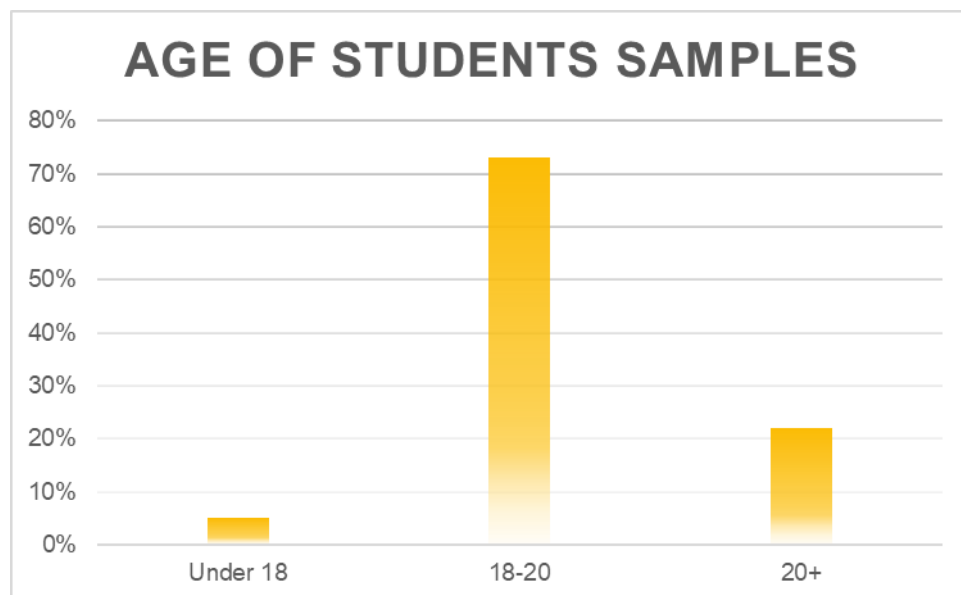ch. Retrieved January 31, 2022, from https://www.pewresearch.org/internet/2020/04/30/53-of-americans-say-the-internet-has-been-essential-during-the-covid-19-outbreak/

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Appendix

Figure 1. Out of 100 people surveyed, 5 participates indicated their age as under 18, 73

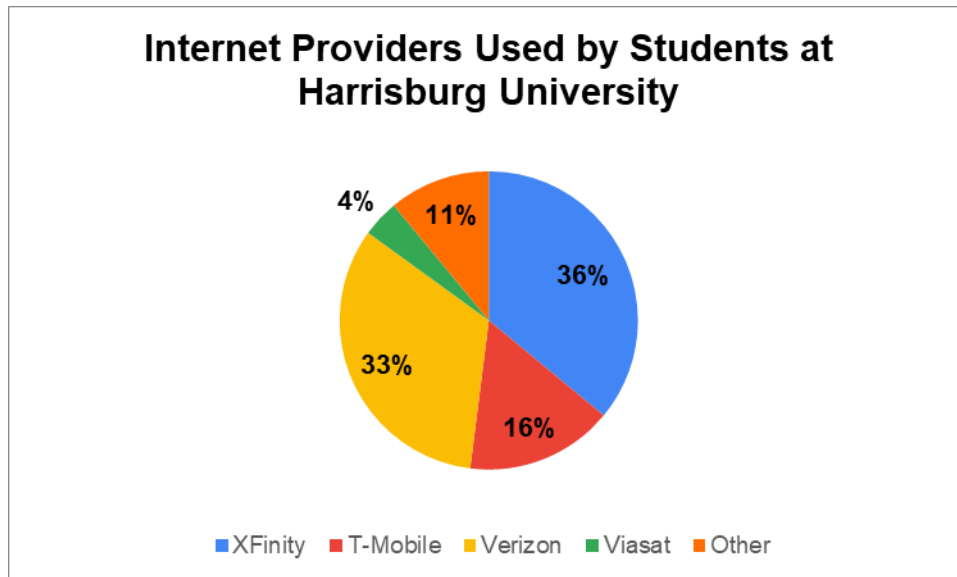participants were 18-20, and 22 participants were older than 20.

Figure 2. This Figure shows a pie chart showing the percentage of students who chose

different internet providers. It shows XFinity was chosen by 33 percent of students, Verizon by

33 percent, T-Mobile by 16 percent, Viasat by 4 percent, and the other 11 percent of students

used a different unspecified internet provider.

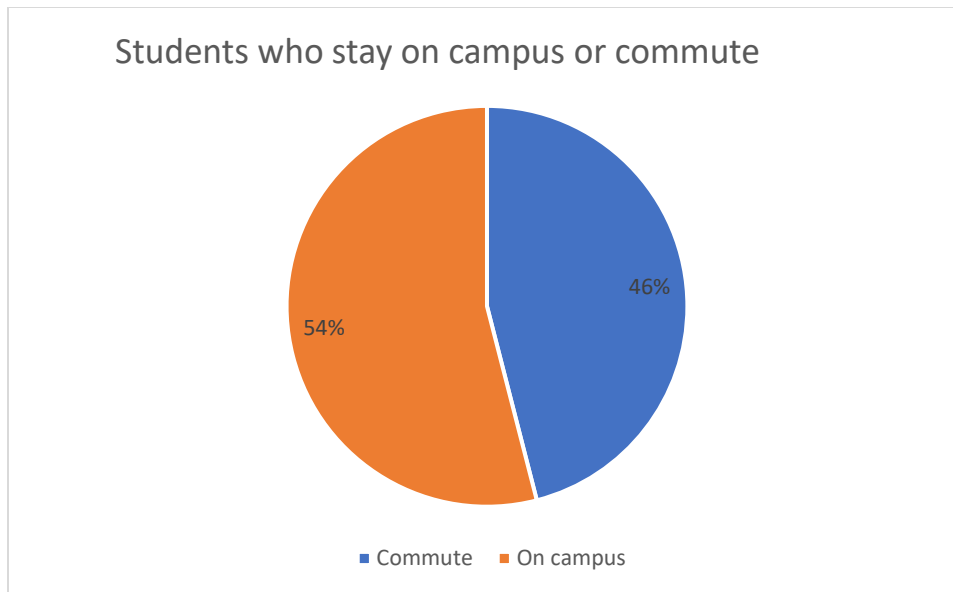Students who stay on campus or commute

46%

54%

■ Commute ■ On campus

Figure 3. This pie chart provides the percentage of participants that either commute or live on campus. Just over half of the respondents lived on campus at 54 percent. The other 46% were participants that did not live on campus and commuted to Harrisburg University.

Table 1. This table shows the range of prices that students paid monthly for their internet services.

Price Paid Monthly	Count
$0-$65	52
$66-$85	25
$86-$120	17
$121-$180	3
$181-$290	3

TOTAL	100

Table 2. This table shows the number of students who chose a number 1-10 on how satisfied they are with their internet speed.

How Satisfied? Scale of 1-10	Count
1	1 Student
2	3 Students
3	1 Student
4	2 Students
5	7 Students
6	6 Students
7	11 Students
8	38 Students
9	13 Students

10	18 Students
TOTAL	**100 Students**