

Darren Chang
Shiyin Liang
Anthony Martinez

Homework 2

Introduction

For many students, video games are a large part of their lives. Incorporating video games into education may make learning more exciting for students and incentivize them to spend more time on classwork. A UC Berkeley statistics class had the same idea and wanted to incorporate video games in labs. To help design these new labs, a lower division statistics class was given a survey about their video game playing habits and general student information. We will be using this dataset to provide useful insight to the designers of the new computer labs.

The survey was given to students in a statistics class at University of California Berkeley during Fall 1994, a week after their midterm. Out of 314 students in the statistics class, there are 91 completed surveys from 95 randomly selected students. The first part of the survey focuses on the hours spent playing video games during their midterm week and other general questions. The second part of the survey focuses on what they liked or disliked about video games.

We determined that why people play video games, the amount of time they play, and who plays are the most important conclusions obtained from the data analysis. The information that we find from these conclusions would be given to the design committee in order to aid them with designing a new computer lab. Through our advice they would be able to improve infrastructure and appeal to a wider audience in order to traffic more people to the computer lab.

The rest of this paper will go over five different scenarios of analysis that allowed us to reach this conclusion. Similarly, there will be a discussion focused on the meaning of these results and future proposals for this project.

Analysis

1. Proportion of Students that Play Video Games During the Week of Midterm

Point Estimate

First, we found the point estimate of students that play video games during the week of the midterm by splitting the dataset obtained by videodata.txt into students who didn't play video games (rows where time was 0) and students who did play video games (rows where time was not equal to 0). We found that 37% of survey takers played some amount of video games during the week of the midterm. However, this point estimate only gives information about our sample and cannot be generalized to the class as a whole.

Confidence Interval

To find the proportion of students who played video games the week of the midterm in the whole class, we will create a 95% confidence interval. First, we made a histogram¹ of 400 bootstrap samples from a bootstrap population and verified that it is indeed normal through a qq plot². After, we found the 95% confidence interval to be [0.27 0.47]. This interval indicates that the proportion of students who played video games the week of the midterm in the whole class is somewhere between 27% to 47%.

Figure 1:

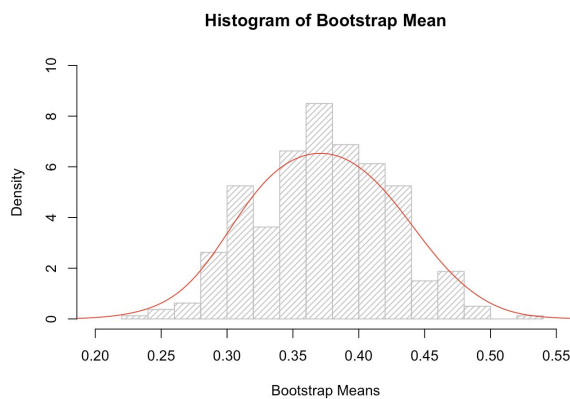
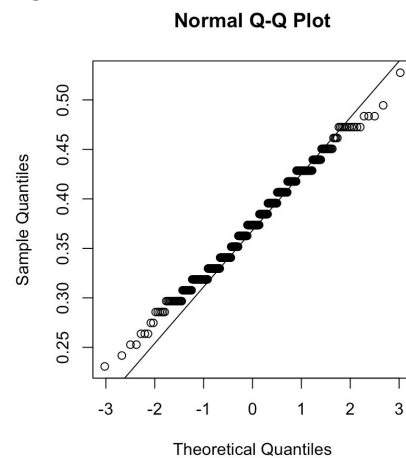


Figure 2:



Conclusion

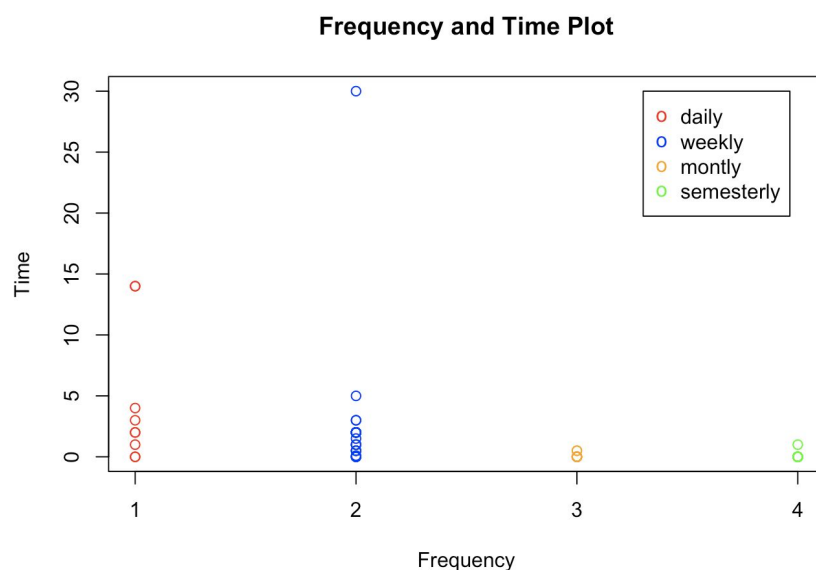
A significant portion of the class played video games during the week of the midterm. This may suggest that students are able to play games regardless of their course load for various reasons, ranging from not caring to having a lot of time on their hands because the class is easy. Introducing video games into their labs may help redirect their time from playing video games to studying for this class if they were able to derive their need for game time by studying instead of wasting time on non-school related games.

2. Time Spent Playing Video Games during Week of Midterm Vs. Frequency of Playing Video Games Overall

Amount of time spent playing video games during the week of midterm compared to the frequency of play.

From our scatter plot³, we see that daily and weekly players played more hours of video games than monthly and semesterly players the week before the midterm. This is expected since players would be less likely to postpone their playing time to the week after the midterm if they play daily or weekly. Also notice that besides a few outliers, most students played 5 or less hours of video games during the week of the midterm for daily and weekly players and monthly and semesterly players played an hour or less.

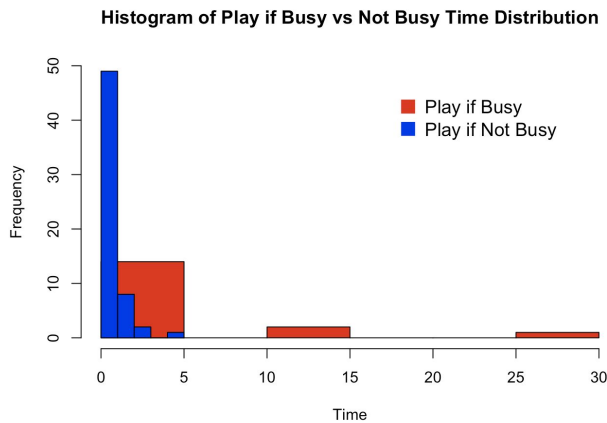
Figure 3.



Effect of Knowing there was a Midterm Week Prior to Survey

We suspect that some students would play less than they would normally or not at all if there is an important test coming up. If our suspicion is correct, our previous point estimate of 37% students playing video games during midterm week would be lower than a point estimate of students playing video games during a week with no midterms. A confidence interval for students playing video games during a week with no midterms would also be higher than our previous confidence interval. The data points on our scatter plot would also be shifted up. We created a bar chart to compare the amount of time spent on video games the week of their midterm for students who would play if they were busy with a midterm (rows where busy = 1) with the students who wouldn't play if they weren't busy with a midterm (rows where busy = 0). The bar chart⁴ shows that most students who said they wouldn't play if they were busy indeed did not play at all during the week of the midterm while a few played 5 hours or less. Additionally we also found that students who said that they would not play if they were busy made up 78% of the sample.

Figure 4.



Conclusion

Students who play daily or weekly are the ones that play the most during the week of the midterm. Although our point estimate and confidence interval for the fraction of students who would play video games during the week of a midterm seems quite high, the majority of students in this survey also claim that they won't play games if they are busy and most follow through with no hours of game time.

3. Average Amount of Time Spent on Video Games the Week of Midterm

Interval Estimate for Average Amount of Time Spent Playing

From the histogram⁶, we can see that the distribution of time spent on video games is not normal but right-skewed and unimodal. Since the outliers at the right tail will inflate our interval estimate, we ran a simulation study to see if we can generate a normal distribution to calculate a confidence interval from. The qq plot⁷ for our bootstrap samples appears to verify its normality so we calculated a 95% confidence interval of $[0.49, 2.00]$. Thus, if we were to find the average amount of time spent on video games the week of the midterm in the whole class, the average is likely somewhere between half an hour to 2 hours. We also see from the histogram⁶ that there are a few outliers: an individual who played 30 hours of games and two who played 14 that are driving up the average. This will affect the bootstrap means.

Figure 6.

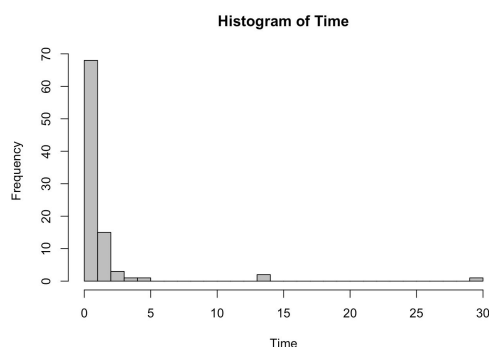


Figure 7.

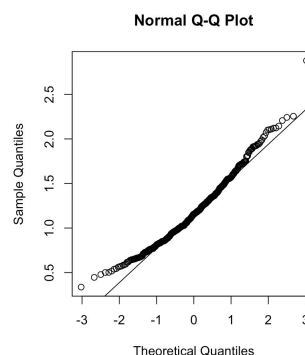
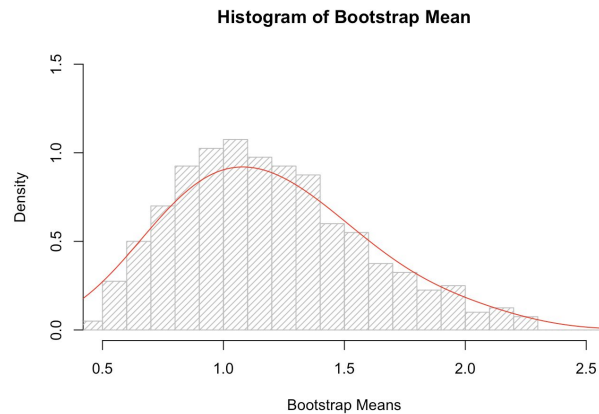


Figure 8.



Conclusion

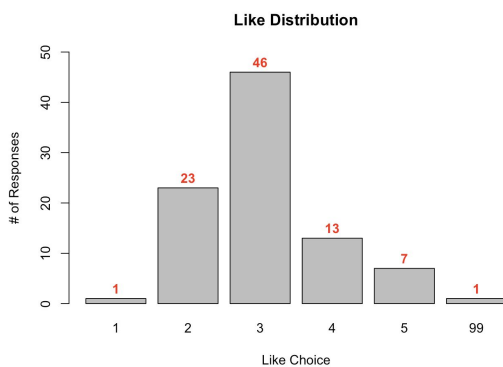
Like we suspected earlier, most students that did play video games during the week of the midterm did not spend much time playing games. Playing for half an hour and up to 2 hours is a low amount compared to the span of a whole week and should not impact the student's ability to adequately prepare for the midterm. Knowing this, our earlier confidence interval that 27% to 49% of students playing video games during the week of the midterm is not so high considering that the students who are part of this estimate are playing only half an hour to 2 hours of video games in the span of an entire week.

4. Student Attitude on Video Games

In general, do students enjoy playing video games?

We define "enjoy playing games" by the survey responses "2"--which represents very much like to play--and "3"--somewhat like to play--to the question if they like playing video games. From the frequency bar chart⁹, we can see that "2" and "3" are the most popular responses. The proportion of people who like to play video games make up 76% of the survey respondents whereas people who don't like to play make up 24%. It is evident that, in general, the students in this class do enjoy playing video games.

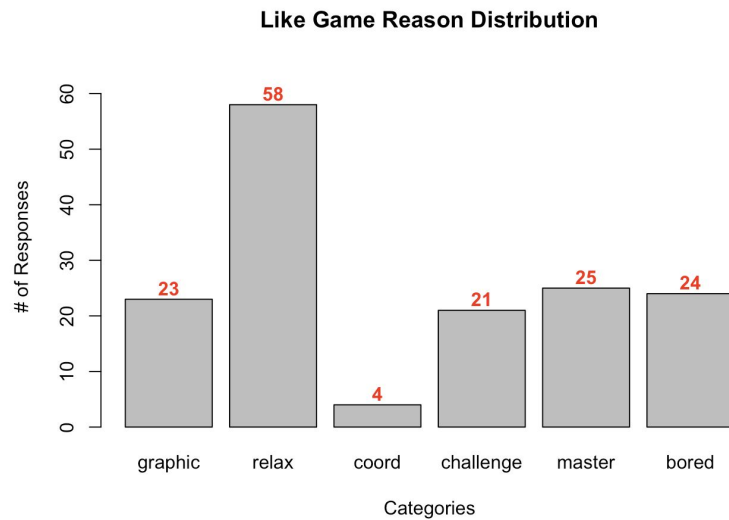
Figure 9.



Most important reasons why students like or dislike video games

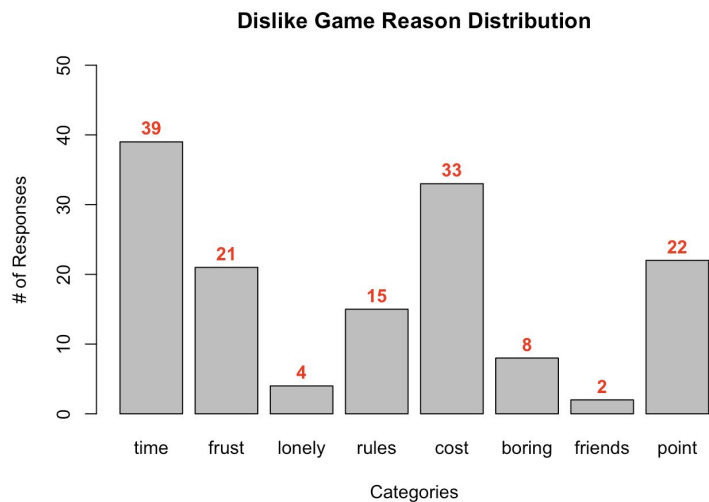
Respondents that had never played a video game or did not like playing video games at all were asked to skip questions in the second survey so we found the indexes that answered 1, 5 or 99 from the first part of the survey (videodata.txt) and filtered those indexes out in the second part of the survey. This left 82 viable responses. Considering respondents were asked to pick their top 3 reasons for liking video games from a list, we can interpret the bar chart¹⁰ results as that 70% of respondents included relaxation as their top 3 reasons for liking video games. Feelings of mastery and boredom are the next most popular reasons students like video games.

Figure 10.



Similarly, the top factor that causes students to dislike video games is that it takes too much time. The other top 2 reasons are that it costs too much and is pointless¹¹.

Figure 11.



Conclusion

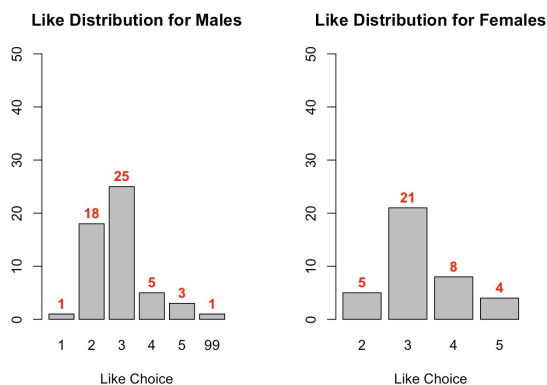
Students in this class tend to like video games and their top reasons for enjoying video games is for relaxation, feelings of mastery and as a way to cure boredom. On the other hand, they dislike that video games consume too much time, cost too much money and can be pointless. Thus, a possible explanation for why as much as half of the class play video games during the week of the midterm is that they want a way to destress from studying. The other half may not play video games because they find that it consumes too much time, time that could have been spent studying instead.

5. Differences Between those who like to Play Video Games and those who don't

Comparison between Females and Males

From the frequency bar chart¹², we see that for both males and females, “3”--somewhat like to play-- is the most popular choice. However, for males, “2”--very much like to play-- is the second most popular while, for females, “4”--not really like to play-- is the second most popular. All in all, using our prior definition of enjoying video games, the proportion of males that like video games--81%--are higher than the proportion of females that like video games--68%. This is unsurprising as there is a bigger culture of video games amongst males than females even today.

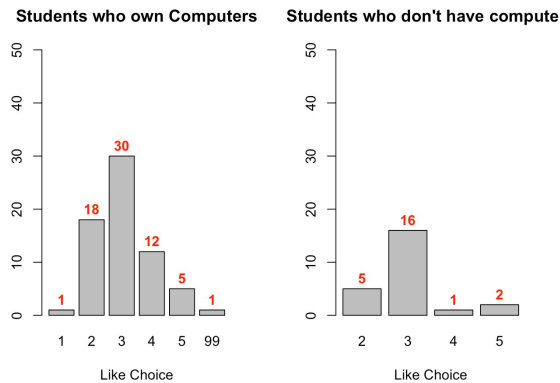
Figure 12:



Comparison between Students who Own PC's and Students who Do Not

From the frequency bar chart¹³, responses “2” and “3” were the most popular choices for both groups; both students with computers and without PC's like video games in general. Interestingly, the proportion of students that don't own PC's and like video games--88% is higher than the proportion of students that own PC's and like video games--72%. We guess that PC owners could be more competitive and serious gamers than non-PC owners and thus video game brings more stress and less enjoyment for them. Also notice that while most students in the sample own PC's, there is still a considerable amount of students--24-- who don't which raises the question how video games labs should be designed to accommodate those that own macs or no computers at all.

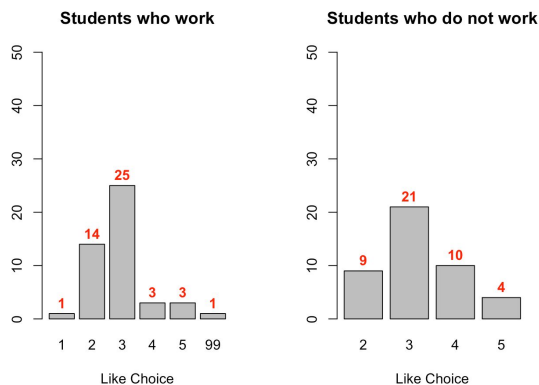
Figure 13:



Comparison between Students Who Work for Pay and Students Who Do Not

From the frequency bar chart¹⁴, we see that again, “3” is the most popular choice for both groups. However, 82% of students who work for pay enjoy video games while 69% of students who do not work enjoy video games. We suspect that this might be because work for pay are more stressful than volunteer jobs and thus students who work for pay need an outlet to destress. From our previous finding that a top reason why students do not like video games is the cost of video games, we also speculate that students who work for pay may be able to afford video games more than those who do not and thus have more experience playing games to develop a liking to them.

Figure 14:



Conclusion

We can conclude that male students have a higher frequency of liking video games compared to female students, non PC owners have a higher frequency of liking video games than PC owners and students who work for pay have a higher frequency than students who don't work for pay. If the point of incorporating video games into students' learning environments is to encourage their incentive to learn, the designers of the labs will have to design the labs in a way that appeals to video game lovers and non video game lovers

alike. The labs should appeal to females as well as males, be runnable on both PC's and Macs and easily accessible to those who don't have their own personal computer, and have low learning curves to accommodate those who do not have much experience playing video games.

Advanced Analysis: Kruskal-Wallis Test

We decided to run a Kruskal-Wallis Test on the follow up data to determine if the different reasons for liking/disliking video games have similar or dissimilar distributions. The Kruskal-Wallis test is the non-parametric version of an analysis of variance. We do this since the follow up data is ordinal. Similarly, we use this test if a collection of data samples are independent if they come from unrelated populations and the samples do not affect each other. Without assuming the data to have normal distribution, test at .05 significance level if reasons for liking/disliking video games has identical data distributions. The null hypothesis is that the different reasons have identical distributions. The p-value obtained from the test is 0.02366 which is less than .05, so we reject the null hypothesis. We can conclude that the different reasons for liking/disliking video games have non-identical distributions.

Conclusion

The Kruskal-Wallis test is important because it lets us know that there are more significant reasons for liking/disliking video games than others. This is important to this assignment because we are tasked with finding the most useful information for designers of the new computer lab. Since we discovered that the distributions are nonidentical, it's crucial that each reason is analyzed in order to get the most use out of the given data.

Conclusion

Our objective for this report was to find useful information about the students' habits of gaming so designers of the new computer lab can effectively incorporate video games into the student environment. Alarmingly, what we found was that up to half of the students in the class played video games during the week of the midterm. However, our data also shows that they did not spend a large amount of time on playing. This shows that these most students were responsible with their study schedule and kept their gaming to a minimum. However, the fact that up to half of students chose to play shows that they need a de-stressing activity to relax in the midst of midterms and an activity that makes them feel good about their skills. If we were to combine their learning with video games, they might be able to fulfill their need for relaxation during stressful times and their need for self confidence in studying rather than video games. After looking at the differences between students who like video games and those that don't, we also found that male students, students who don't own PC's, and students who work for pay have the highest frequencies of liking video games in each of their respective groupings. This information is important because it identifies the groups of people that don't enjoy video games as much and allows the lab designers to figure out ways to make the computer lab appeal to the group of students who dislike video games. We also found that an overwhelming amount of students in the survey enjoy video games which makes incorporating video games into a computer lab promising since it will create something students will enjoy while learning at the same time. Our findings show that incorporating video

games has a great potential of promoting excitement for learning, motivate self-studying and how to target the groups that don't enjoy video games to better design these labs for all students.

In the future we can improve this project by generalizing the gaming habits of all students in the week of all important tests. However, we would need to gather data from sources outside of UC Berkeley and from weeks after midterms and finals. Getting grades received instead of just grades expected as a column would be helpful to see how much of a detriment playing any amount of video games the week of a test is. We can see how much of an impact combining video games into learning would help in terms of grades for up to half of the student population.

Appendix

1. <http://acsweb.ucsd.edu/~dj035/Assignment1.html>
2. <http://www.r-tutor.com/elementary-statistics/non-parametric-methods/kruskal-wallis-test>
3. videodata.txt
4. videoMultiple.txt

Contributions

Darren: R code for analysis, added information to the report, proofread report

Shiyin: Wrote analysis for Scenarios 1-4, Wrote part of introduction and conclusion, proofread report

Anthony: Wrote part of the introduction and conclusion, wrote the code for scenario 5 and advanced analysis, wrote the analysis for scenario 5 and advanced analysis