What STA304H5 Lecture Duration is Most Beneficial to a Student's Learning?

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1 Introduction

Instructors and leaders of higher education institutions are always motivated to enhance the learning environment and ability of students to excel in their academic career. The amount of time a student has to sit in a class often contributes to this matter. The duration of lectures that students prefer is the main aspect of this study.

2 Summary of Study

Our study is about the class duration that STA304 students at UTM prefer. With one long class being two to three hours long or several shorter classes, each being an hour long. We also consider other aspects which could potentially contribute to the results we have obtained. A survey was distributed to 32 students from LEC0101 and LEC0102, our main survey question being which of the two duration the students preferred. We also asked which academic year students are in, followed by whether they live on campus or not. Finally, we asked about the number of courses each student is taking for the current semester.

3 Summary of Results

Analysis of the collected data suggests that the majority of current STA304 students prefer having longer, less frequent classes. The difference between the two preferences is about 10% (55% of students for longer, less frequent classes and 45% of students for shorter, more frequent classes). Now, projecting the preference percentages onto the number of students currently enrolled in STA304 (252), we get that about 139 of them prefer longer classes, whereas only 113 prefer shorter classes. Other correlations observed may help explain these results. Looking at only the responses from 3rd year students, 61% of them prefer longer lecture times. Since they also make up more than half of the sample, it certainly helps the case that STA304 students prefer longer classes. The opposite can be said about 2nd year students, however there are not many of them so their impact on the overall preference proportion is minimal compared to the 3rd year students. To summarize, the main result is that the majority of STA304 students prefer less frequent, longer classes rather than

shorter, more frequent classes. Although there is a greater number of people that prefer a less frequent, longer class, there is still a substantial minority that prefers more frequent, shorter classes. Thus, we cannot impose one solution to cover the majority as it will greatly impact the population as a whole.

4 Real World Implications of Results

After seeing the results of the study, we can tell that there is not one clear preference for lecture length by the students. This means that the situation is not a ”one solution fits all”; we cannot assume that one lecture system will be right for all students. There are sure to be downsides to having the wrong lecture system for a student, such as increased chances of them skipping classes and missing out on important material.

When analyzing the results, we can see that students with a heavier course load (more than 4 courses) have a clear preference for length of lectures. The ratio of those students who prefer longer lectures is 11 to 6, which means the current layout is not working for them. A possible reason for this could be that these students do not want to have short lectures with gaps because they want to get their classes over with and study for the rest. We know all the students surveyed are not commuters so this makes more sense as part of their day is taken up by commuting to campus.

5 Hypothetical Business Question

Our business question is how we can improve the learning environment for students enrolled in future STA304 courses at the University of Toronto Mississauga. We did this by surveying how the students view a longer, less frequent lecture duration against a shorter, more frequent lecture duration.

6 Summary of Business Plan

When observing the proportion of the students who preferred multiple, shorter lectures rather than one long lecture, we see the ratio is approximately 45 to 55, given 100 students. Keeping this in mind, we believe our best option to fulfill the students needs, is to have every STA304 course moving forward be split into two sections. The first section will have have one short lecture section that takes place two or three times a week whereas the second section will have one long lecture that takes place once a week.

The reason for splitting lectures into two different sections is because the percentage of students who prefer a shorter class compared to a longer class is very close to 50%. This implies approximately half the students that were sampled believe that their learning is more effective when lectures are kept shorter and spread throughout the week, however the other half of students disagree.

To summarize, we propose all STA304 courses offered at the University of Toronto Mississauga have lecture sections with a different duration. This gives students an option during course selection to select which duration of lecture works best with their schedule and which lecture duration is the most conductive to their learning. We do see some drawbacks with this approach as some professors may not be able to teach both the shorter and longer lecture sections. To counteract that, we propose having multiple professors leading the various lecture sections to ensure there are no conflicts with the learning of the material for students as well as time conflicts for the professors.

7 Conclusion

To conclude, we found that the majority of STA304 students (55%) prefer having a less frequent but longer lecture duration compared to more frequent shorter ones. Also, the majority of these students happened to be in their third year of studies (61%), and these students have a clear preference for longer lectures so their preferences make a big impact on the class as a whole. Because of this evidence, we propose the idea that future STA304 courses should keep a minimum of two

lecture sections, one less frequent but longer and the other more frequent but shorter. Furthermore, to account for this greater increase of lecture sections, we propose that the Statistics Department should invest in a larger teaching stream.

8 Appendix

8.1 Cover Sheet

University of Toronto at Mississauga
Fall 2019
SURVEYS, SAMPLING AND OBSERVATIONAL DATA
STA304H5F L0101

COURSE PROJECT

Final Written Report Due – 25 Nov 2019

All undersigned students have made a significant contribution to this project:

Name (Print)	Student Number	Signature
Thamodh Egodawatte	1004318650	T Egodawatte
Bikramjit Saini	1003977173	Bsaini
Humza Afzal	1004020132	Humza
Khadijah Mosaheb	1004622116	KMosaheb
Daleep Singh	1001694432	DSingh
Pruthvi Palanpurwala	1004183607	Pruthvi

8.2 Consent Form

STA304H5 Fall 2019
Student Consent Form
Appendix B

You are invited to participate in a number of class research projects lead by STA304H5 instructor Dr. Luai Al Labadi.

What will participants be asked to do?
Participants will be asked to complete a number of brief questionnaires. Each questionnaire will consist of 2 to 3 questions, and you may be asked to complete in up to 20 of these questionnaires. The questionnaires may be send and returned by email, or may be completed using pen and paper, or may be completed using oral interviews.

What will you gain by participating?
By participating in this study you will help your peers experience the research process. In addition, participation in this study allows you to gain first-hand experience of the research process. You will learn about asking research questions, experimental ethics, and data privacy – all important topics for a statistician or a researcher.

What happens if you don't want to participate in the study? Or decide to discontinue participation?
You have the right to decline to participate any number of the questionnaires, and to decline to respond to any individual question on a questionnaire, or to discontinue participation at any time, and your decision to participate or not participate will not negatively impact you in any way, it will not affect your achievement in STA304H5 Fall 2019, or any other University of Toronto Mississauga course, or your admission to any University of Toronto Mississauga program. Please note that once a questionnaire has been completed, the data will not be removed from the data analysis for that questionnaire.

How is your right to privacy maintained?
We respect your right to privacy and confidentiality. At no time will the students conducting the projects have knowledge of your student ID. At no time will the Course Instructor or any of your Teaching Assistants be able to connect your questionnaire answers to your identity. The only people who will ever have access to this information will be the group who designed the questionnaire. Immediately after data collection is complete, every group will create an anonymized dataset with all personal information, such as student emails, removed.

All data will be securely kept and protected at all times. Paper questionnaires and consent forms will be shredded in December 2019. All electronic data will be deleted in December 2019.

Do you have any more questions?
If you have any questions regarding this study, please do not hesitate to contact Dr. Luai Al Labadi, Aisstant Professor Teaching Stream in Statistics, Deerfield Hall, Room 3072, 3359 Mississauga Road North, Mississauga, ON, L5L 1C6 or email luai.allabadi@utoronto.ca.

If you feel that you understand the above conditions of participation, have had your questions answered by the researchers, and wish to participate in this study, please check the "I Accept" box on the next page and print your student ID. Then bring that page with you to your lecture on September 21th.

You are invited to participate in a research study conducted by a group of researchers led by Dr. Luai Al Labadi from the University of Toronto Mississauga.

☐ **I Accept**

☐ **I Decline**

Student ID: _____

8.3 Questionnaire

Estimating the Proportion of STA304H5 F 2019 Students who prefer Shorter Lectures

1) **What year are you currently in? (circle your answer)**
   1st Year 2nd year 3rd year 4th year +
2) **Do you live on campus? (circle your answer)**
   Yes No
3) **How many courses are you taking this semester? (circle your answer)**
   1 2 3 4 5 6
4) **Do students prefer one long class per week (2 or 3 hours) or 2-3 shorter classes (1 hour) per week? (circle your answer)**
   1 long class 2-3 shorter classes

8.4 Technical Report

UTM STA304HF Students Preference on Short and Long Lectures

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November 14, 2019

Introduction

Lectures in universities are known to vary in their duration ranging from either shorter lectures (1-2 hours) multiple times a week or a longer lecture (2-3 hours) one to two times per week. Our objective is to estimate the proportion of STA304HF 2019 students at UTM in lecture sections 0101 and 0102 on whether they prefer one long lecture (2 or 3 hours) or 2-3 shorter lectures (1 hour) per week. We hypothesize that the proportion of students that prefer shorter lectures will be larger than those that prefer longer lectures.

Body

Simple random sampling was used in the study according to the following methodology: out of the 12 rows in LEC0101 and 8 rows in LEC0102, a random number generator was used to select 3 rows from LEC0101 and 2 rows from LEC0102. These rows were (2, 8, and 11) and (1 and 2) respectively. We used only 2 rows from LEC0102 since it is held in the Instructional Centre, which has longer rows than LEC0101 which is held in the Davis Building. Using the rows that were selected, we provided a questionnaire to each sampling element (a student) and recorded their response; in total there were 32 elements in our sample with one being a non-response, therefore we neglected it in our calculations.

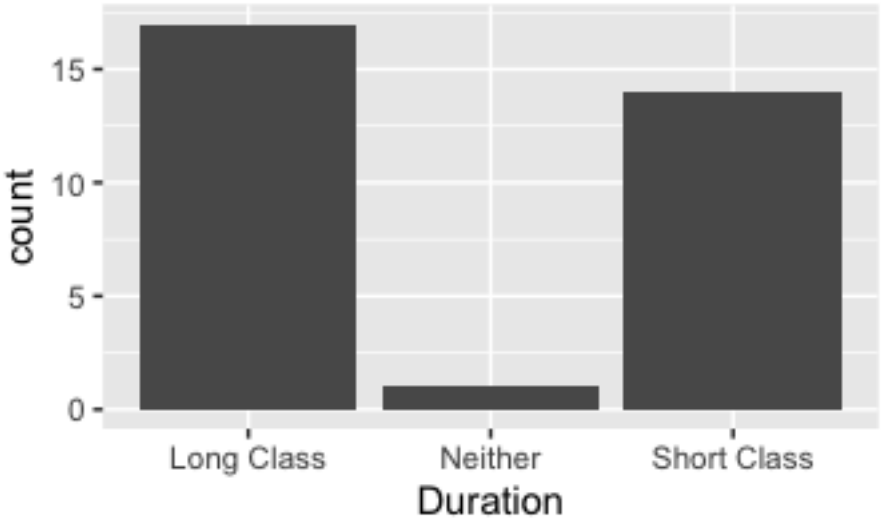
Results

We found out that 14 students preferred multiple shorter lectures and 17 students preferred one longer lecture. Let P and R represent the population proportion of STA304HF students that prefer shorter and longer lectures respectively. Now, we can estimate P and R using the following information obtained through our sample:

$$\hat{P} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{14}{31} = 0.45$$

$$\hat{R} = \frac{1}{n}\sum_{i=1}^{n} x_i = \frac{17}{31} = 0.55$$

Thus we can see that a higher proportion of STA304H students preferred a longer lectures compared to shorter ones.



When we used the formula for estimated variance of the proportion of students who prefer either shorter or longer lectures, we obtained:

$$\sigma^2_{\hat{P}} = (1 - \frac{n}{N})\frac{\hat{P}\hat{Q}}{n-1} = (1 - \frac{31}{250})\frac{0.45 * 0.55}{30} = 0.007$$

Using this estimate, we came up with a bound of error:

$$B = 2\sqrt{0.007} = 0.1673$$

For a 95% confidence interval of the proportion, we used the formula:

$$(\hat{P} - 0.1673, \hat{P} + 0.1673)$$

which makes the interval for students who prefer shorter lectures (0.2827, 0.6173), and the interval for students who prefer longer lectures (0.3827, 0.7173). We can conclude with 95% confidence that the true proportions lie within these ranges.

For estimating what the total number of students preferring each lecture type would be, we first used the following formula:

$$\tau = N\hat{P} = 250 * \hat{P} = 250 * 0.45 = 112.5$$

which gave us 112.5 for students preferring the shorter lecture and 137.5 for the longer lecture (by subtracting from total). Then, we calculated the estimated variance of this estimate as follows:

$$\sigma^2_{\tau} = (1 - \frac{n}{N})\frac{N^2 s^2}{n} = (1 - \frac{31}{250})\frac{250^2 * 0.2561}{31} = 452.3056$$

Note: s^2 was take from the spreadsheet labelled Appendix 1.

The bound of error using this estimate came out to be:

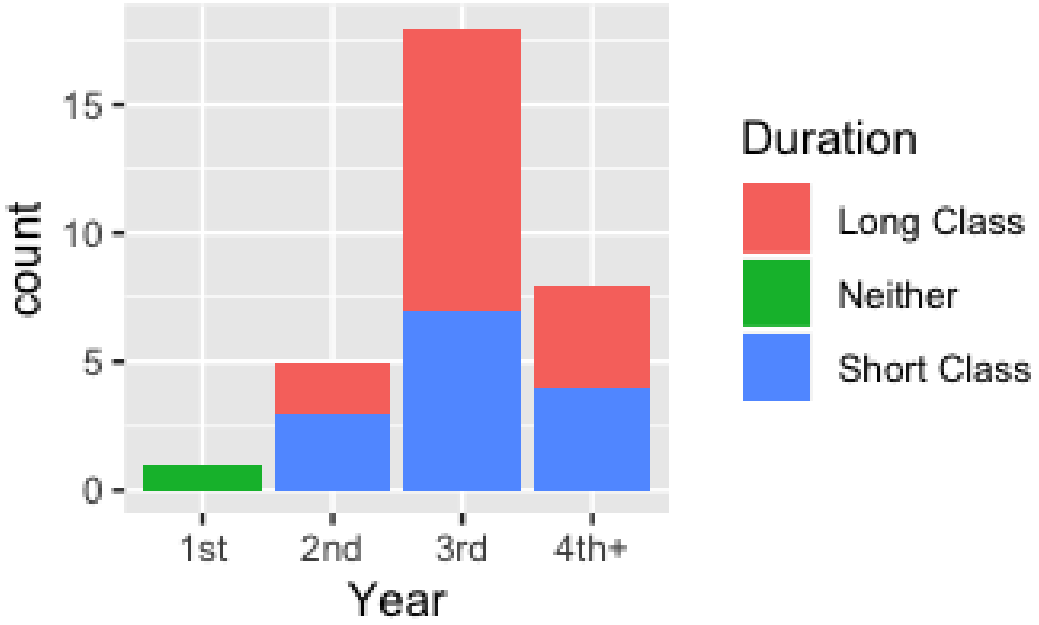
$$B = 2\sqrt{452.3056} = 42.5$$

For a 95% confidence interval of the total, we used the formula:

$$(\tau - 42.5, \tau + 42.5)$$

which makes the interval for students who prefer shorter lectures (70.0, 155.0), and the interval for students who prefer longer lectures (95.0, 180.0). We can conclude with 95% confidence that the true totals lie in these ranges.

With regard to current academic year and preference for short versus long lectures we obtained the following data. Let X,Y,Z represent the proportion of 2nd, 3rd, and 4th year STA304HF students that prefer long lectures respectively (there were no applicable results for 1st year students).



Then their respective proportions of long class preference is as follows:

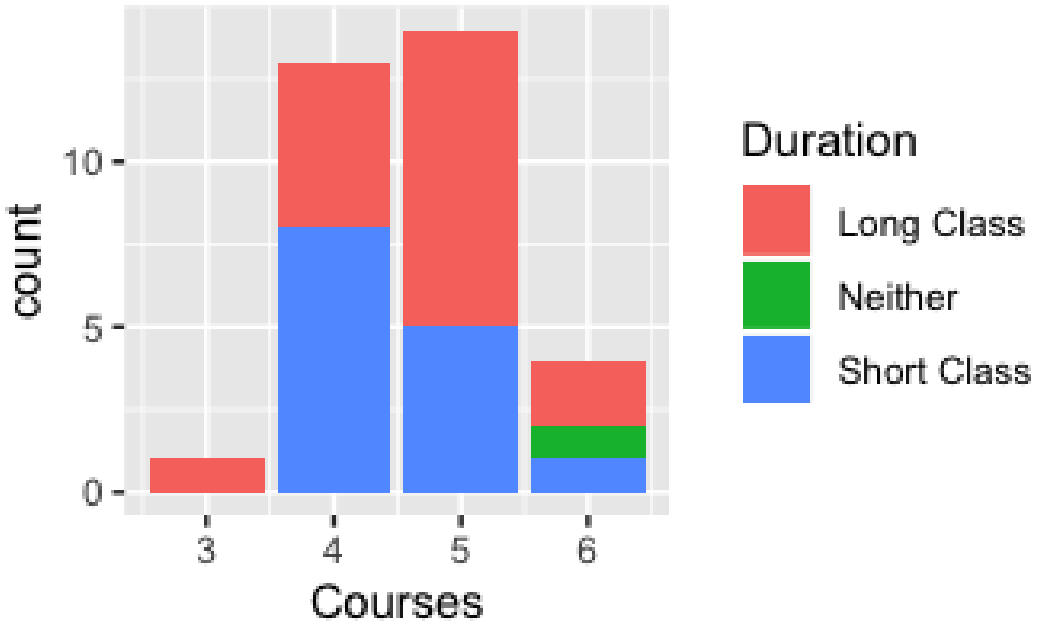
$$\hat{X} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{2}{5} = 0.4$$

$$\hat{Y} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{11}{18} = 0.61$$

$$\hat{Z} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{4}{8} = 0.5$$

Thus, 40% of 2nd year students, 61% of 3rd year students, and an equal proportion of 4th+ year students prefer longer lectures. Since the majority of STA304HF students are in 3rd year ($\frac{18}{32} = 56\%$), the majority of STA304HF students prefer longer lectures.

Lastly, with regard to current academic load and preference for short versus long lectures we obtained the following data. Let F,T,Q,U represent the proportion of STA304HF students taking three, four, five, and six courses who prefer long instead of short lectures respectively.



Then,

$$\hat{F} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{1}{1} = 1$$

$$\hat{T} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{5}{13} = 0.39$$

$$\hat{Q} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{9}{14} = 0.65$$

$$\hat{U} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{2}{3} = 0.67$$

There is not enough students taking three classes to infer to all STA304HF students within the population taking 3 classes. Furthermore, 39%, 65%, and 67% of students taking a 4, 5, and 6 course load within the semester preferred taking longer classes respectively.

Conclusion

In conclusion, the analysis of the data collected by using simple random sampling disagrees with our original hypothesis. Using data from both lecture sections, a larger percent of STA304HF students seem to prefer having less frequent, longer classes (2-3 hours) compared to more frequent, shorter classes (1-2 hours). Although, the difference between both percentages is quite close (55% students preferring longer classes vs. 45% preferring shorter classes). We also observed that the majority of 3rd year students (61%) prefer longer lectures whereas we have the opposite case with 2nd year students (only 40%). In terms of course load, we observed that the majority of students taking 5 courses preferred longer classes whereas students with 4 courses preferred shorter classes. Overall, the proportion of students in STA304HF prefer a longer lecture duration is larger than those that prefer a smaller lecture duration.

8.5 Data Set

Element #	Year	Live on Campus	# of Courses	Class Duration	Short Lecture, Bernoulli Value	Total:	Mean:	Difference from Mean (Bernoulli)	Squared (Bernoulli)	Variance (Bernoulli)
1	2nd	No	5	Long Class	0	14	0.4375	-0.4375	0.19140625	0.2561197917
2	4th+	No	4	Short Class	1			0.5625	0.31640625	
3	4th+	No	6	Long Class	0	Total Courses:	Mean Courses:	-0.4375	0.19140625	
4	3rd	No	5	Long Class	0	149	4.65625	-0.4375	0.19140625	
5	3rd	No	5	Long Class	0			-0.4375	0.19140625	
6	3rd	No	5	Long Class	0			-0.4375	0.19140625	
7	3rd	No	6	Short Class	1			0.5625	0.31640625	
8	4th+	No	4	Long Class	0			-0.4375	0.19140625	
9	2nd	No	5	Short Class	1			0.5625	0.31640625	
10	4th+	No	4	Short Class	1			0.5625	0.31640625	
11	3rd	No	4	Long Class	0			-0.4375	0.19140625	
12	4th+	No	6	Long Class	0			-0.4375	0.19140625	
13	3rd	No	5	Short Class	1			0.5625	0.31640625	
14	3rd	No	5	Long Class	0			-0.4375	0.19140625	
15	2nd	No	4	Short Class	1			0.5625	0.31640625	
16	1st	No	6	Neither	-			-	-	
17	3rd	No	5	Long Class	0			-0.4375	0.19140625	
18	3rd	No	4	Short Class	1			0.5625	0.31640625	
19	3rd	No	5	Long Class	0			-0.4375	0.19140625	
20	2nd	No	3	Long Class	0			-0.4375	0.19140625	
21	3rd	No	4	Short Class	1			0.5625	0.31640625	
22	3rd	No	4	Long Class	0			-0.4375	0.19140625	
23	3rd	No	5	Short Class	1			0.5625	0.31640625	
24	3rd	No	5	Long Class	0			-0.4375	0.19140625	
25	3rd	No	4	Long Class	0			-0.4375	0.19140625	
26	4th+	No	5	Short Class	1			0.5625	0.31640625	
27	4th+	No	4	Short Class	1			0.5625	0.31640625	
28	4th+	No	5	Long Class	0			-0.4375	0.19140625	
29	3rd	No	4	Short Class	1			0.5625	0.31640625	
30	3rd	No	5	Short Class	1			0.5625	0.31640625	
31	3rd	No	4	Long Class	0			-0.4375	0.19140625	
32	2nd	No	4	Short Class	1			0.5625	0.31640625	