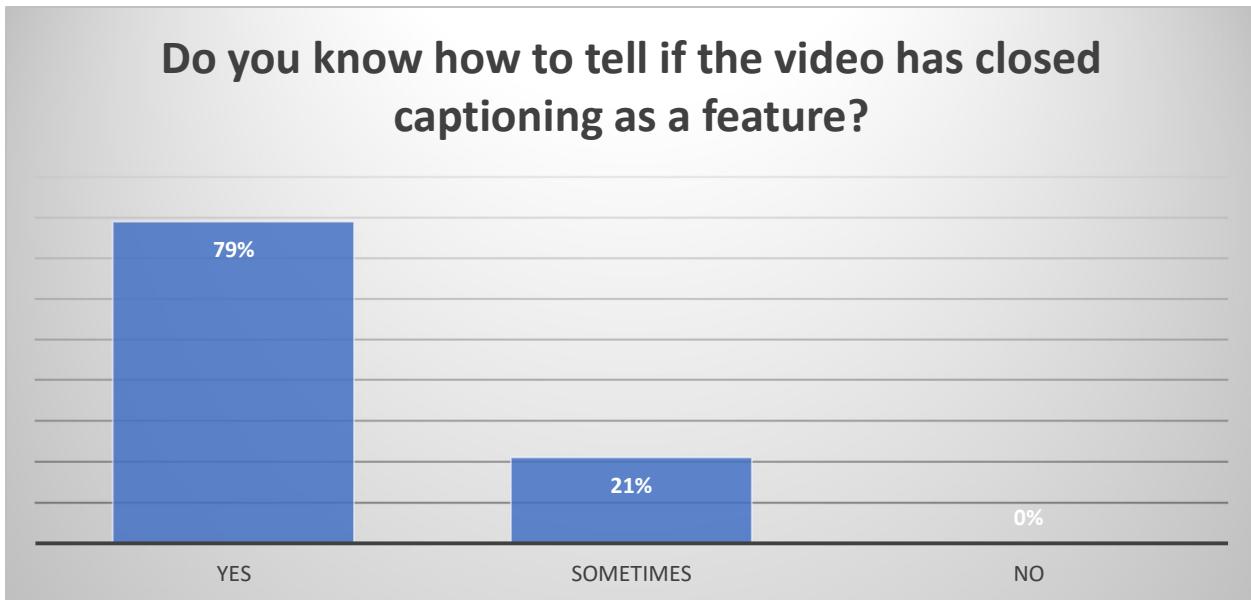


### Preliminary Research Questions:

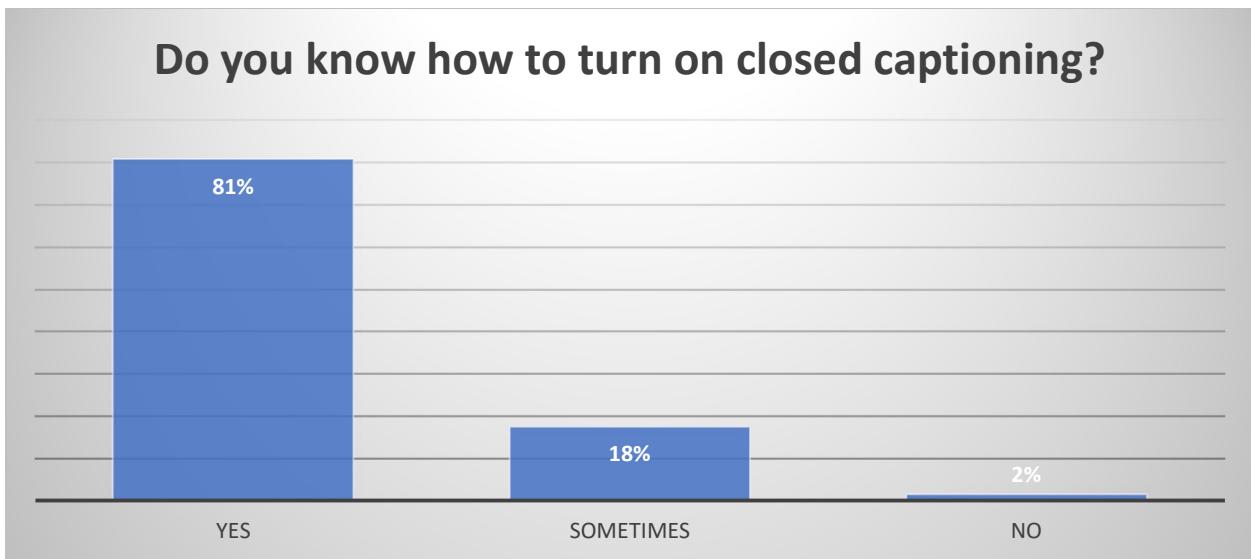
To what extent are students aware of the availability of video closed captions in their courses?

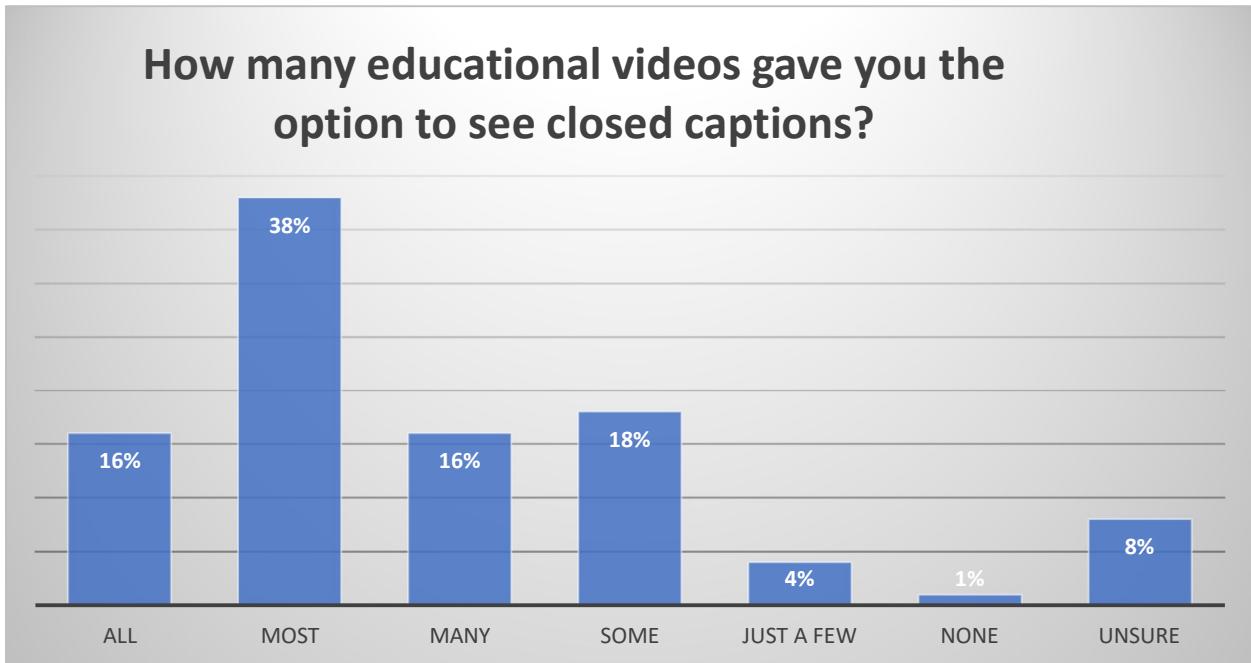
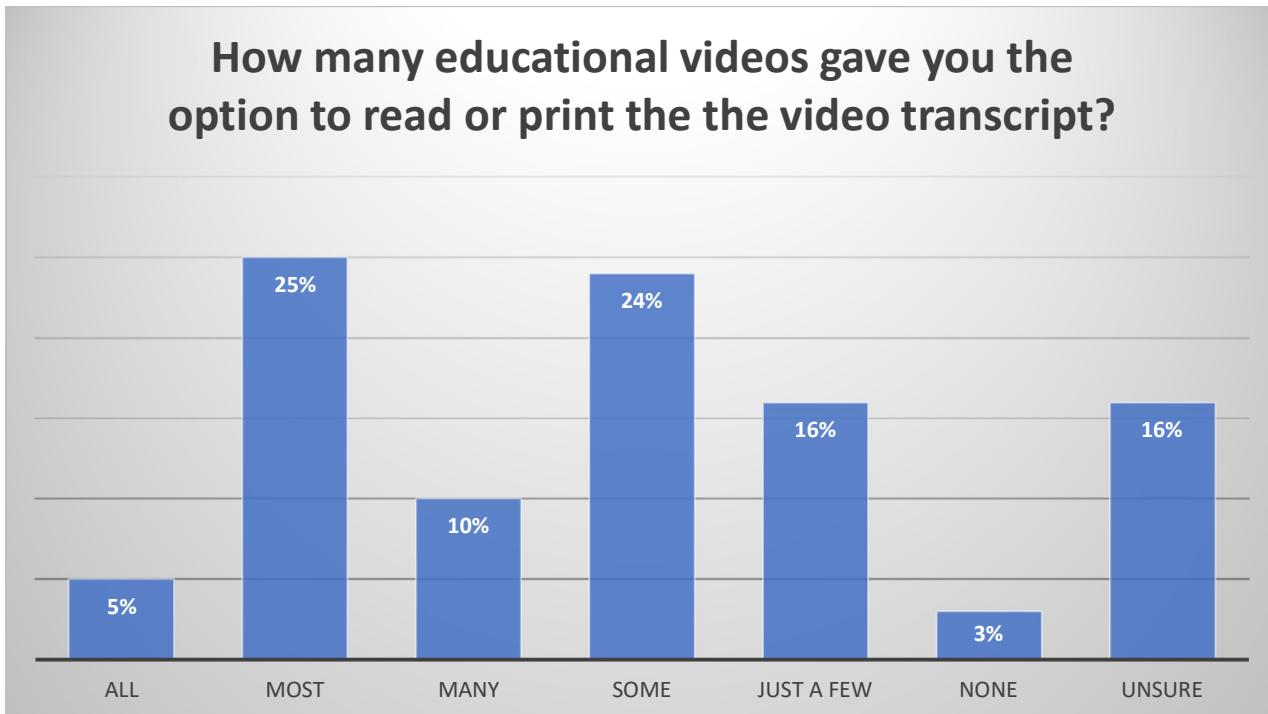
To answer this question, I used responses from questions 13, 14, 15 and 22 from the survey.

#### Question 13



#### Question 14



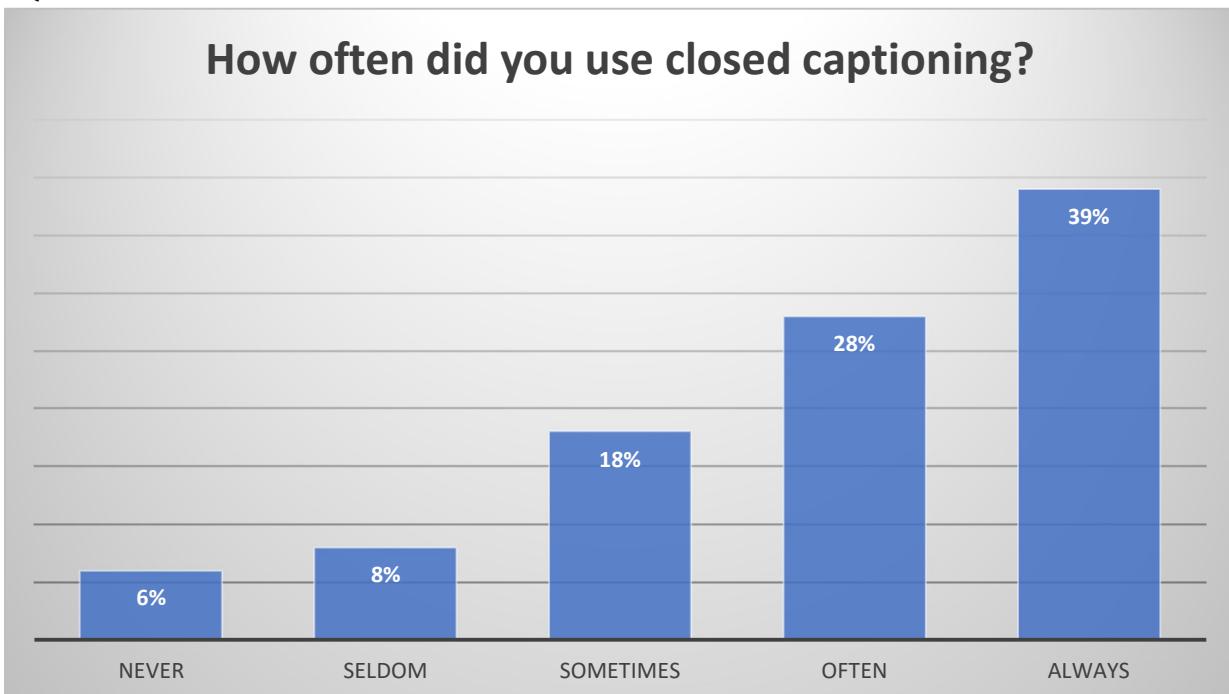
**Question 15****Question 22**

To what extent do various student populations use video closed captions and transcripts?

To answer this research question, I used the responses from questions 16 and 23 from the survey.

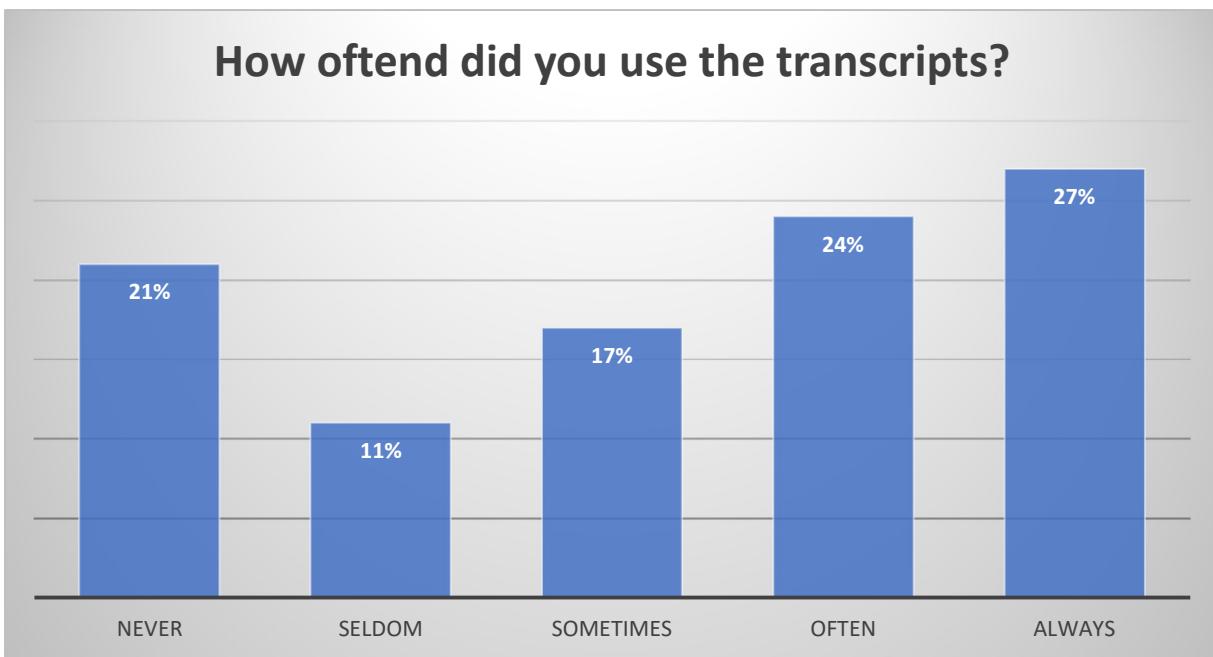
#### Question 16

##### How often did you use closed captioning?



#### Question 23

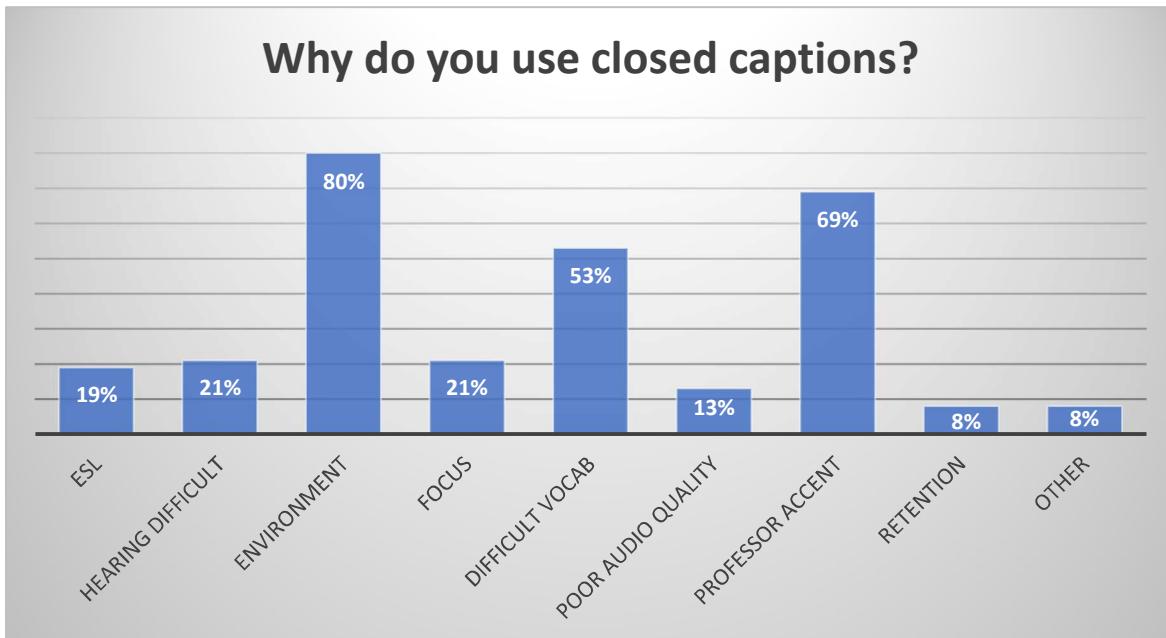
##### How oftend did you use the transcripts?



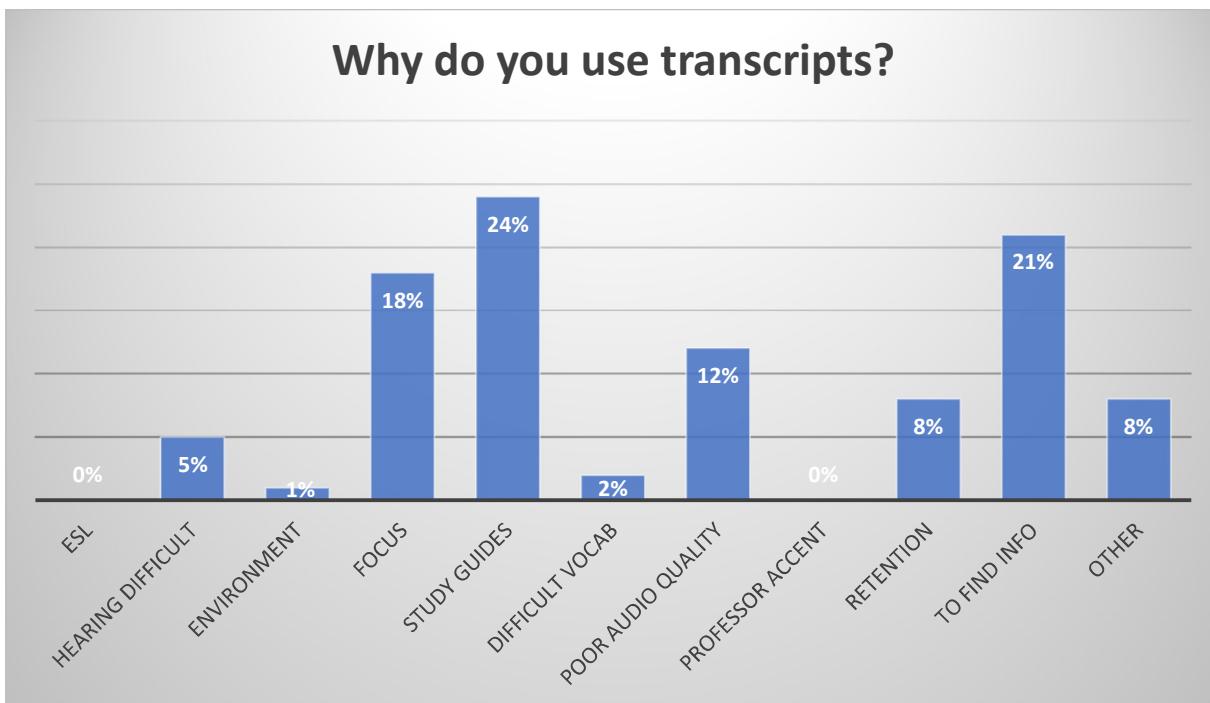
Why do students use video closed captions and transcripts to support their learning?

To answer this research question, I used the responses from question 17 & 24 from the survey.

Question 17 (check all that apply)



Question 24 (check all that apply)



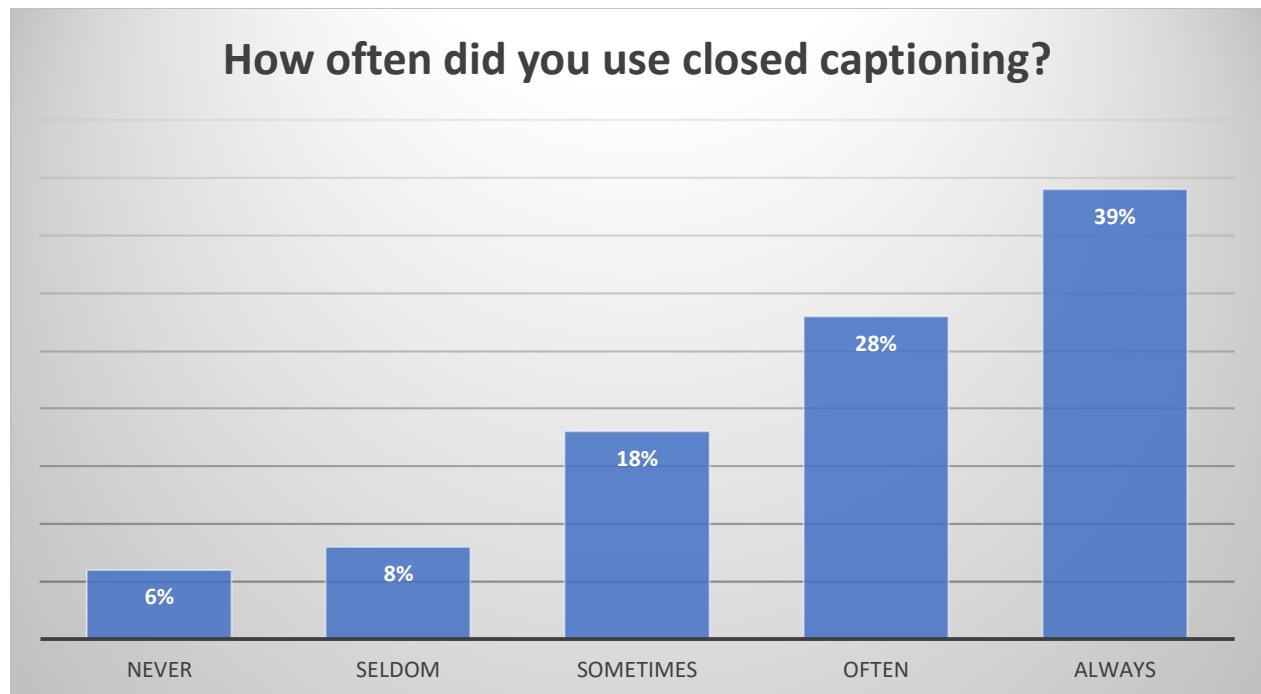
How do students use video closed captions and transcripts to support their learning?

To what extent do various student population perceive the use of video closed captions as potentially valuable to their learning?

For these two questions I would use the responses to questions 19 and 26 from the survey. These two questions provide great typed in responses to the questions so I will not provide bar charts to provide a clearer picture for these two questions.

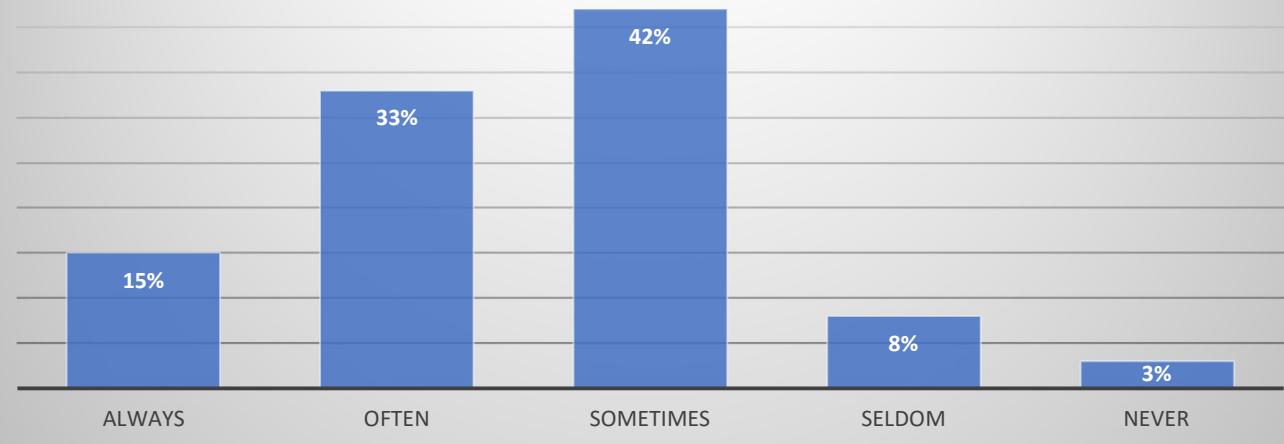
How do students with disabilities compare to students without disabilities in closed caption use?

Question 16

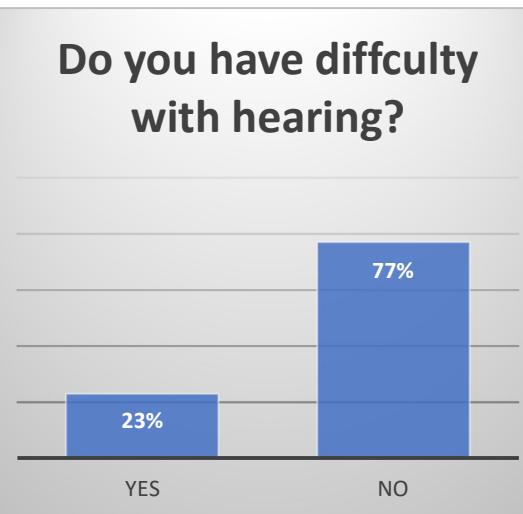


**Question 39**

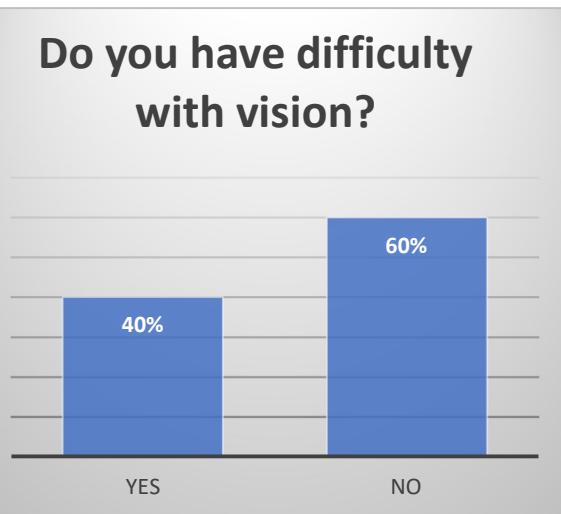
**Do you ever struggle with focusing or maintaining attention in class?**

**Question 40**

**Do you have difficulty with hearing?**

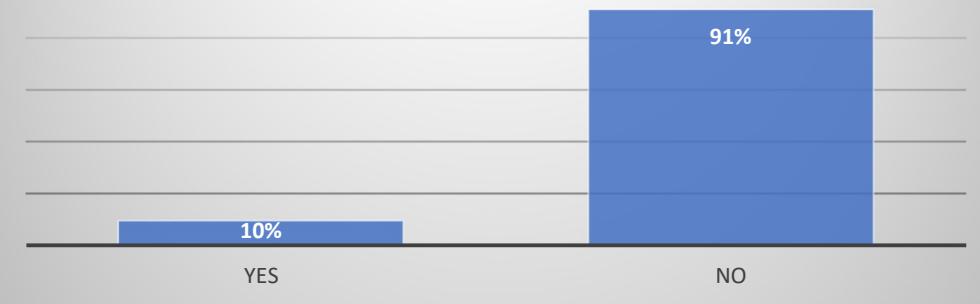
**Question 41**

**Do you have difficulty with vision?**



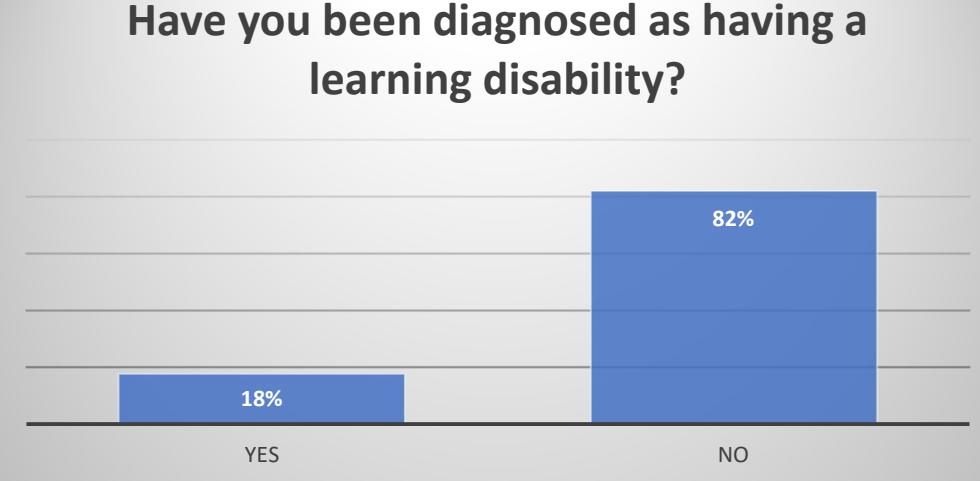
Question 42

**Do you have difficulty understanding  
the content of charts or graphs?**



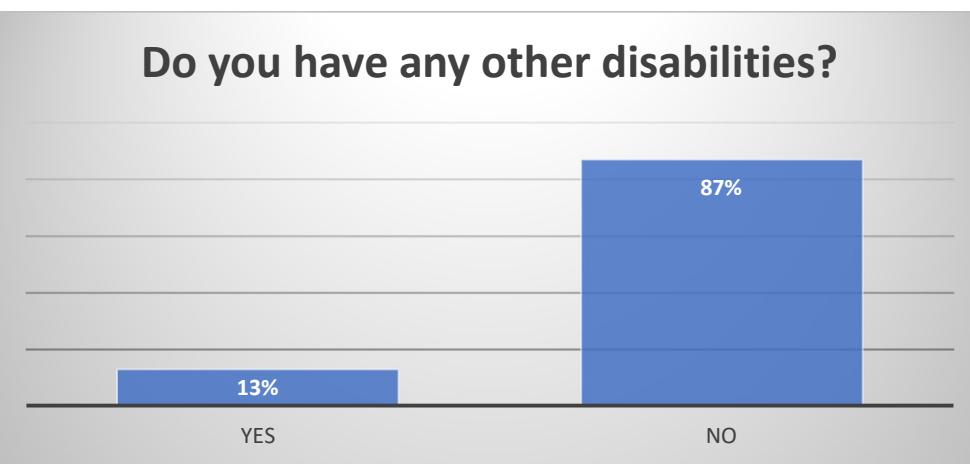
Question 43

**Have you been diagnosed as having a  
learning disability?**

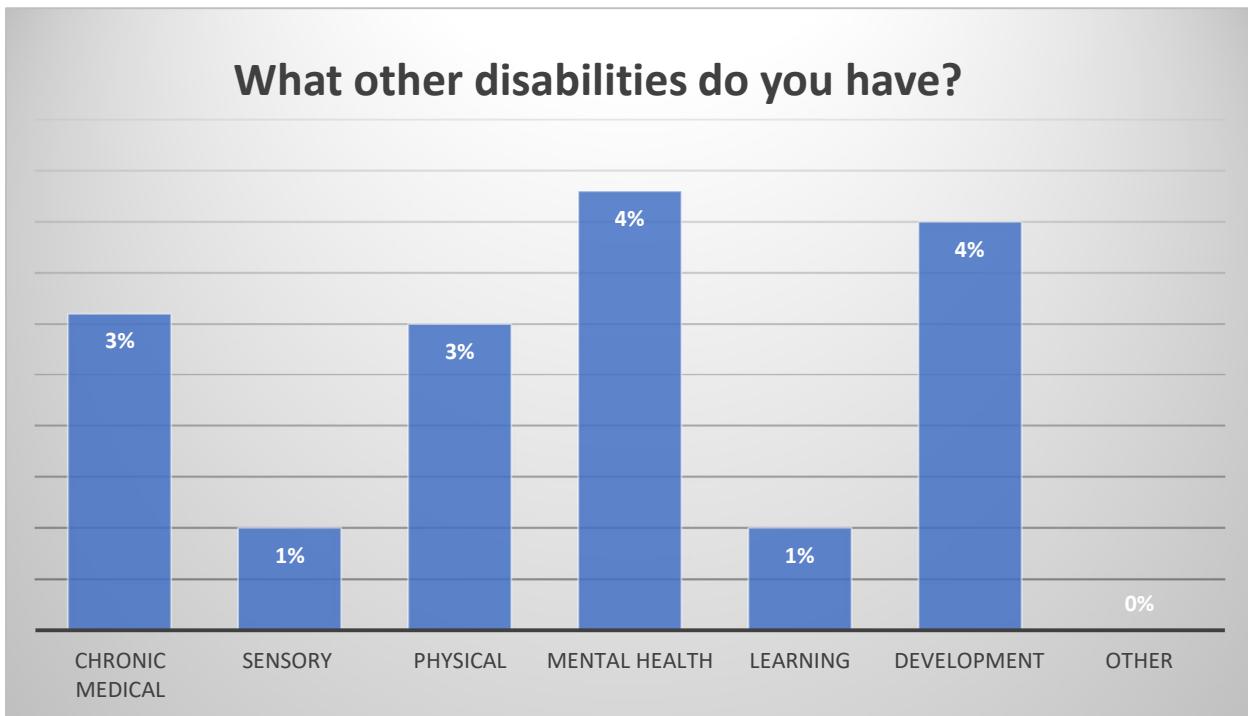


Question 44

**Do you have any other disabilities?**



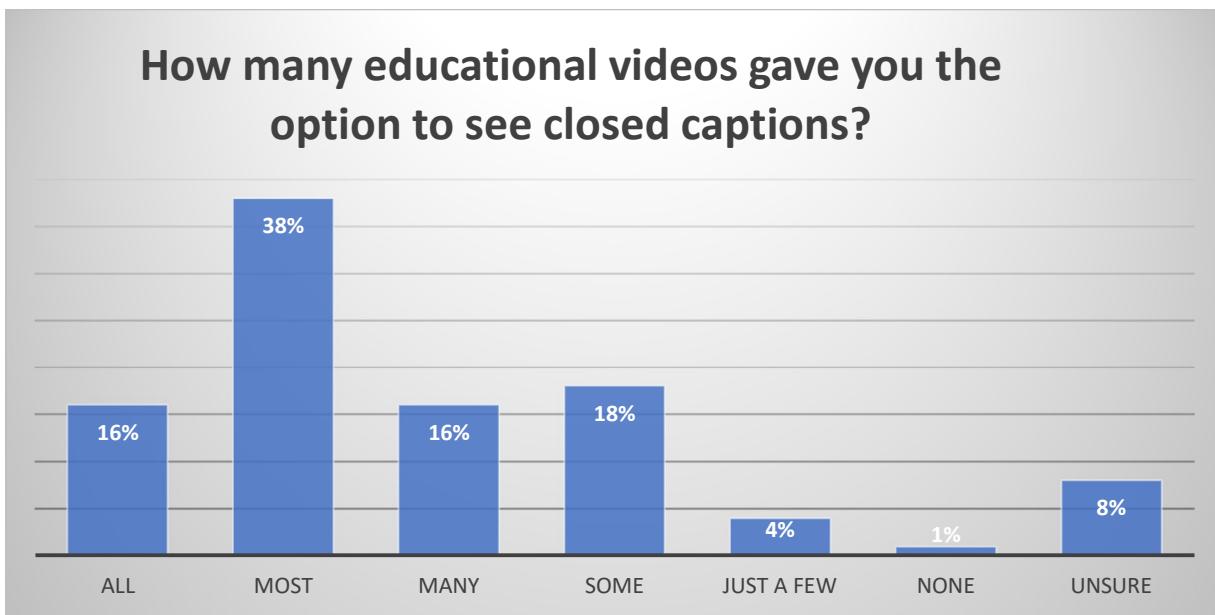
## Question 45



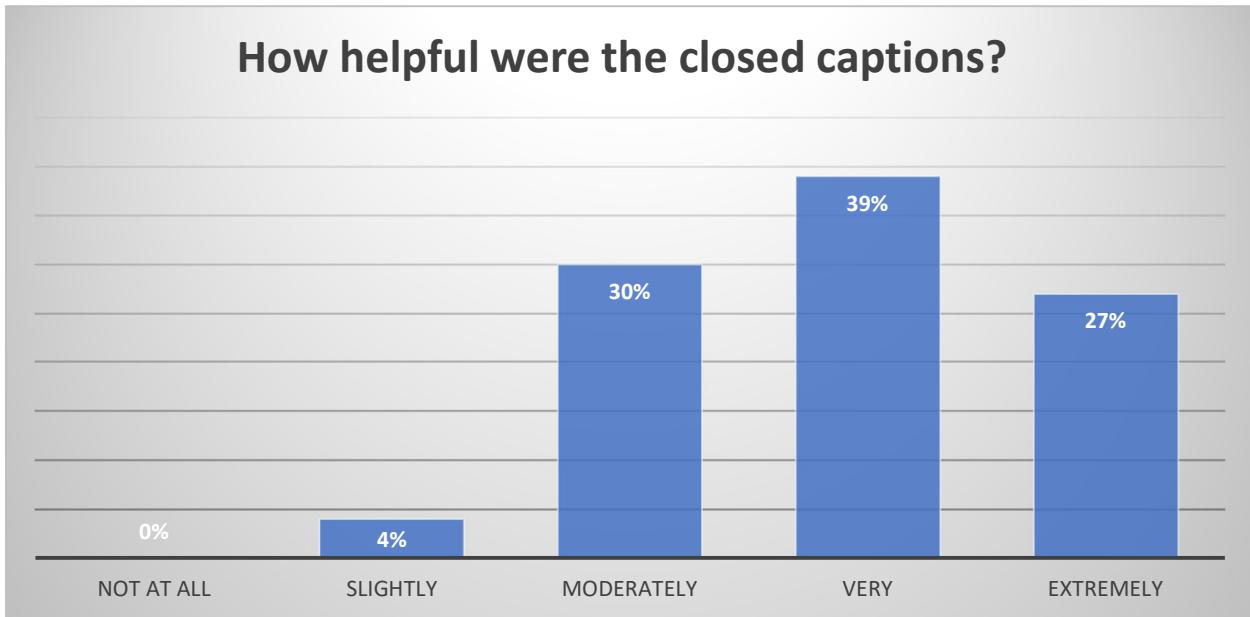
26 counts of some type of disability from a total of 18 students. Some students selected more than one type of disability.

Does the availability of closed captions make a difference regarding how helpful respondents perceive the closed captions to be?

## Question 15

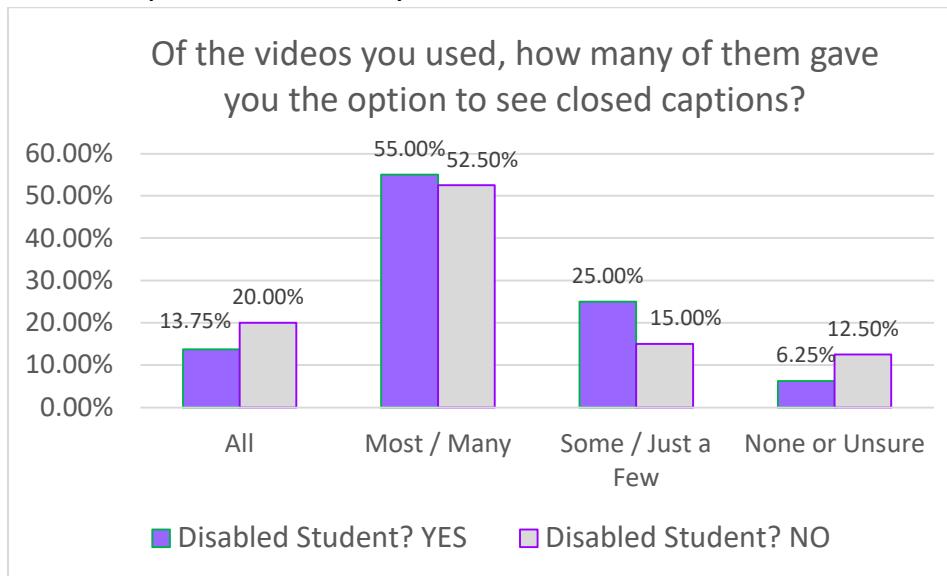


Question 18

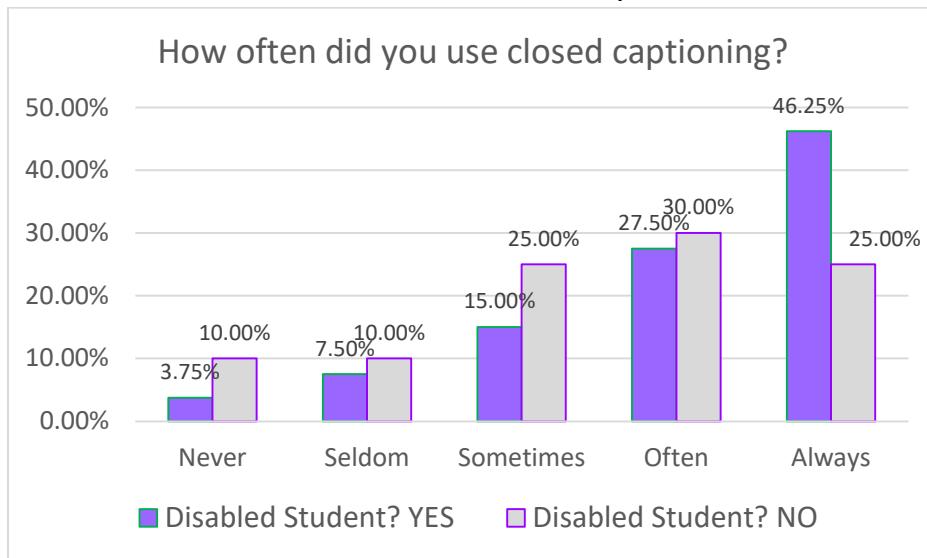


A group of researchers at LSU reached out to the consulting group seeking advice on how to determine if student's responses on a survey differ depending on whether the student has a disability. The questions of interest include:

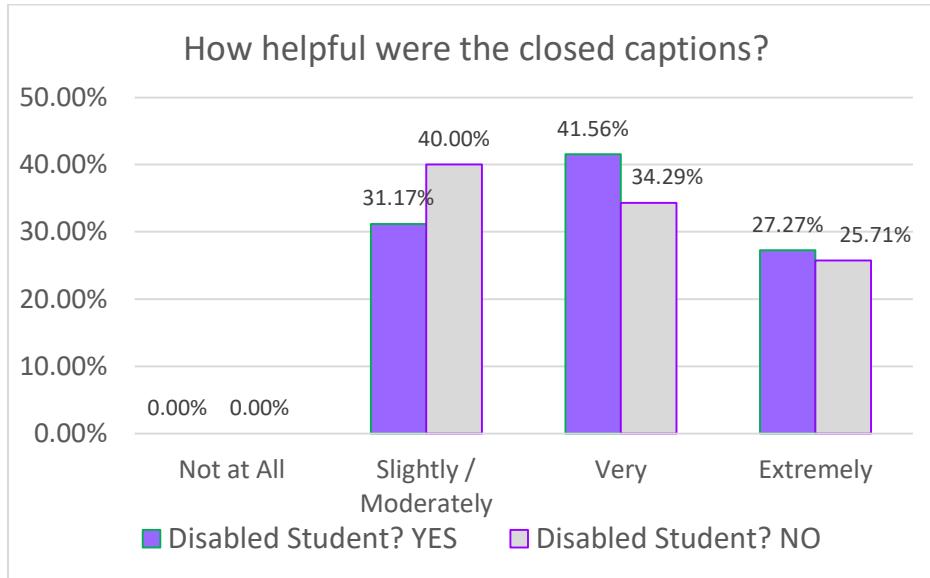
15. Of the videos you used, how many of them gave you the options to see closed captions? All, Many or Most, Some or Just a Few, None or Unsure



16. Of the videos you knew had closed captions how often did you use them? Never, Seldom, Sometimes, Often, Always



18. How helpful were the captions? Not at All, Slightly or Moderately, Very, Extremely



The chi-square test for homogeneity is used to determine if students with and without a disability answered differently on each of these three questions. The assumptions of the chi-square test include:

- ✓ The data in the cells should be frequencies or counts of cases rather than percentages or some other transformation of the data.
- ✓ The levels (or categories) of the variables are mutually exclusive. That is, a particular subject fits into one and only one level of each of the variables.
- ✓ Each subject may contribute data to one and only one cell in the  $\chi^2$ . If, for example, the same subjects are tested over time such that the comparisons are of the same subjects at Time 1, Time 2, Time 3, etc., then  $\chi^2$  may not be used.
- ✓ The study groups must be independent. This means that a different test must be used if the two groups are related. For example, a different test must be used if the researcher's data consists of paired samples, such as in studies in which a parent is paired with his or her child.
- ✓ There are 2 variables, and both are measured as categories, usually at the nominal level. However, data may be ordinal data. Interval or

ratio data that have been collapsed into ordinal categories may also be used. While Chi-square has no rule about limiting the number of cells (by limiting the number of categories for each variable), a very large number of cells (over 20) can make it difficult to meet assumption #6 below, and to interpret the meaning of the results.

- ✓ The value of the cell *expected* should be 5 or more in at least 80% of the cells, and no cell should have an expected of less than one.

### Chi-Square Hypotheses:

$H_0$ : Students with and without a disability answer the survey questions the same.

$H_A$ : Students with and without a disability answer the survey questions differently.

The original question answer choices had some cell counts with low values (or less than 5) and we cannot meet the assumptions of the chi-square test with very small cell counts. So, the research team agreed to combining certain groups to create larger cell counts for individual groups to meet the assumptions of the chi-square test.

Below you will find the contingency table for the counts associated with question 15 of the survey.

**Disabled \* Response Crosstabulation**

		Response					
		All	Many_or_Most	None_or_Unsure	Some_or_Just_a_Few		
Disabled	NO	Count	8	21	5	6	
		Expected Count	6.3	21.7	3.3	8.7	
	YES	Count	11	44	5	20	
		Expected Count	12.7	43.3	6.7	17.3	
Total		Count	19	65	10	26	
		Expected Count	19.0	65.0	10.0	26.0	

In the data below you will find the results of the chi-square test for homogeneity. With a p-value greater than 0.05 we cannot conclude the students with and without disabilities have answered the questions differently. Therefore, we fail to reject the null.

Chi-Square Tests		df	Asymptotic Significance (2-sided)
	Value		
Pearson Chi-Square	3.169 <sup>a</sup>	3	.366
Likelihood Ratio	3.154	3	.368
N of Valid Cases	120		

Below you will find the contingency table associated with question 16 of the survey.

**Disabled \* Response Crosstabulation**

Disabled	NO		Response					
			Always	Never	Often	Seldom	Sometimes	
Disabled	NO	Count	10	4	12	4	10	
		Expected Count	15.7	2.3	11.3	3.3	7.3	
Disabled	YES	Count	37	3	22	6	12	
		Expected Count	31.3	4.7	22.7	6.7	14.7	
Total		Count	47	7	34	10	22	
		Expected Count	47.0	7.0	34.0	10.0	22.0	

With an alpha level of 0.05 I would fail to reject the null that student with and without a disability answered the questions the same. Since our p-value is not less than 0.05 we cannot conclude there is a difference in how students responded to question 16.

**Chi-Square Tests**

		df	Asymptotic Significance (2-sided)
	Value		
Pearson Chi-Square	6.574 <sup>a</sup>	4	.160
Likelihood Ratio	6.623	4	.157
N of Valid Cases	120		

Below you will find the contingency table for question 18. The response not at all was removed from the chi-square test and table because both groups of students had zero responses to not at all.

**Disabled \* Response Crosstabulation**

		Response			Total
		Extremely	Slight_Moderate	Very	
Disabled	NO	Count	9	14	35
		Expected Count	9.4	11.9	13.8
YES	NO	Count	21	24	77
		Expected Count	20.6	26.1	30.3
Total		Count	30	38	112
		Expected Count	30.0	38.0	44.0
					112.0

The chi-square test of homogeneity once again shows that we will fail to reject the null for students who responded to question 18. Students with and without a disability responded similarly to question 18.

**Chi-Square Tests**

		Asymptotic Significance		
		Value	df	(2-sided)
Pearson Chi-Square	.899 <sup>a</sup>	2		.638
Likelihood Ratio	.891	2		.640
N of Valid Cases	112			

In conclusion, we did not find any difference in how students with a disability and students without a disability responded to survey questions concerning their use of closed captions during lecture hours.

As a follow up to the original study comparing students with all types of disabilities, official or unofficial, to students without any type of disability in their use of closed captions during lecture hours, we decided to redefine and retest the groups based on different attributes than in the original analysis of test groups.

- The null hypothesis for each of the tests below is: The defined groups responded the same in the survey to a particular question of interest.
- The alternative hypothesis for each of the test below is: The defined groups responded differently in the survey to a particular question of interest.

The first group is defined as those who have an official disability. Those students who confirmed an official disability responded so in questions 43 to 47 of the survey and were grouped accordingly. The responses to question 15: "Of the videos you used, how many of them gave you the option to see closed captions?" give us a p-value of 0.086. We would fail to reject the null and conclude that respondents from both groups did not respond differently to this question.

However, a p-value of 0.086 is very close to 0.05. Another sample from another university very well may have been found the two groups had responded differently. One suggestion to increase sample size would be to repeat this survey with the graduate population at LSU. A larger sample typically gives a test more precision and power when compared to smaller sample sizes. In general, as long as the sample isn't too big, we find larger samples provide more accurate results when compared to smaller sample sizes.

It should also be noted that we will use the Pearson Chi-square test p-value as a measure of how likely it is that any observed difference between groups is due to chance. If the cell counts are less than 5 in more than 20% of the cells, then the likelihood ratio test will be used as the test statistic.

**Officially\_Disabled \* Response Crosstabulation**

		Response			
		All	Most or Many	None Unsure	
Officially_Disabled	NO	Count	8	45	1
		Expected Count	11.9	42.9	2.0
	YES	Count	10	20	2
		Expected Count	6.1	22.1	1.0
Total		Count	18	65	3
		Expected Count	18.0	65.0	3.0

**Officially\_Disabled \* Response Crosstabulation**

			Response	Total
			Some Just a Few	
Officially_Disabled	NO	Count	20	74
		Expected Count	17.2	74.0
	YES	Count	6	38
		Expected Count	8.8	38.0
Total		Count	26	112
		Expected Count	26.0	112.0

**Chi-Square Tests**

	Value	df	Asymptotic
			Significance (2-sided)
Pearson Chi-Square	6.845 <sup>a</sup>	3	.077
Likelihood Ratio	6.604	3	.086
N of Valid Cases	112		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is

1.02.

The next question asked to these two groups of officially disabled students and students without an official disability is: “Of the videos that you knew had closed captions how often did you use them?” the test provides a p-value of 0.059. Our conclusion with our sample of students for this question is the two groups did not respond differently to this question. However, again this p-value is so close to 0.05. Another sample from a different university may have found the groups responded differently.

**Officially\_Disabled \* Response Crosstabulation**

			Response	Seldom
			Always	
Officially_Disabled	NO	Count	24	6
		Expected Count	31.1	5.3
	YES	Count	23	2
		Expected Count	15.9	2.7
Total		Count	47	8
		Expected Count	47.0	8.0

**Officially\_Disabled \* Response Crosstabulation**

			Response	Total
			Sometimes	
Officially_Disabled	NO	Count	16	74
		Expected Count	12.6	74.0
	YES	Count	3	38
		Expected Count	6.4	38.0
Total		Count	19	112
		Expected Count	19.0	112.0

**Chi-Square Tests**

	Value	df	Significance (2-sided)
Pearson Chi-Square	8.880 <sup>a</sup>	4	.064
Likelihood Ratio	9.103	4	.059
N of Valid Cases	112		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.70.

The responses to the third question of interest for officially disabled students and students without an official disability: “How helpful were the closed captions?” give a p-value of 0.72. With a p-value this high I would not expect another sample from another university to respond differently. We would fail to reject the null hypothesis that the students responded similarly to the questions of interest and conclude that the two groups responded in a similar fashion to this question.

**Officially\_Disabled \* Response Crosstabulation**

			Response	Total
			Extremely	
Officially_Disabled	NO	Count	18	70
		Expected Count	19.6	70.0
	YES	Count	12	37
		Expected Count	10.4	37.0
Total		Count	30	107
		Expected Count	30.0	107.0

### Chi-Square Tests

	Value	df	Significance (2-sided)
Pearson Chi-Square	.661 <sup>a</sup>	2	.719
Likelihood Ratio	.658	2	.720
N of Valid Cases	107		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.37.

The next group we culled from the data set are the students who have difficulty hearing. Depending on how the students responded to question 40 alone allowed us to divide the students into two groups depending on whether they have difficulty hearing.

The responses to question 15: “Of the videos you used, how many of them gave you the option to see closed captions?” give us a p-value of 0.873. Students with and without hearing difficulty responded almost identically for this question. We will fail to reject the null and conclude that students with and without hearing difficulty did not respond differently to this question 15 on the survey.

### Hearing\_Difficulty \* Response Crosstabulation

		Response		
		All	Most or Many	None Unsure
Hearing_Difficulty	NO	Count	14	45
		Expected Count	13.1	46.6
YES	YES	Count	4	19
		Expected Count	4.9	17.4
Total		Count	18	64
		Expected Count	18.0	64.0

**Hearing\_Difficulty \* Response Crosstabulation**

		Response		Total
		Some	Just a Few	
Hearing_Difficulty	NO	Count	20	86
		Expected Count	18.9	86.0
Hearing_Difficulty	YES	Count	6	32
		Expected Count	7.1	32.0
Total		Count	26	118
		Expected Count	26.0	118.0

**Chi-Square Tests**

	Value	df	Asymptotic
			Significance (2-sided)
Pearson Chi-Square	.689 <sup>a</sup>	3	.876
Likelihood Ratio	.701	3	.873
N of Valid Cases	118		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 2.71.

The responses to question 16 for students with and without hearing difficulty: “Of the videos that you knew had closed captions how often did you use them?” give a p-value of 0.349. Again, we would fail to reject the null and conclude students with and without hearing difficulty responded similarly to question 16.

**Hearing\_Difficulty \* Response Crosstabulation**

		Response					
		Always	Never	Often	Seldom	Sometime	
Hearing_Difficulty	No	Count	30	7	24	8	17
		Expected Count	33.5	5.1	24.1	7.3	16.0
Hearing_Difficulty	Yes	Count	16	0	9	2	5
		Expected Count	12.5	1.9	8.9	2.7	6.0
Total		Count	46	7	33	10	22
		Expected Count	46.0	7.0	33.0	10.0	22.0

**Hearing\_Difficulty \* Response Crosstabulation**

		Total
Hearing_Difficulty	No	Count
	Yes	Expected Count
Total	No	32
	Yes	32.0
		Count
		118
		Expected Count

**Chi-Square Tests**

	Value	df	Asymptotic
			Significance (2-sided)
Pearson Chi-Square	4.443 <sup>a</sup>	4	.349
Likelihood Ratio	6.223	4	.183
N of Valid Cases	118		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.90.

The responses to question 18 for students with and without hearing difficulty: “How helpful were the closed captions?” give a p-value of 0.937. We would fail to reject the null and conclude students with and without hearing difficulty did not respond differently to question 18 of the survey.

**Difficulty\_Hearing \* Response Crosstabulation**

		Response				Total
Difficulty_Hearing	NO	Extremely	Slightly	Moderately	Very	
		Count	20	26	32	78
YES		Expected Count	20.6	26.2	31.2	78.0
		Count	9	11	12	32
Total	NO	Expected Count	8.4	10.8	12.8	32.0
		Count	29	37	44	110
	YES	Expected Count	29.0	37.0	44.0	110.0

**Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.131 <sup>a</sup>	2	.937
Likelihood Ratio	.131	2	.937
N of Valid Cases	110		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.44.

The last group of students selected for testing include those students who responded to having difficulty hearing or difficulty seeing. The responses to question 15: “Of the videos you used, how many of them gave you the option to see closed captions?” give us a p-value of 0.62. We would fail to reject the null and conclude that the respondents who have either hearing or vision difficulty responded similarly to those without this hardship.

**Hearing\_Vision\_Difficulty \* Response Crosstabulation**

Hearing_Vision_Difficulty			Response			
			All		Most Many	
			Count	Expected Count	Count	Expected Count
No	Count		9	30	5	
			8.1	29.2	4.0	
	Count		9	35	4	
			9.9	35.8	5.0	
Total	Count		18	65	9	
			18.0	65.0	9.0	

**Hearing\_Vision\_Difficulty \* Response Crosstabulation**

Hearing_Vision_Difficulty			Response		Total	
			Some Just a Few			
			Count	Expected Count		
No	Count		9	11.7	53	
			11.7	53.0		
	Count		17	14.3	65	
			14.3	65.0		
Total	Count		26	26.0	118	
			26.0	118.0		

**Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.755 <sup>a</sup>	3	.625
Likelihood Ratio	1.776	3	.620
N of Valid Cases	118		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 4.04.

The responses to question 16 for students with either vision or hearing difficulty: “Of the videos that you knew had closed captions how often did you use them?” give a p-value of 0.213. We would conclude that students with either difficulty hearing or difficulty with vision responded similarly to those without this difficulty.

**Vision\_And\_Hearing\_Difficulty \* Response Crosstabulation**

			Response				
			Always	Never	Often	Seldom	
Vision_And_Hearing_Difficulty	NO	Count	15	5	17	5	
		Expected Count	20.7	3.1	14.8	4.5	
Vision_And_Hearing_Difficulty	YES	Count	31	2	16	5	
		Expected Count	25.3	3.9	18.2	5.5	
Total		Count	46	7	33	10	
		Expected Count	46.0	7.0	33.0	10.0	

**Vision\_And\_Hearing\_Difficulty \* Response Crosstabulation**

			Response		
			Sometimes	Total	
Vision_And_Hearing_Difficulty	NO	Count	11	53	
		Expected Count	9.9	53.0	
Vision_And_Hearing_Difficulty	YES	Count	11	65	
		Expected Count	12.1	65.0	
Total		Count	22	118	
		Expected Count	22.0	118.0	

**Chi-Square Tests**

	Value	df	Significance (2-sided)	Asymptotic
Pearson Chi-Square	5.720 <sup>a</sup>	4	.221	
Likelihood Ratio	5.819	4	.213	
N of Valid Cases	118			

- a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 3.14.

The responses to question 18 for students with and without hearing difficulty: “How helpful were the closed captions?” give a p-value of 0.985. We would conclude no difference in responses is seen between students with either vision or hearing difficulty when compared to students without this difficulty.

**Difficulty\_Hearing\_Vision \* Response Crosstabulation**

		Response				Total
		Extremely	Slightly	Moderately	Very	
Difficulty_Hearing_Vision	NO	Count	12	16	19	47
		Expected Count	12.4	15.8	18.8	47.0
	YES	Count	17	21	25	63
		Expected Count	16.6	21.2	25.2	63.0
Total		Count	29	37	44	110
		Expected Count	29.0	37.0	44.0	110.0

**Chi-Square Tests**

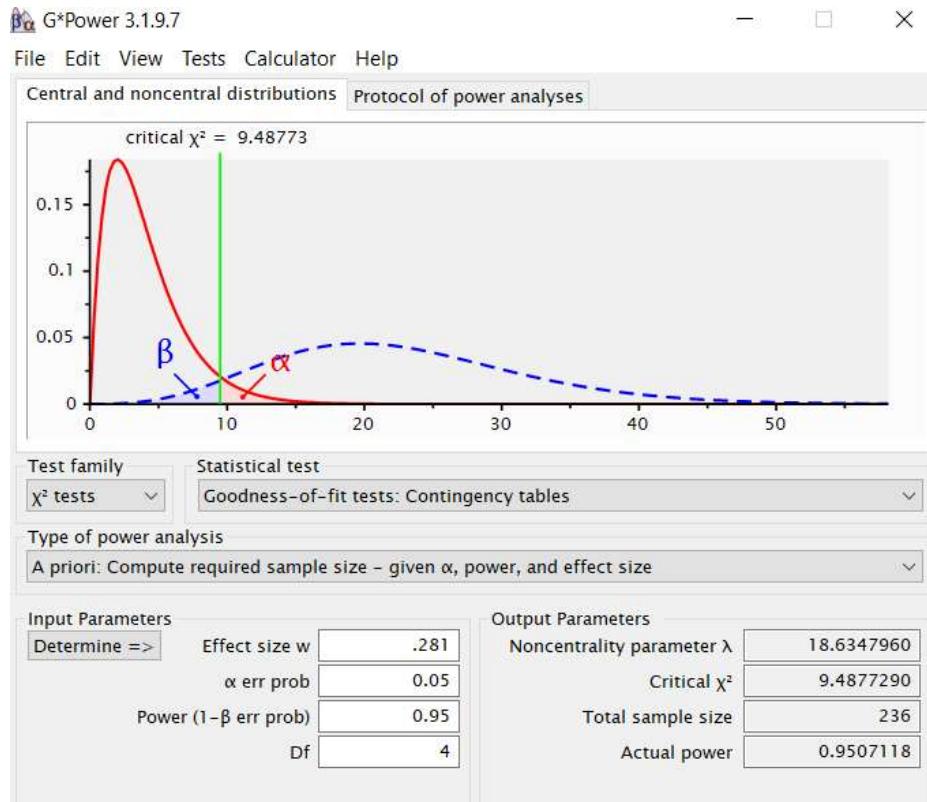
	Value	df	Significance (2-sided)	Asymptotic
Pearson Chi-Square	.029 <sup>a</sup>	2	.985	
Likelihood Ratio	.029	2	.985	
N of Valid Cases	110			

- a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.39.

## Conclusions

In conclusion, all the groups combined and formed in this study were found to respond in a similar fashion to the opposing group. However, the officially disabled group gave a p-value so close to 0.05 for question 15 and 16 of this survey. Another sample from a different university very well may have concluded these groups responded differently. If you decide to repeat this study with the graduate students to possibly increase the sample size of disabled students, you may find your results match more closely to the university you are comparing this study to.

## Sample Size Recommendations



For a chi-square test with an alpha of 0.05, power of 0.95, an effect size of 0.281, and 4 degrees of freedom, it is recommended to have a total sample size of 236 respondents. Your survey had 159 total survey takers, but for the officially disabled answering question 16 you only had a total 112 students respond or answer this survey question. The p-value for this question is 0.059. You may have

a different result if you were to get closer to the optimal sample size of 236 student responses.

The effect size was computed using the contingency coefficient found in the SPSS output below for this specific question (16) for officially disabled students.

Symmetric Measures		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient		
		.271	.064
N of Valid Cases		112	

One way to compute effect size is to use the following equation:

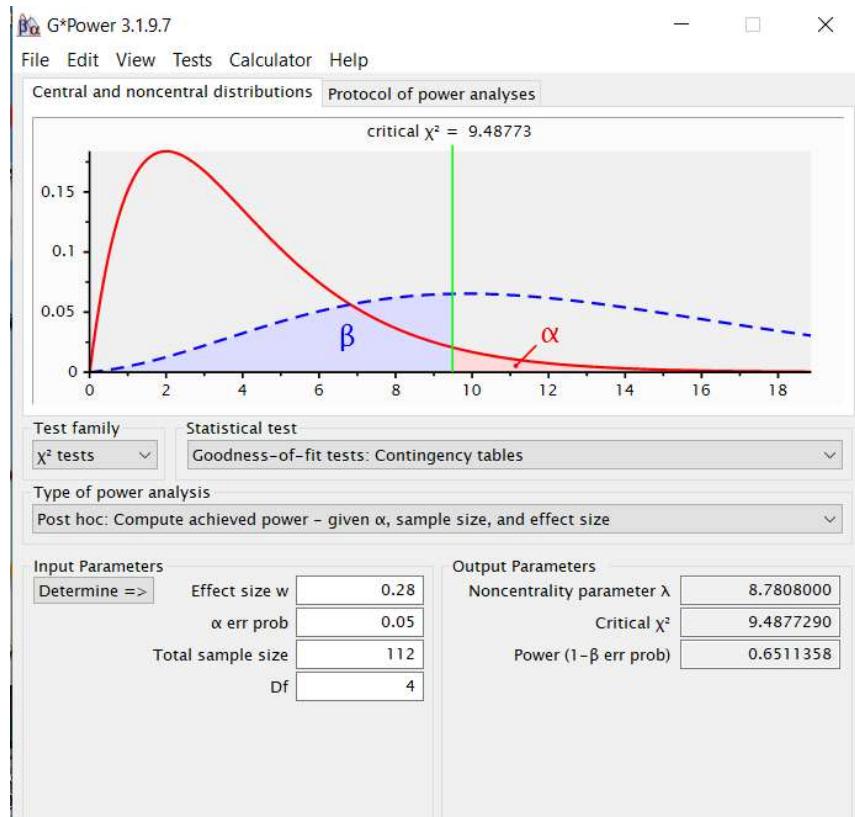
For contingency tables, Cohen's W can also be computed from the contingency coefficient  $C$  as

$$W = \sqrt{\frac{C^2}{1 - C^2}}$$

For more information on effect size check out the link below.

<https://www.spss-tutorials.com/effect-size/>

## Post-Hoc Power Level Achieved

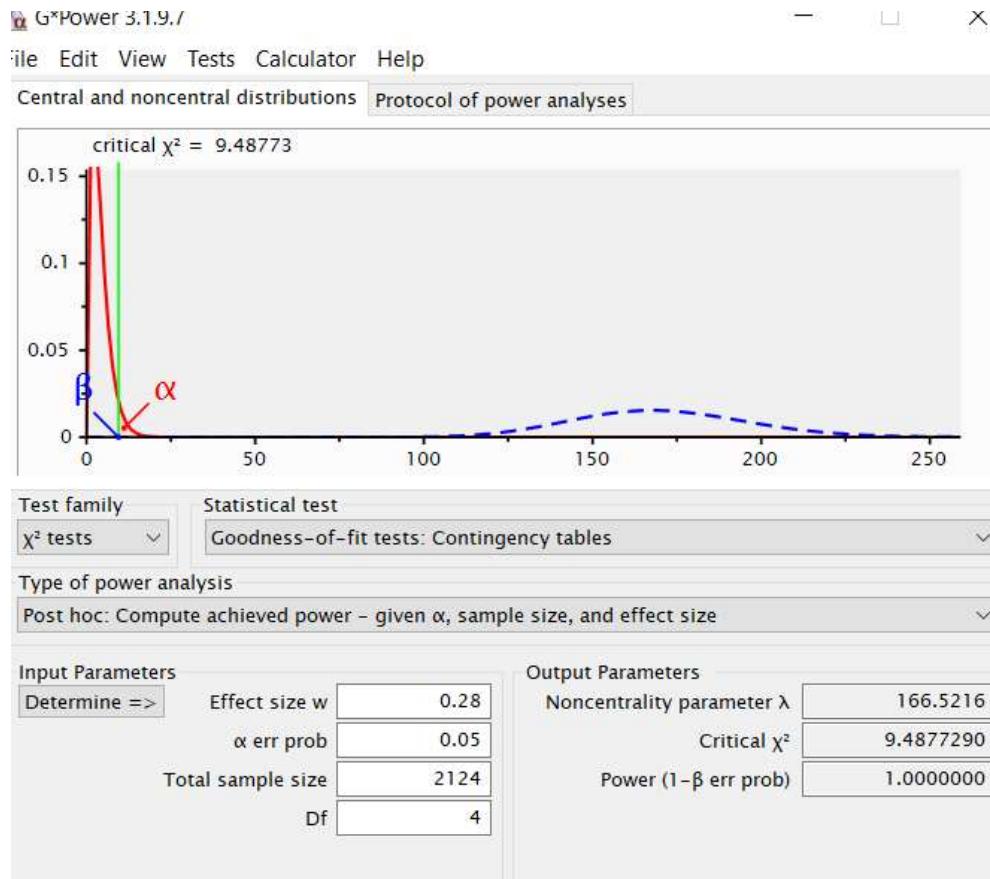


With this sample size and these parameters for this survey, you have 45% risk of committing a type II error. The power associated with this test is 0.65, so the probability of correctly rejecting the null hypothesis (when the null isn't true) is 0.65. Type II errors occur when we fail to reject the null, but the null hypothesis is actually false.

The comparative paper had respondents from 15 institutions and a total of 2,839 students responded to the survey. After data cleaning 2,124 participant responses were included in their analysis. See table below for more information.

School	Respondents	Institutional Profile
A	1	Private 4-year, nonprofit, Northeast
B	8	Public 2-year, nonprofit, Midwest
C	32	Public 4-year, nonprofit, Southeast
D	4	Public 4-year, nonprofit, Southeast
E	32	Public 2-year, nonprofit, Southwest
F	7	Public 4-year, nonprofit, Midwest
G	64	Public 2-year, nonprofit, Midwest
H	24	Private 4-year, nonprofit, Southwest
I	60	Public 4-year, nonprofit, Midwest
J	4	Public 4-year, nonprofit, Midwest
K	1130	Public, 4-year, nonprofit, West
L	300	Public 4-year, nonprofit, West
M	100	Private 4-year, nonprofit, Northeast
N	123	Public 4-year, nonprofit, West
O	235	Public 4-year, nonprofit, West

If your survey would have had a sample of this size, then your post-hoc power analysis would have provided a power equal to 1.0 with a 0% risk of committing a type II error. However, it should be noted with a large enough sample size you could find a difference between any two groups or samples from populations. We should question whether having a sample size of 2,124 is too large?



For more information on power check out the following links.

<https://support.minitab.com/en-us/minitab/19/help-and-how-to/statistics/power-and-sample-size/supporting-topics/what-is-power/>

<https://cxl.com/blog/statistical-power/>

[https://theebmproject.wordpress.com/power-type-ii-error-and-beta/#:~:text=Switch%20camera-,Statistical%20Power,making%20a%20Type%20II%20error.&text=Power%20\(1%20D%CE%B2\)%3A%20the,hypothesis%20isn't%20true\).](https://theebmproject.wordpress.com/power-type-ii-error-and-beta/#:~:text=Switch%20camera-,Statistical%20Power,making%20a%20Type%20II%20error.&text=Power%20(1%20D%CE%B2)%3A%20the,hypothesis%20isn't%20true).)



# Student Disability Survey

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Emily Conrad  
April 2022

## Agenda

- Overview
- Initial Consulting Request
- Follow Up Consulting Request
- Conclusions

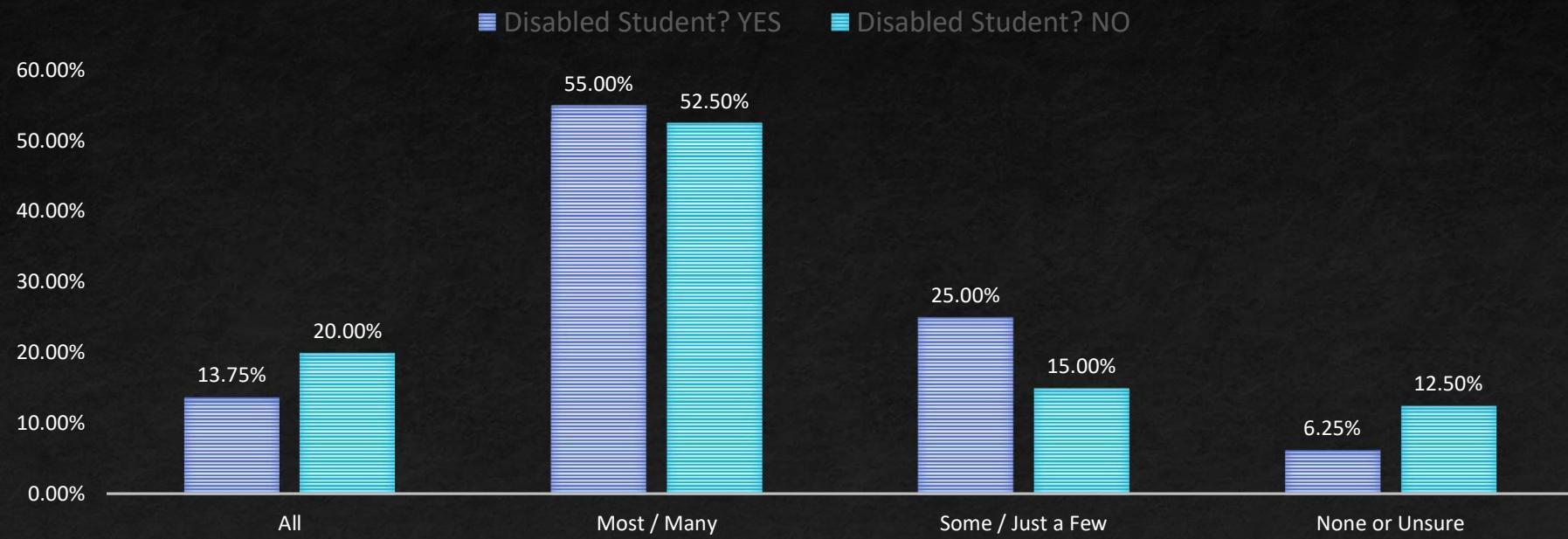
Outline

# Overview

- A consulting request was initiated through the Law Department to determine if the results from a multi-university survey, which analyzed the use of closed captions in disabled students, matched the results of a similar survey from the LSU population.
- The first set of survey questions included a simple, yet lengthy process, to run chi-square tests to determine if graduate Law students with a disability responded differently in the survey when compared to non-disabled graduate Law students at LSU.
- The follow up analysis compared the results from LSU to the results of the previous publication from the multi-university survey whose population included undergraduate students.

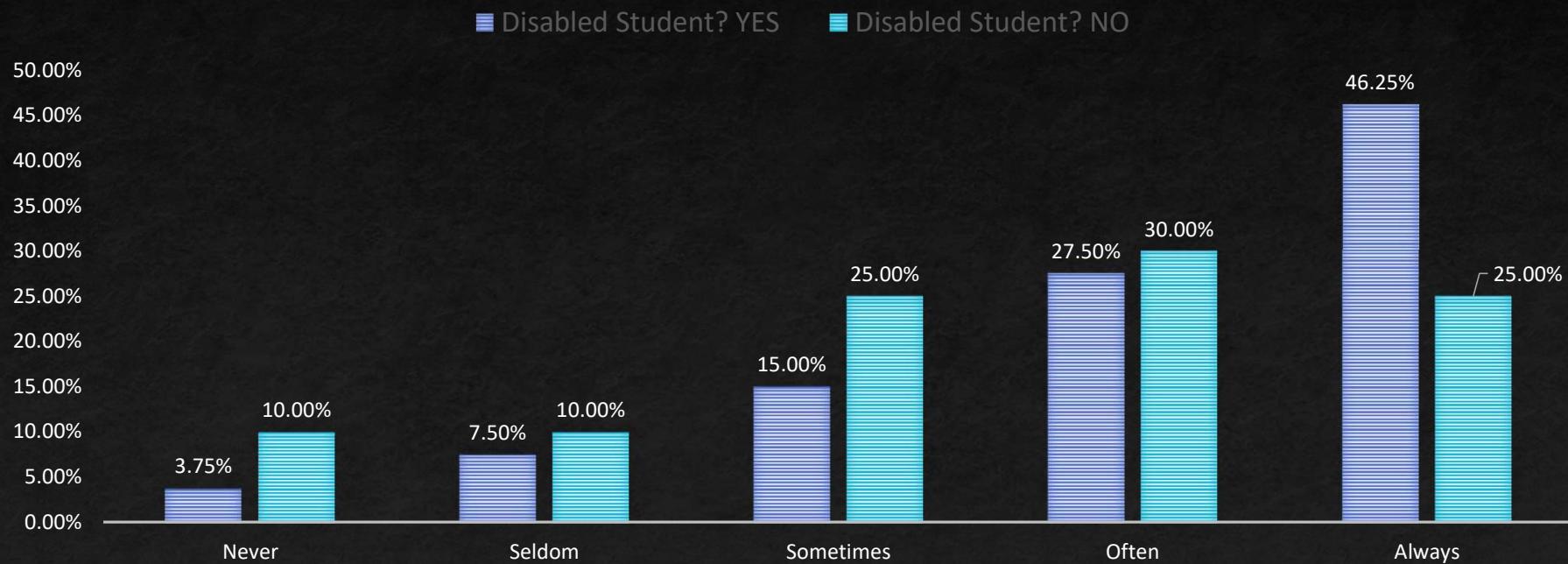
# Survey Question # 1

OF THE VIDEOS YOU USED, HOW MANY OF THEM GAVE YOU  
THE OPTION TO SEE CLOSED CAPTIONS?



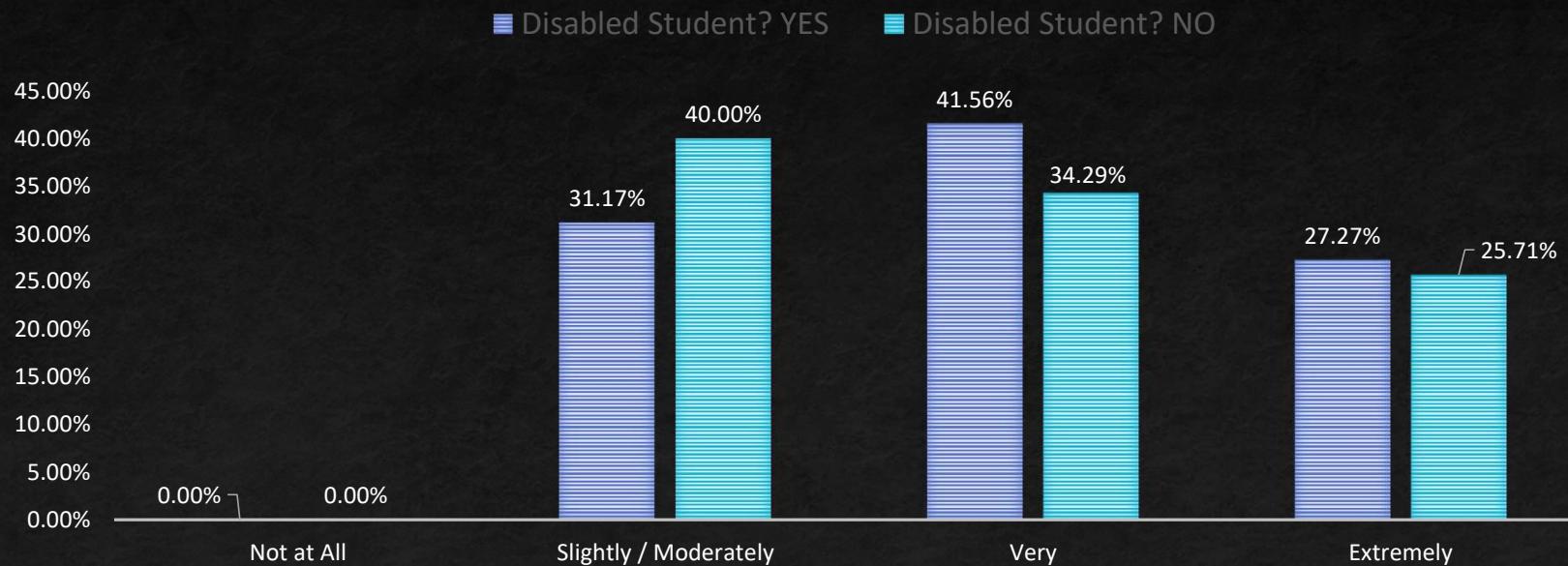
## Survey Question # 2

### HOW OFTEN DID YOU USE CLOSED CAPTIONING?



# Survey Question # 3

## HOW HELPFUL WERE THE CLOSED CAPTIONS?



## Chi-Square Test

- The chi-square test for homogeneity is used to determine if students with and without a disability answered differently on each of these three questions.
- Chi-square Hypothesis ( $\alpha = 0.05$ )
- $H_0$ : Students with and without a disability respond similarly to survey questions.
- $H_A$ : Students with and without a disability respond differently to survey questions.

# Chi-square Results

Question # 1

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.169 <sup>a</sup>	3	.366
Likelihood Ratio	3.154	3	.368
N of Valid Cases	120		

Question # 2

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.574 <sup>a</sup>	4	.160
Likelihood Ratio	6.623	4	.157
N of Valid Cases	120		

Question # 3

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.899 <sup>a</sup>	2	.638
Likelihood Ratio	.891	2	.640
N of Valid Cases	112		

No differences are detected between the samples of students surveyed from LSU with a disability and without a disability. Our results did not match the results of the comparative study across multiple campuses of undergraduate students.

# Follow Up Study

- As a follow up study, we redefined what constitutes disabled. In the original analysis we chose to use the following questions to divide students with and without a disability:
  - 39. Do you struggle with focusing or maintaining attention in class?
  - 40. Do you have difficulty hearing?
  - 41. Do you have difficulty with vision?
  - 42. Do you have difficulty with understanding visual representations of content?
  - 43. Were you ever diagnosed as having a learning disability?
  - 44. Do you have any other disabilities?
  - 45. What other disabilities do you have?
  - 46. Are you registered with an Office of Disability Services at your institution?
  - 47. Do you require academic accommodations?
- The follow study only included student who have an official disability and responded accordingly to questions 43 – 47.

## Chi-square test p-values

	Q. 1	Q. 2	Q. 3
Official Disability (43-47)	0.086	0.059	0.719
Hearing Difficulty (40)	0.873	0.349	0.937
Hearing & Visioan Difficulty (41)	0.62	0.213	0.985

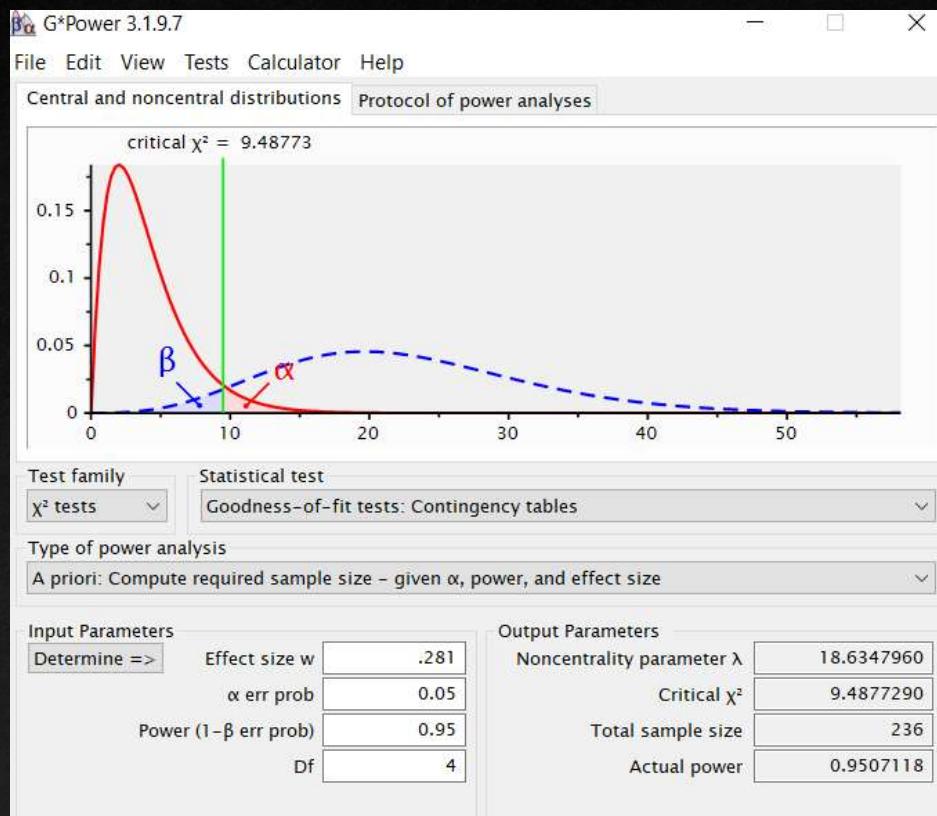
It should be noted that all the cell counts had low cell count values for disabled students so, the p-values for the Likelihood Ratio Test was used instead of the Pearson Chi Square Test.

Once again, no differences are detected between the samples of Law students surveyed from LSU with a disability and without a disability.

# Conclusions

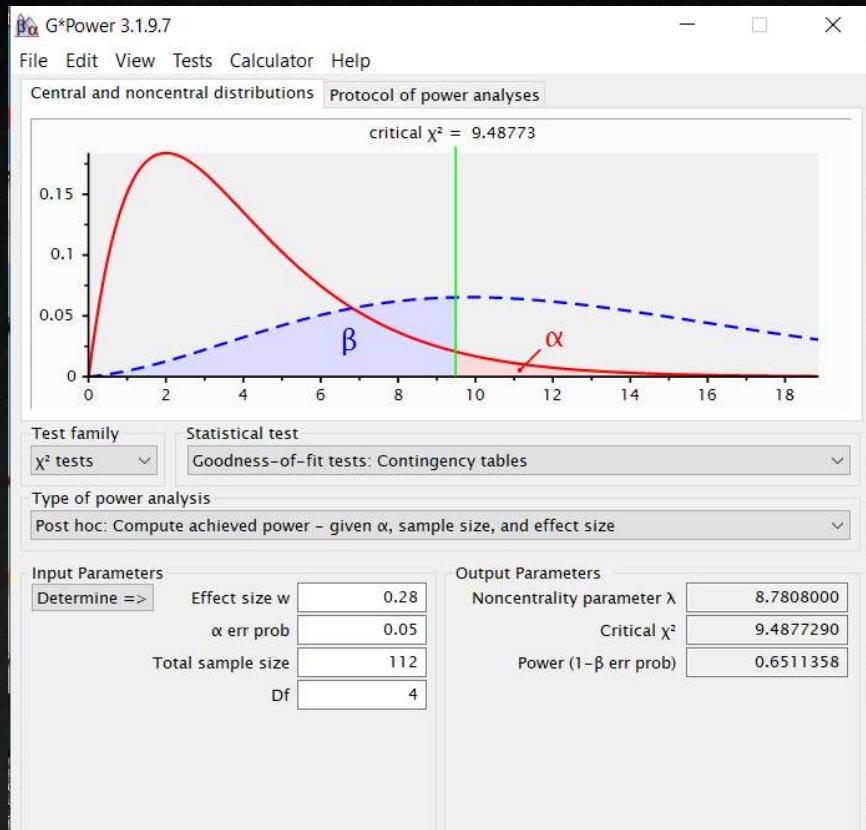
- In conclusion, all groups combined and formed in this study were found to respond in a similar fashion to the opposing group. However, the officially disabled group gave a p-value so close to 0.05 for question 15 and 16 of this survey. Another sample from a different university very well may have concluded these groups responded differently.
- My recommendation was to repeat this study with all graduate students to possibly increase the sample size of disabled students. With a larger sample size, it may be found the results match more closely to the comparative multi-university study.

# Sample Size Recommendations



For a chi-square test with an alpha of 0.05, power of 0.95, an effect size of 0.281, and 4 degrees of freedom, it is recommended to have a total sample size of 236 respondents. Your survey had 159 total survey takers, but for the officially disabled answering question 16 you only had a total 112 students respond or answer this survey question. The p-value for this question is 0.059. You may have a different result if you were to get closer to the optimal sample size of 236 student responses.

# Post-hoc Power Level Achieved



With this sample size and these parameters for this survey, you have 45% risk of committing a type II error. The power associated with this test is 0.65, so the probability of correctly rejecting the null hypothesis (when the null isn't true) is 0.65. Type II errors occur when we fail to reject the null, but the null hypothesis is actually false.

If LSU's survey would have had a sample of this size, then your post-hoc power analysis would have provided a power equal to 1.0 with a 0% risk of committing a type II error. However, it should be noted with a large enough sample size you could find a difference between any two groups or samples from populations. We should question whether having a sample size of 2,124 is too large?

# Comparative Study

School	Respondents	Institutional Profile
A	1	Private 4-year, nonprofit, Northeast
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The comparative paper had respondents from 15 institutions and a total of 2,839 students responded to the survey. After data cleaning 2,124 participant responses were included in their analysis.

If it is known that with an alpha of 0.05, an effect size of 0.281, and 4 degrees of freedom an optimal sample size is 236, then the best way to analyze such a large data set is to randomly sample (without replacement) from the 2,124 population of students who took the survey.

## Conclusions

- Overall, the results of LSU's survey did not match the multi-university comparative survey.
- This is due to inadequate sample sizes in both surveys.
- LSU really needed a larger sample size in order to conduct this type of survey.
- On the other side, the **multi-university** study with 2,124 respondents should have randomly sampled from the total population of students who responded to obtain an optimal sample size of 236.

*Thank You!*

## Consulting Project 2

Egbedi Peters consulted us about his SAS code for his research. The recommendation was to take his data out of wide view and put it into long view. He also asked about the assumptions of homogeneity of variance when using Proc Glimmix. After looking at the assumptions associated with PROC GLIMMIX it doesn't appear that homogeneity of variance is an assumption for this test in SAS.