



# Changing Statistics Projects to Better Relate to Students

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# Math 171

- o Goal 5 General Education course
- o Two projects are assigned
- o Students are allowed to work individually or in pairs.
- o Modified projects and grading rubrics to improve student understanding and success.

# Design Charrette Results

- o Evaluated by a group of six instructors from two universities.
- o None of the evaluators were in mathematics so it gave a different perspective to the project.
- o Project needs to be refined to include a scenario making it relevant to students.
- o Rubric needs to be refined to include more details and change the division of points.

# Sampling Project

- o First week of class, all Math 171 and 301 students complete an online survey.
- o Raw data from relevant questions is randomly divided into groups of approximately 25 – 26 students each.

# Sampling Project

- o Students are required to determine a simple random sample.
- o Students are required to explain how the simple random sample was created.
- o Students are required to explain its limitations on making assumptions about different populations.

# 2015 Sampling Project

- o Create a simple random sample of at least 50 students. Write a 2-3 page paper in Times New Roman font size 12 with one inch margins and double spaced.
- o The paper should include a detailed explanation of how you determined your sample.

# 2015 Sampling Project

- o The paper should also include an explanation of why this study is considered observational or experimental as well as the population of the study.
- o Finally, the paper should include a detailed explanation of why or why not this data should be used to make assumptions of the entire Longwood student population, the Virginia college student population, and the general United States population.

# 2015 Sampling Grading Rubric

	5 points	3 points	1 point
<b>Paper Specifications</b>	Paper is (a) 2-3 pages in length, (b) uses Times New Roman 12 font, AND is (c) double spaced with one inch margins	Paper missing one of the three criteria (a) 2-3 pages in length, (b) uses Times New Roman 12 font, OR is (c) double spaced with one inch margins	Paper missing two or more of the three criteria (a) 2-3 pages in length, (b) uses Times New Roman 12 font, OR is (c) double spaced with one inch margins
<b>Grammar and Spelling</b>	Paper is free of grammatical and spelling errors. Sentence structure is correct and sentences are understandable.	Paper has minor grammatical or spelling errors. Sentence structure is correct and sentences are understandable.	Paper contains major grammatical or spelling errors. Sentence structure is incorrect and sentences are difficult to interpret.
<b>Simple Random Sample</b>	The sample is a simple random sample. The explanation of how the sample was created is clear and easily replicated.	Either (a) the sample is not a simple random sample but the explanation of how the sample was created is clear and easily replicated OR (b) the sample is a simple random sample but the explanation of how the sample was created is unclear and cannot be replicated .	Both (a) the sample is not a simple random AND (b) the explanation of how the sample was created is unclear and cannot be replicated .
<b>Appendix</b>	Appendix includes all data from sample as described in the paper. The data matches the description of how the sample was selected.	Either (a) appendix does not include all data from sample as described in the paper OR (b) the data does not match the description of how the sample was selected.	Both (a) appendix does not include all data from sample as described in the paper AND (b) the data does not match the description of how the sample was selected.



# 2015 Sampling Grading Rubric

<b>Study Explanation</b>	<p>The type of study represented by this project is correctly identified AND the explanation clear and easily understood.</p>	<p>The type of study represented by this project is correctly identified AND the explanation is unclear and difficult to understand.</p>	<p>The type of study represented by this project is incorrectly identified.</p>
<b>Longwood Student Explanation</b>	<p>Paper correctly determines if data can be used to make assumptions about Longwood student population AND the explanation is clear and easily understood.</p>	<p>Paper correctly determines if data can be used to make assumptions about Longwood student population AND the explanation is unclear and difficult to understand.</p>	<p>Paper incorrectly determines if data can be used to make assumptions about Longwood student population.</p>
<b>Virginia College Student Explanation</b>	<p>Paper correctly determines if data can be used to make assumptions about Virginia college student population AND the explanation is clear and easily understood.</p>	<p>Paper correctly determines if data can be used to make assumptions about Virginia college student population AND the explanation is unclear and difficult to understand.</p>	<p>Paper incorrectly determines if data can be used to make assumptions about Virginia college student population.</p>
<b>United States Explanation</b>	<p>Paper correctly determines if data can be used to make assumptions about United States general population AND the explanation is clear and easily understood.</p>	<p>Paper correctly determines if data can be used to make assumptions about United States general population AND the explanation is unclear and difficult to understand.</p>	<p>Paper incorrectly determines if data can be used to make assumptions about United States general population.</p>

# 2016 Sampling Project

A group of student supporters of presidential candidate Gary Johnson are trying to convince him to attend a rally at Longwood University. The Virginia chairperson for his campaign is not convinced that there is enough interest in the presidential election among college students for Governor Johnson to attend. To determine if there are enough registered voters at Longwood University, you decide to collect a sample.

# 2016 Sampling Project

Since there was a question on your Math 171 survey at the beginning of class, you ask your professor for that data. You decide to conduct a simple random sample on Math 171 and Math 301 students to determine if there are enough registered voters at Longwood to convince the campaign to invite Governor Johnson to Longwood.

# 2016 Sampling Project

- o Create a simple random sample of 30 students. The paper must include a detailed explanation of how the SRS was created. The instructor should be able to follow your explanation to find the same SRS.
- o What type of study is this? Your paper should include a detailed explanation.
- o Can your SRS be used to approximate the population of all Math 171 and Math 301 students for Fall 2016? Your paper should include a detailed explanation.
- o Can your SRS be used to approximate the population of all Math 171 and Math 301 students in 2015-2017 academic years? Your paper should include a detailed explanation.

# 2016 Sampling Project

- o Compare the demographics of your sample to the demographics of Longwood University. (68% of Longwood students are female; 22.5% of Longwood undergraduates are freshmen; 26.2% of Longwood undergraduates are sophomores ; 22.7% of Longwood undergraduates are juniors ; 28.6% of Longwood undergraduates are seniors) Your paper should include a detailed comparison.
- o Can your SRS be used to approximate the population of all Longwood students? Your paper should include a detailed explanation.

# 2016 Sampling Grading Rubric

	5 points	4 points	3 point
<b>Paper Specifications</b>	Paper is (a) 2-3 pages in length, (b) uses Times New Roman 12 font, AND is (c) single spaced with one inch margins	Paper missing one of the three criteria (a) 2-3 pages in length, (b) uses Times New Roman 12 font, OR is (c) single spaced with one inch margins	Paper missing two or more of the three criteria (a) 2-3 pages in length, (b) uses Times New Roman 12 font, OR is (c) single spaced with one inch margins
<b>Grammar, Spelling, and Mathematical terms</b>	Paper is free of grammatical and spelling errors. Sentence structure is correct and sentences are understandable. Mathematical terms are used correctly throughout the paper.	Paper has minor grammatical or spelling errors. Sentence structure is correct and sentences are understandable. Mathematical terms are used incorrectly once.	Paper contains major grammatical or spelling errors. Sentence structure is incorrect and sentences are difficult to interpret. Mathematical terms are used incorrectly throughout the paper.
<b>Simple Random Sample</b>	The sample is a simple random sample. The explanation of how the sample was created is clear and easily replicated.	Either (a) the sample is not a simple random sample but the explanation of how the sample was created is clear and easily replicated OR (b) the sample is a simple random sample but the explanation of how the sample was created is unclear and cannot be replicated .	Both (a) the sample is not a simple random AND (b) the explanation of how the sample was created is unclear and cannot be replicated .
<b>Appendix</b>	Appendix includes a listing of each student in the SRS and their answers to each question. The data matches the description of how the sample was selected.	Either (a) appendix does not include a listing of each student in the SRS and their answers to each question OR (b) the data does not match the description of how the sample was selected.	Both (a) appendix does not include a listing of each student in the SRS and their answers to each question AND (b) the data does not match the description of how the sample was selected.

# 2016 Sampling Grading Rubric

<b>Study Type and Explanation</b>	The type of study represented by this project is correctly identified AND the explanation clear and easily understood.	The type of study represented by this project is correctly identified AND the explanation is unclear and difficult to understand.	The type of study represented by this project is incorrectly identified.
<b>Fall 2016 Math 171 and 301 student population usage Explanation</b>	Paper correctly determines if data can be used to make assumptions about Fall 2016 Math 171 and Math 301 student population AND the explanation is clear and easily understood.	Paper correctly determines if data can be used to make assumptions about Fall 2016 Math 171 and Math 301 student population AND the explanation is unclear and difficult to understand.	Paper incorrectly determines if data can be used to make assumptions about Fall 2016 Math 171 and Math 301 student population.
<b>Academic years 2015-2017 Math 171 and 301 student population usage Explanation</b>	Paper correctly determines if data can be used to make assumptions about academic years 2015-2017 Math 171 and Math 301 student population AND the explanation is clear and easily understood.	Paper correctly determines if data can be used to make assumptions about academic years 2015-2017 Math 171 and Math 301 student population AND the explanation is unclear and difficult to understand.	Paper incorrectly determines if data can be used to make assumptions about academic years 2015-2017 Math 171 and Math 301 student population.
<b>Sample Demographic and Longwood Demographic Comparison</b>	Paper correctly thoroughly compares the sample demographics by gender AND by class.	Paper incorrectly thoroughly compares the sample demographics by gender OR by class.	Paper incorrectly thoroughly compares the sample demographics by gender AND by class.
<b>Longwood student population usage Explanation</b>	Paper correctly determines if data can be used to make assumptions about Longwood student population AND the explanation is clear and easily understood.	Paper correctly determines if data can be used to make assumptions about Longwood student population AND the explanation is unclear and difficult to understand.	Paper incorrectly determines if data can be used to make assumptions about Longwood student population.

# Confidence Interval Project

- o The students use the simple random sample from Sampling Project. If the sampling from Part One is not a simple random sample, a new sample will be taken for Part Two.
- o Students created confidence intervals and explained their importance.



# 2015 Confidence Interval Project

- o This project relates to the Math 171 survey question “How many countries have you visited (do not include USA)?”. The survey results are listed under the Counties column.
- o Using your sample, determine a 95% confidence interval and a 99% confidence interval for the proportion of Math 171 students who have traveled outside the United States.

# 2015 Confidence Interval Project

Write a 2-3 page paper in Times New Roman font size 12 with one inch margins and double spaced. The paper should include a detailed explanation of how you determined your sample and a detailed explanation of how you determined each confidence interval, the meaning of each confidence interval, and an explanation about why they are different. Finally, for all Math 171 students in fall 2015, 60.71% have traveled outside the United States. Compare this information to your confidence intervals.

# 2015 Confidence Interval Grading Rubric

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# 2015 Confidence Interval Grading Rubric

<p><b>95% Confidence Interval</b></p>	<p>The paper correctly identifies the confidence interval. The explanation of how it was determined is clear and easily replicated.</p>	<p>Either (a) the confidence interval is incorrect but the explanation of how the confidence interval was determined is clear and easily replicated OR (b) the confidence interval is correct but the explanation of how the confidence interval was determined is unclear and cannot be replicated .</p>	<p>Both (a) the confidence interval is incorrect AND (b) the explanation of how the confidence interval was determined is unclear and cannot be replicated .</p>
<p><b>99% Confidence Interval</b></p>	<p>The paper correctly identifies the confidence interval. The explanation of how it was determined is clear and easily replicated.</p>	<p>Either (a) the confidence interval is incorrect but the explanation of how the confidence interval was determined is clear and easily replicated OR (b) the confidence interval is correct but the explanation of how the confidence interval was determined is unclear and cannot be replicated .</p>	<p>Both (a) the confidence interval is incorrect AND (b) the explanation of how the confidence interval was determined is unclear and cannot be replicated .</p>
<p><b>95% and 99% Confidence Interval Comparison and meanings</b></p>	<p>Paper correctly states the meaning of each confidence interval AND correctly compares them.</p>	<p>Either (a) paper incorrectly states the meaning of each confidence interval OR (b) incorrectly compares them.</p>	<p>Both (a) paper incorrectly states the meaning of each confidence interval AND (b) incorrectly compares them.</p>
<p><b>Comparison of Confidence Intervals to Math 171 Percentage</b></p>	<p>Paper correctly determines how the Math 171 percentage compares to the confidence intervals AND the explanation is clear and easily understood.</p>	<p>Paper correctly determines how the Math 171 percentage compares to the confidence intervals AND the explanation is unclear and difficult to understand.</p>	<p>Paper incorrectly determines how the Math 171 percentage compares to the confidence intervals</p>

# 2016 Confidence Interval Project

The Pew Research Center reported that “millennials have surpassed baby boomers as the largest living generation.” These numbers could have a large political impact, beginning with the 2016 elections. Previous elections show that Americans aged 18-29 with a college education are more likely to vote than those without a college education.

# 2016 Confidence Interval Project

- o In 2012, 66.3% of college students were registered to vote. Because of the tone of this campaign, there is concern that fewer students will register to vote for this election. Does your sample support this claim?
- o According to the United States Census Bureau, voter registration rates tend to increase with age. What is the 95% confidence interval for the difference between the proportion of freshmen/sophomore students and junior/senior students who are registered to vote?

# 2016 Confidence Interval Project

- o Use your sample to test the claim about college student voter registration.
- o Should you use your sample to test the claim for all Longwood statistics students?
- o Use your sample to determine the confidence interval. Explain what the confidence interval means.
- o Does your confidence interval imply that juniors/seniors are more likely to register to vote than freshmen/sophomores?

# 2016 Confidence Interval Grading Rubric

	5 points	4 points	3 point
<b>Simple Random Sample</b>	The sample is a simple random sample. The explanation of how the sample was created is clear and easily replicated.	Either (a) the sample is not a simple random sample but the explanation of how the sample was created is clear and easily replicated OR (b) the sample is a simple random sample but the explanation of how the sample was created is unclear and cannot be replicated.	Both (a) the sample is not a simple random AND (b) the explanation of how the sample was created is unclear and cannot be replicated.
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<b>Hypothesis Test work</b>	Paper correctly explains the process for testing the hypothesis AND the explanation is clear and easily understood.	Paper correctly explains the process for testing the hypothesis AND the explanation is unclear and difficult to understand.	Paper incorrectly explains the process for testing the hypothesis.
<b>Hypothesis Test results</b>	Paper correctly tests the claim AND correctly interprets its meaning.	Paper correctly tests the claim AND the explanation is unclear and difficult to understand.	Paper incorrectly tests the claim.



# 2016 Confidence Interval Grading Rubric

<b>Longwood statistics student population usage of hypothesis test</b>	Paper correctly determines if conclusion can be made about all Longwood statistics students AND the explanation is clear and easily understood.	Paper correctly determines if conclusion can be made about all Longwood statistics students AND the explanation is unclear and difficult to understand.	Paper incorrectly determines if conclusion can be made about all Longwood statistics students.
<b>Confidence Interval Work</b>	Paper correctly explains the process for determining the confidence interval AND the explanation is clear and easily understood.	Paper correctly explains the process for determining the confidence interval AND the explanation is unclear and difficult to understand.	Paper incorrectly explains the process for determining the confidence interval.
<b>Confidence Interval</b>	Paper correctly determines the confidence interval AND correctly interprets its meaning.	Paper incorrectly determines the confidence interval OR incorrectly interprets its meaning.	Paper incorrectly determines the confidence interval AND incorrectly interprets its meaning.
<b>Likelihood of students to register</b>	Paper correctly determines if juniors/seniors are more likely to register to vote than freshmen/sophomores AND the explanation is clear and easily understood.	Paper correctly determines if juniors/seniors are more likely to register to vote than freshmen/sophomores AND the explanation is unclear and difficult to understand.	Paper incorrectly determines if juniors/seniors are more likely to register to vote than freshmen/sophomores.
<b>Paper Specifications</b>	Paper is (a) 1-2 pages in length, (b) uses Times New Roman 12 font, AND is (c) single spaced with one inch margins	Paper missing one of the three criteria (a) 2-3 pages in length, (b) uses Times New Roman 12 font, OR is (c) single spaced with one inch margins	Paper missing two or more of the three criteria (a) 2-3 pages in length, (b) uses Times New Roman 12 font, OR is (c) single spaced with one inch margins
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# Anecdotal Results

- o Only one group had to take a second sample.
- o Fewer students came by to clarify the projects.
- o Grades did improve significantly.

# contact information

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