Brandy V. Fralin

Understanding Local Economic Issues using Statistics

I. UNIT OVERVIEW & PURPOSE:

This lesson is designed to apply prior knowledge to a real world situation by having students create their own experiments/studies and then use appropriate mathematical concepts to analyze the situation. The lessons in this unit are designed to make connections between the various statistical procedures learned in a classroom in such a way that students are able to see the relevance to what is being taught.

II. UNIT AUTHOR:

Brandy V. Fralin, Bassett High School, Henry County School Division

III. COURSE:

Mathematical Modeling: Capstone Course (the course title might change)

IV. CONTENT STRAND:

Data Analysis and Probability

V. OBJECTIVES:

- The student will understand how to select appropriate sampling techniques based upon experiment/survey design
- The student will understand sampling size as it relates to reliability
- The student will understand sources of bias, how they impact an experiment/survey, and how to control for them in order to reduce impact
- The student will understand experimental error, how experimental error can impact an experiment/survey, and how to control for error in order to reduce impact
- The student will understand how to select appropriate data collection methods and how to maintain data collection records
- The student will understand how to select appropriate statistical analysis methods to perform data analysis on collected data and understand the results of the data analysis
- The student will understand how to select appropriate reporting methods for an experiment/survey

VI. MATHEMATICS PERFORMANCE EXPECTATION(s):

The student will design and conduct an experiment/survey. Key concepts include: a) sample size; b) sampling technique; c) controlling sources of bias and experimental error; d) data collection; and e) data analysis and reporting.

VII. CONTENT:

In addition to the mathematical content involved in this unit lesson, local economic issues will be addressed and analyzed such as welfare, income, education level, home ownership, etc. Students will be responsible for designing an experiment/survey in order to address one of the above mentioned issues in their local

community/neighborhood as it related to them. Research will be conducted by the student(s) and they will be responsible for meeting the above mentioned performance expectations.

VIII. REFERENCE/RESOURCE MATERIALS:

Computers with Internet access as well as Microsoft Office will be required. A TI-83 graphing calculator will be required in order for students to conduct statistical analysis on collected data.

IX. PRIMARY ASSESSMENT STRATEGIES:

A student drafted proposal of the experiment/survey will be completed by the student addressing sample size, sampling technique, and controlling sources of bias and experimental error. This proposal will be the final product from lesson one of the unit. Lesson two of the unit will contain the actual experiment design/survey as well as the data collection method(s) chosen along with the data that was collected. Primary assessment strategies resulting from this lesson will be in the form of professional documentation (excel spreadsheet, questionnaire with answers, etc.). The final lesson in the unit will consist of detailed data analysis and a final power point presentation documenting the findings of the experiment/survey.

X. EVALUATION CRITERIA:

Each lesson plan includes a rubric for evaluation, which is contained within each lesson.

XI. INSTRUCTIONAL TIME:

2 weeks

What's your design? (Lesson 1)

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Mathematical Objective(s)
In this lesson students will draft a proposal of an experiment/survey they will be responsible for conducting in a later lesson. In the draft, students will address sample size, sampling technique, controlling sources of bias and experimental error.

Mathematics Performance Expectation(s)
Use and reinforce content and data from spectrum of real-world sources including local, state, federal, and international data sources (e.g., natural resource, environmental, weather, agricultural, energy-use and production, economic, labor, population and demographic, scientific, media, sports, entertainment, and health data)

- Use presentation and other communication technologies to develop, refine, and share developed solutions, ideas, and problems;
- Require research using technology, interviews, and traditional print resources;
- Provide opportunities for individual collaborative investigation and performance;
- Augment skills in self and peer editing;

Require high-interest, high-level problem solving, decision making, analysis, and critical thinking, and evaluation in content and applied contexts.

9. The student will design and conduct an experiment/survey. Key concepts include: a) sample size; b) sampling technique; c) controlling sources of bias and experimental error; d) data collection; and e) data analysis and reporting.

Related SOL

AFDA.8 The student will design and conduct an experiment/survey. Key concepts include:

a) sample size
b) sampling technique
c) controlling sources of bias and experimental error
d) data collection
e) data analysis and reporting

*PS.9 The student will plan and conduct a survey. The plan will address sampling techniques (e.g., simple random and stratified) and methods to reduce bias.

PS.10 The student will plan and conduct an experiment. The plan will address control, randomization, and measurement of experimental error.

NCTM Standards List all applicable NCTM standards related to each lesson. Example:

Content standards:

- understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each
- know the characteristics of well-designed studies, including the role of randomization in surveys and experiments
- evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions

Process standards:

- Organize and consolidate their mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others;
- Use the language of mathematics to express mathematical ideas precisely.

Materials/Resources

- Smart board
- Student cell phones
- http://www.polleverywhere.com/ (a free resource)
- Teacher created blog (free at blogspot.com or blogger.com, etc.)
- Student Interne access at home (helpful but not required)
- The following template:

Sampling Technique	Definition	Given Example	Alternate Example
Simple Random Sample			
Stratified Sample			
Cluster Sample			

- Computers with internet access
    - http://changingminds.org/explanations/research/sampling/simple_random_sampling.htm
    - http://changingminds.org/explanations/research/sampling/stratified_sampling.htm
    - http://changingminds.org/explanations/research/sampling/cluster_sampling.htm

Assumption of Prior Knowledge

- Students should have basic knowledge of general statistical practices (mean, median, mode, range).

- Students should have taken high school mathematics courses through Algebra, Functions, and Data Analysis, which requires students to possess knowledge about sampling techniques and statistical procedures.
- Students may find it difficult to distinguish between the different types of sampling techniques; therefore, a review of those techniques as well as general statistical practices may be necessary prior to beginning lesson one.
- Sampling techniques, sample size, bias and experimental error should have been topics explored prior to this lesson.
- Local economic issues are drawn upon in this lesson.

Introduction: Setting Up the Mathematical Task

Modeling Problem:

The recent/current depression has resulted in a higher than normal unemployment rate and because of this fact, income levels in Henry County/Martinsville has been effected. Local politicians and economists have asked you to design an experiment/survey that would produce current information regarding this situation. You are asked to design an experiment/survey using the following sampling techniques: simple random sampling, stratified sampling, and cluster sampling. In addition, you are asked to address sample size and allow for and control sources of bias as well as experimental error. (25-30 min)

- State your sampling technique
- Identify sample size, sources of bias and experimental error, and identify how you will control for those for each sampling technique (small groups 10 min; followed by whole class 5 min)
- Identify additional information that you have to gather (in order to solve the problem) using technology. (whole class 5 min)

- In order to receive student responses to the questions/prompts from above, the teacher should allow students to use their cell phones during class to post their answers/opinions to http://www.polleverywhere.com/ . This will encourage participation and maintain anonymity

- Also, it is encouraged that the teacher creates a blog specifically for this unit, which will allow students to post questions and/or comments as they progress through the activities in each lesson. Free blogs can be created using blogspot.com or blogger.com.

It would be helpful to have a discussion on what are some possible scenarios for each sampling technique and discuss bias as well as experimental error and how to design an experiment/survey that would control for them

Student Exploration 1:

Student/Teacher Actions:

- Students should be designing an experiment/survey using three different sampling techniques that address sample size, controlling for sources of bias and experimental error. This will be done in whole class, small groups, and will conclude with whole group sharing/discussion. Groups should be no larger than three people and should be chosen randomly.
- Teacher will observe student interactions and address common questions in order to facilitate the learning process.

Monitoring Student Responses

- Students make their mathematical thinking and understanding public by discussing/presenting the aforementioned experiment/design in their small groups as well as during the whole class discussions. Since there is more than one correct way to design this problem, allow students to share their models and modifications. Allow time to share students' models and their reasoning behind each mathematical model.
- Simplify this model even more for a group of students who are experiencing difficulty.
- To extend materials for students who are ready to move forward introduce a different local economic issue and have students design an experiment/survey individually and then present their design to their initial group and discuss the designs.
- Individual student assignment will be evaluated based on the rubric contained within each lesson and will be provided with feedback back to the students prior to starting the next individual assignment.
- Summarize the lesson by allowing 5 -10 minutes for each small group of student's to share their mathematical models and their reasoning behind each mathematical model with the whole class.

Student Exploration 2:

In this individual assignment, students will draft a proposal that will identify and justify a chosen sampling technique, identify and justify an appropriate sample size for this proposal, identify and justify ways to control for sources of bias as well as experimental error. The proposal draft should be a typed, working document that students will add to in following lessons.

Assessment

- **Questions**
- Describe the model presented by another group. Identify which sampling technique is being used. How is this model different from yours? What would you change about their experiment/survey? Do they effectively and efficiently control for sources of bias and experimental error?
- Scoring rubric for individual assignment:

	1	2	3	4
Sampling Technique	The student has no understanding of the sampling	The student has minimal understanding of	The student has sufficient but limited	The student has complete understanding of

	technique chosen which is evident through their experiment/survey design	the sampling technique chosen which is evident through their experiment/survey design	understanding of the sampling technique chosen which is evident though their experiment/survey design	the sampling technique chosen which is evident through their experiment/survey design
Sample Size	The student has no understanding of appropriate sampling size which is evident though identification and justification expressed in the draft proposal	The student has minimal understanding of appropriate sampling size which is evident though identification and justification expressed in the draft proposal	The student has sufficient but limited understanding of appropriate sampling size which is evident though identification and justification expressed in the draft proposal	The student has complete understanding of appropriate sampling size which is evident though identification and justification expressed in the draft proposal
Bias Control	The student has no understanding of appropriate bias control methods which is evident though identification and justification expressed in the draft proposal	The student has minimal understanding of appropriate bias control methods which is evident though identification and justification expressed in the draft proposal	The student has sufficient but limited understanding of appropriate bias control methods which is evident though identification and justification expressed in the draft proposal	The student has complete understanding of appropriate bias control methods size which is evident though identification and justification expressed in the draft proposal
Experimental Error Control	The student has no understanding of appropriate experimental error control which is evident though identification and justification expressed in the draft proposal	The student has minimal understanding of appropriate experimental error control which is evident though identification and justification expressed in the draft proposal	The student has sufficient but limited understanding of appropriate experimental error control which is evident though identification and justification expressed in the draft proposal	The student has complete understanding of appropriate experimental error control which is evident though identification and justification expressed in the draft proposal

Strategies for Differentiation

- Simplify this model even more for a group of students who are experiencing difficulty. This can be done by providing those students with additional websites that will be helpful to this activity.
- To extend materials for students who are ready to move forward introduce a different local economic issue and have students design an experiment/survey individually and then present their design to their initial group and discuss the designs.

- ELL/EOL Strategies: Allow ELL/EOL students to work collaboratively in groups no larger than three students during classroom activities and Student Exploration #1.

So, what'd you do? (Lesson 2)

Strand
Data Analysis and Probability

Mathematical Objective(s)
In this lesson students will conduct the actual experiment/survey that was produced in lesson #1. Students will be responsible for conducting the experiment/survey and maintaining accurate records of collected data.

Mathematics Performance Expectation(s)
Use and reinforce content and data from spectrum of real-world sources including local, state, federal, and international data sources (e.g., natural resource, environmental, weather, agricultural, energy-use and production, economic, labor, population and demographic, scientific, media, sports, entertainment, and health data)

- Use presentation and other communication technologies to develop, refine, and share developed solutions, ideas, and problems;
- Require research using technology, interviews, and traditional print resources;
- Provide opportunities for individual collaborative investigation and performance;
- Augment skills in self and peer editing;

Require high-interest, high-level problem solving, decision making, analysis, and critical thinking, and evaluation in content and applied contexts.

9. The student will design and conduct an experiment/survey. Key concepts include: a) sample size; b) sampling technique; c) controlling sources of bias and experimental error; d) data collection; and e) data analysis and reporting.

Related SOL

AFDA.8 The student will design and conduct an experiment/survey. Key concepts include:

a) sample size
b) sampling technique
c) controlling sources of bias and experimental error
d) data collection
e) data analysis and reporting

*PS.9 The student will plan and conduct a survey. The plan will address sampling techniques (e.g., simple random and stratified) and methods to reduce bias.

PS.10 The student will plan and conduct an experiment. The plan will address control, randomization, and measurement of experimental error.

NCTM Standards List all applicable NCTM standards related to each lesson. Example:

Content standards:

- understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each
- know the characteristics of well-designed studies, including the role of randomization in surveys and experiments
- evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions

Process standards:

- Organize and consolidate their mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others;
- Use the language of mathematics to express mathematical ideas precisely.

Materials/Resources

- Smart board
- Student draft proposals from lesson #1
- Computers with Internet access and Microsoft Word
- Student cell phones
- http://www.polleverywhere.com/ (a free resource)
- Teacher created blog (free at blogspot.com or blogger.com, etc.)

Assumption of Prior Knowledge

- Students should have basic knowledge of general statistical practices.
- Students should have taken high school mathematics courses through Algebra, Functions, and Data Analysis.
- Students may find it difficult to design an experiment/survey
- Students may find it difficult to conduct an experiment/survey
- Sampling techniques, sample size, bias and experimental error should have been topics explored prior to this lesson.
- Local economic issues are drawn upon in this lesson.

Introduction: Setting Up the Mathematical Task

Modeling Problem:

The recent/current depression has resulted in a higher than normal unemployment rate and because of this fact, income levels in Henry County/Martinsville have been effected. Local politicians and economists have asked you to design an experiment/survey that would produce current information regarding this situation. You are asked to conduct an experiment/survey using the following sampling techniques: (use a sampling technique

provided in lesson #1's opening activity). In addition, you are asked record your collected data using an appropriate recording method (i.e., tabular, Excel, Word) (25-30 min)

- What method will you use or would be best to collect your data (online survey like SurveyMonkey.com, mail solicitation, random phone-calls using the phone book)?
- What format will you use for recording the data collected?
- The entire class will design/conduct an actual experiment/survey in order to understand the process and expectations, which are contained within the rubric. Afterword, students in small groups will conduct an actual experiment/survey and this will spread over a few class periods
- It would be helpful to have ongoing class discussions on what are some possible scenarios for data collection and recording methods

- In order to receive student responses to the questions/prompts from above, the teacher should allow students to use their cell phones during class to post their answers/opinions to http://www.polleverywhere.com/ . This will encourage participation and maintain anonymity

- Also, it is encouraged that the teacher creates a blog specifically for this unit, which will allow students to post questions and/or comments as they progress through the activities in each lesson. Free blogs can be created using blogspot.com or blogger.com.

Student Exploration 1:

Student/Teacher Actions:

- Students should be conducting an experiment/survey and recording the data that is collected. This should be done as a class activity in order to model for students what/how they are to do their individual assignment in Student Exploration 2. The proposal drafted from Student Exploration 1 in Lesson 1.
- Teacher will observe student interactions and address common questions in order to facilitate the learning process.

Monitoring Student Responses

- Students make their mathematical thinking and understanding public by discussing/presenting the aforementioned experiment/design in their small groups as well as during the whole class discussions. Since there is more than one correct way to conduct the experiment/survey in this problem, allow students to share their models and modifications. Allow time to share students' models and their reasoning behind each mathematical model.
- Simplify this model even more for a group of students who are experiencing difficulty.
- To extend materials for students who are ready to move forward introduce a different local economic issue and have students conduct an experiment/survey individually and

then present their findings to their initial group and discuss the collected data and process.

- Individual student assignment will be evaluated based on the rubric contained within each lesson and will be provided with feedback back to the students prior to starting the next individual assignment.
- Summarize the lesson by allowing 5 -10 minutes for each small group of student's to share their mathematical models and their reasoning behind each mathematical model with the whole class.

Student Exploration 2:

Students will begin to conduct actual experiment/survey that they drafted a proposal for from assignment #1. In this individual assignment, students will follow the process for conducting an experiment/survey while recording the collected data throughout the process. Students should use the class activity and group activity from this lesson as a guide. The teacher should display the class and group activities in a central location in the classroom to be used as a resource. The recorded data should be in an appropriate format that can be used in the lesson following this one.

Assessment

- **Questions**
- Describe the process presented by another group. Identify flaws contained within their process.
    - How is this experiment/survey different from yours?
    - What would you change about their experiment/survey?
    - Do they effectively and efficiently record the data collected in their experiment/survey? Why or why not?
- Scoring rubric for individual assignment:

	1	2	3	4
Experiment/Survey Conduction	The student has no understanding of the technique and process involved in the conduction of an experiment/survey and this is evident in what has been presented in their data record	The student has minimal understanding of the technique and process involved in the conduction of an experiment/survey and this is evident in what has been presented in their data record	The student has sufficient but limited understanding of the technique and process involved in the conduction of an experiment/survey and this is evident in what has been presented in their data record	The student has complete understanding of the technique and process involved in the conduction of an experiment/survey and this is evident in what has been presented in their data record
Recorded data collection	The student has no understanding of appropriate	The student has minimal understanding of	The student has sufficient but limited	The student has complete understanding of

	data recording methods which is evident in what has been presented in their data record	appropriate data recording methods which is evident in what has been presented in their data record	understanding of appropriate data recording methods which is evident in what has been presented in their data record	appropriate data recording methods which is evident in what has been presented in their data record

Strategies for Differentiation

- Simplify this model even more for a group of students who are experiencing difficulty. This can be done by providing those students with a detailed outline and summary of the class and group activities that were completed in class.
- To extend materials for students who are ready to move forward introduce a different local economic issue and have students conduct an experiment/survey individually and then present their findings to their initial group and discuss the collected data and process.

- ELL/EOL Strategies: Allow ELL/EOL students to work collaboratively in groups no larger than three students during classroom activities and Student Exploration #1.

And the results are… (Lesson 3)

Strand
Data Analysis and Probability

Mathematical Objective(s)
In this lesson students will conduct data analysis on the data collected during the experiment/survey that was conducted in lesson #2. Students will be responsible for selecting the appropriate statistical method(s) and will conclude with a power point presentation that summarizes the experiment/survey that was conducted as well as the conclusions of the data analysis.

Mathematics Performance Expectation(s)
Use and reinforce content and data from spectrum of real-world sources including local, state, federal, and international data sources (e.g., natural resource, environmental, weather, agricultural, energy-use and production, economic, labor, population and demographic, scientific, media, sports, entertainment, and health data)

- Use presentation and other communication technologies to develop, refine, and share developed solutions, ideas, and problems;
- Require research using technology, interviews, and traditional print resources;
- Provide opportunities for individual collaborative investigation and performance;
- Augment skills in self and peer editing;

Require high-interest, high-level problem solving, decision making, analysis, and critical thinking, and evaluation in content and applied contexts.

9. The student will design and conduct an experiment/survey. Key concepts include: a) sample size; b) sampling technique; c) controlling sources of bias and experimental error; d) data collection; and e) data analysis and reporting.

Related SOL

AFDA.8 The student will design and conduct an experiment/survey. Key concepts include:

a) sample size
b) sampling technique
c) controlling sources of bias and experimental error
d) data collection
e) data analysis and reporting

*PS.9 The student will plan and conduct a survey. The plan will address sampling techniques (e.g., simple random and stratified) and methods to reduce bias.

PS.10 The student will plan and conduct an experiment. The plan will address control, randomization, and measurement of experimental error.

NCTM Standards List all applicable NCTM standards related to each lesson.

Content standards:

- understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each
- know the characteristics of well-designed studies, including the role of randomization in surveys and experiments
- evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions
- compute basic statistics and understand the distinction between a statistic and a parameter
- for univariate measurement data , be able to display the distribution, describe its shape, and select and calculate summary statistics

Process standards:

- Organize and consolidate their mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others;
- Use the language of mathematics to express mathematical ideas precisely.

Materials/Resources

- Smart board
- Student draft proposals from lesson #1
- Student data collected in lesson #2
- Computers with Internet access and Microsoft Word
- Student cell phones
- http://www.polleverywhere.com/ (a free resource)
- Teacher created blog (free at blogspot.com or blogger.com, etc.)

Assumption of Prior Knowledge

- Students should have basic knowledge of general statistical practices.
- Students should have taken high school mathematics courses through Algebra, Functions, and Data Analysis.
- Students may find it difficult to design an experiment/survey
- Students may find it difficult to conduct an experiment/survey
- Sampling techniques, sample size, bias and experimental error should have been topics explored prior to this lesson.
- Local economic issues are drawn upon in this lesson.

Introduction: Setting Up the Mathematical Task

Modeling Problem:

The recent/current depression has resulted in a higher than normal unemployment rate and because of this fact, income levels in Henry County/Martinsville have been effected. Now that you have designed and conducted an experiment/survey and gathered data on this issue, local economists want you to summarize the data statistically and interpret the results. You must decide what statistical procedures would be best and justify your reasoning. Once you've decided what would be best, analyze the data using the procedures chosen and interpret those results. Afterword, create a power point presentation that summarizes the entire experiment/survey with data analysis and interpretation.

- What method will you use to analyze your data (mean, median, mode, standard deviation, etc)?
- Students in small groups will conduct analysis using the methods chosen.
- What interpretations can be drawn from your results? Compare your results to previous data found on the Internet.
- It would be helpful to have a discussion on what statistical procedures other students chose and why.

- In order to receive student responses to the questions/prompts from above, the teacher should allow students to use their cell phones during class to post their answers/opinions to http://www.polleverywhere.com/ . This will encourage participation and maintain anonymity

- Also, it is encouraged that the teacher creates a blog specifically for this unit, which will allow students to post questions and/or comments as they progress through the activities in each lesson. Free blogs can be created using blogspot.com or blogger.com.

Power Point Expectations:

Lesson #1 Draft Proposal	Lesson #2 Survey/Experiment	Lesson #3 Data Analysis/Power Point Presentation
▪ Sampling Technique Chosen along with explanation/justification ▪ Sample Size along with explanation/justification ▪ How they controlled for the following ▪ Sources of bias with explanation/justification ▪ Experimental Error with explanation/justification	▪ Data collection method chosen along with explanation/justification ▪ Method chosen for recording collected data ▪ Highlights from the process including mistakes, memorable events ▪ One slide documenting actual data that was collected ▪ One slide documenting survey/experiment method	▪ Selected data analysis method chosen with explanation/justification ▪ Summary of data analysis (actual values) ▪ Design/clarity of presentation ▪ Free of grammatical errors ▪ Professional in appearance ▪ Accuracy content ▪ Interpretation/Conclusion from data analysis ▪ Were the any changes in income level in Henry County? Why?

Student Exploration 1:

Student/Teacher Actions:

- Students should be conducting statistical procedures on data collected in last lesson during Student Exploration 1/Class activity in order to demonstrate what students are to do during their individual assignment in Student Exploration 2.
- Teacher will observe student interactions and address common questions in order to facilitate the learning process.

Monitoring Student Responses

- Students make their mathematical thinking and understanding public by discussing/presenting the aforementioned activity in their small groups as well as during the whole class discussions. Since there is more than one correct way to conduct the experiment/survey in this problem, allow students to share their models and modifications. Allow time to share students' models and their reasoning behind each mathematical model.
- Simplify this model even more for a group of students who are experiencing difficulty.
- To extend materials for students who are ready to move forward introduce a different local economic issue and have students conduct research to find data on that topic. Then, have students conduct data analysis individually, present their findings to their initial group, and discuss the data analysis and interpret the results.
- Individual student assignment will be evaluated based on the rubric contained within each lesson and will be provided with feedback back to the students prior to starting the next individual assignment.
- Summarize the lesson by allowing 5 -10 minutes for each small group of student's to share their mathematical models and their reasoning behind each mathematical model with the whole class.

Student Exploration 2:

Students will begin to conduct data analysis on data collected during individual assignment from lesson #2. In this individual assignment, students will analyze data, justify statistical procedures chosen, interpret results and produce a power point presentation summarizing their experiment/survey as well as their findings.

Assessment

- **Questions**
- Describe the statistical procedure presented by another group. Identify flaws contained within their selection(s). How is this procedure different from your own? What would you change about their selection(s)? Do they effectively and efficiently analyze the data collected in their experiment/survey?
- Scoring rubric for individual assignment:

Power Point Expectations:

Lesson #1 Draft Proposal	Lesson #2 Survey/Experiment	Lesson #3 Data Analysis/Power Point Presentation
▪ Sampling Technique Chosen along with explanation/justification ▪ Sample Size along with explanation/justification ▪ How they controlled for the following ▪ Sources of bias with explanation/justification ▪ Experimental Error with explanation/justification	▪ Data collection method chosen along with explanation/justification ▪ Method chosen for recording collected data ▪ Highlights from the process including mistakes, memorable events ▪ One slide documenting actual data that was collected ▪ One slide documenting survey/experiment method	▪ Selected data analysis method chosen with explanation/justification ▪ Summary of data analysis (actual values) ▪ Design/clarity of presentation ▪ Free of grammatical errors ▪ Professional in appearance ▪ Accuracy content ▪ Interpretation/Conclusion from data analysis ▪ Were the any changes in income level in Henry County? Why?

	1	2	3	4
Data Analysis	The student has no understanding of the statistical procedure(s) chosen in the data analysis of their experiment/survey and this is evident in what has been presented in their data analysis	The student has minimal understanding of the statistical procedure(s) chosen in the data analysis of their experiment/survey and this is evident in what has been presented in their data analysis	The student has sufficient but limited understanding of the statistical procedure(s) chosen in the data analysis of their experiment/survey and this is evident in what has been presented in their data analysis	The student has complete understanding of the statistical procedure(s) chosen in the data analysis of their experiment/survey and this is evident in what has been presented in their data analysis
Data Interpretation and Experiment/Survey Power Point Presentation	The student has no understanding of experiment/survey design and does not understand how to interpret finding from data analysis which is evident in what has been presented in their power point presentation	The student has minimal understanding of experiment/survey design and minimally understands how to interpret finding from data analysis which is evident in what has been presented in their power point presentation	The student has sufficient but limited understanding of experiment/survey design and has sufficient but limited understanding of how to interpret finding from data analysis which is evident in what has been presented in their	The student has complete understanding of experiment/survey design and completely understands how to interpret finding from data analysis which is evident in what has been presented in their power point presentation

			power point presentation	

Strategies for Differentiation

- Simplify this model even more for a group of student who are experiencing difficulty. This can be done by providing students with a sample study that is contains all of the relevant elements of this activity, which are highlighted, as well as supplying them with an accompanying power point template that only requires them to edit the appropriate fields.
- To extend materials for students who are ready to move forward introduce a different local economic issue and have students conduct research to find data on that topic. Then, have students conduct data analysis individually, present their findings to their initial group, and discuss the data analysis and interpret the results.

- ELL/EOL Strategies: Allow ELL/EOL students to work collaboratively in groups no larger than three students during classroom activities and Student Exploration #1.