

Engaged Learning Project

Title of Project: Statistics Research Study

Subject(s): Math

Grade Level(s): 9th and 10th

Abstract:

In this activity, students will be working in collaborative groups to conduct statistical research. Each group will select two variables that they believe have a relationship with each other. Using Google Forms, students will create a survey and determine a strategy in order to collect data from their selected population. After collecting data, students will use statistical methods to analyze their data and write a research paper to summarize their findings. Students will be taking the role of a professional researcher in order to explore issues or topics that are important to others. The final project will be submitted to The [American Statistical Association's Statistics Project Competition for Grades 7-12](#).

Learner Description/Context:

This lesson will be taking place in several classes. The school has a minority enrollment of about 15%. There are a couple of ELL students who are being monitored in their classes. The learning environment has a good variety of technology. There is a class set of Chromebooks available for use during class and before or after school. Students are also able to bring their own devices such as phones, tablets, and personal laptops. Collaboration stations are also available in the media center where students can display their work on a large screen and discuss it with up to four other students. The school is situated in a rural community. Students will be encouraged to seek a problem that is present in their community and provide a solution for it using statistics. This will maximize the funds of knowledge available in the community as they work with mentors.

Time Frame:

This activity will be spread out over the entire spring semester. The statistics unit is usually taught during the end of January and beginning of February and many concepts learned throughout the year will play a role in this assignment. Students will be given one day of class every other week to work on their project. They will be expected to do some aspects of the assignment in between class work days. Students will take time after their EOC Tests at the end of April to put some finishing touches on their final product which will be a video presentation.

Standards Assessed:

Math Standards

MGSE9-12.S.ID.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

MGSE9-12.S.ID.6a: Decide which type of function is most appropriate by observing graphed data, charted data, or by analysis of context to generate a viable (rough) function of best fit. Use this function to solve problems in context. Emphasize linear, quadratic, and exponential models.

MGSE9-12.S.ID.6c: Using given or collected bivariate data, fit a linear function for a scatter plot that suggests a linear association. Interpret linear models

MGSE9-12.S.ID.7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

MGSE9-12.S.ID.8: Compute (using technology) and interpret the correlation coefficient "r" of a linear fit. (For instance, by looking at a scatterplot, students should be able to tell if the

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ELA Standards

ELAGSE9-10W2: Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

a. Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

ELAGSE9-10W5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 9–10.)

ISTE-S Standards

2b: Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices.

2c: Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.

3a: Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

5a: Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.

5b: Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

6a: Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

6d: Students publish or present content that customizes the message and medium for their intended audiences.

7b: Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.

Learner Objectives:

Students will be able to collect, interpret, and represent data as a result of this learning experience. By doing this, students will gain the ability to evaluate and solve problems using statistics. While working in collaborative groups, students will gain strengths that will be beneficial to them while working in professional roles. Students will become more confident in sharing their work with others. Students will use technology in a manner that is safe for everyone involved. These objectives will be measured by the work submitted and informal conversations about their work.

The “hook” or Introduction:

This learning experience will begin with a class discussion about actual statistical studies that have been used to either solve a real-world problem or make a prediction. After examining these examples students will be introduced to careers that use these statistical methods. We will have a class discussion about problems within our community that could be analyzed using a statistical study. This will gain the interest of students as they have the freedom to select a topic of their choice for a statistical research study.

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Process:

This process will be spread out over the course of 16 weeks. Students will be given one day of class every other week where we will have a checkpoint to assess their progress.

Introduction:

Students will learn about the task and what is expected of them. At this point, students will select groups of up to 4 members and begin brainstorming ideas for their project. The maximum number of members allowed in a group by the American Statistics Association is 4. Students will be encouraged to search for a topic where they can make a prediction or solve a real-world problem. Some examples include weather forecasting, customer satisfaction, population growth, or stock market performance.

Checkpoint 1:

Each group will submit an idea for their topic. I will assess each topic and determine if it is feasible to complete a study on this topic. If the topic is feasible, I will search for community members who could serve as mentors for when students begin to interpret their data. Students will also post their ideas on a discussion board on our Learning Management System. Each student will comment on another group's idea. After this checkpoint, all students will be matched with a mentor. Students will meet with their mentors in order to determine a purpose of their data collection. If it is not possible for students to meet with their mentor face to face, they will use some form of technology to communicate such as email or video chat. In order to ensure that students remain safe while using the internet, we will review a module on [Digital Security](#) that has been created by the Madison Metropolitan School District. Students will be reminded of the importance of protecting the privacy of everyone involved.

Checkpoint 2:

Each group will submit the survey that they will be using to collect data or conduct research for the appropriate data. I will assess the survey and determine if it will collect the appropriate data needed for their study to be successful. If their survey is appropriate, they will begin to develop a plan to collect their data. Each group will create a Google Form for collecting their data.

Checkpoint 3:

During an in-class discussion, each group will share their plan for collecting data. I will support students as they determine if their plan will create a representative sample and allow them to make appropriate adjustments.

Checkpoint 4:

At this point, students should have collected their data. Each group will submit a spreadsheet with charts and graphs that summarize their data. They will use technology such as Google Sheets or Desmos Graphing Calculator to create a regression line and correlation coefficient for their data.

Checkpoint 5:

At this point, students will submit a rough draft of their report. Their report should contain the question they are solving, the data collected, a data display, analysis, conclusion, and a reflection. They will have the opportunity to collaborate with their mentors to get a perspective of the significance of their data. Students will use the rubric that is supplied by the American Statistical Association for the statistics project as a guide. We will create a partnership with a college statistics

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class. The college students will come from a course called Probability and Statistics for Secondary Educators. These college students are prospective teachers or current teachers who are working on a graduate degree. The college students will provide feedback on the rough draft and share suggestions based on techniques they are learning in class. These students will receive credit for field experience in exchange for providing additional feedback. I will also provide feedback at this point.

Checkpoint 6:

Students will submit a second draft. This draft will be posted to a discussion board and class members will provide peer feedback. I will also provide additional feedback.

Checkpoint 7:

Students will submit a final draft of their research paper. This paper will be submitted to the American Statistics Association's statistics project. Before submitting the report, we will ensure that it meets all required guidelines. Students will ensure that they have acknowledged all adult guidance that was received throughout the process. Students will upload their written report to the American Statistics Association website.

Checkpoint 8:

Students will submit a video presentation which summarizes their findings. Students will have the opportunity to display their presentations at our end of year community night. This night is planned for parents and community members to come and celebrate all of the things that make our school great. Students will be given a time slot where they can talk about the importance of their project and they will show their video presentation. After sharing these presentations with the community, these videos will be posted to a class wiki page. This wiki page will be posted on the school website to allow for more visibility of the product.

Product:

Students will be creating a statistics project. Within their project will be Excel charts of data, graphs, and explanations. Students will determine if their data can be summarized with a linear or exponential regression line. They will interpret characteristics of their regression line and discuss what they mean in the context of their problem. Using technology, students will calculate a correlation coefficient and discuss the strength of the correlation in their problem. Other students seeking to learn about these standards, teachers, or various community members will care about the product. The product will be meaningful to students because they have the opportunity to begin with a topic that they are passionate about. They will have the opportunity to work with real data from a survey that they have created and see if their original hypothesis is true or not. Technology will be integrated throughout this project. Google Forms will be used for students to create a survey and collect data. Google Sheets will be used for students to compile the data that they receive. Students will be able to create a graph using a graphing calculator software such as Desmos or a spreadsheet software. Students will compile all of their components to create a research paper summarizing their results. Their final research paper will be submitted to the [American Statistical Association's statistics project for grades 7-12](#). Students will also create a video summarizing the findings of their project. The video presentations will be graded based on their ability to clearly summarize their findings. A rubric similar to the one used for the written product will be used to assess the presentation. The presentation should include a clearly stated statistical question, evidence of data collection, display of the data, a clear analysis, and a conclusion.

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Technology Use:

Technologies that are critical to the project include:

Google Forms: to collect data

Google Sheets: to summarize data collected and create data displays

Desmos (or any other graphing calculator): to create graphs and calculate correlation

Learning Management System (or any other discussion board): for peer reviews

Video Editing Software: for creating a video presentation

Wiki: for sharing video presentations

These technologies support indicators of engaged learning in many ways. Using the Google tools allow groups of students to work as professionals as they use these tools to collaborate and solve real problems. I believe that this task is very authentic, meaningful, and collaborative for that reason. These tools allow the students to become producers as they create professional looking displays. The discussion boards and Wiki allow for this project to be seamless and ongoing.

References and Supporting Material:

A majority of the inspiration for this project comes from the goal of having students enter the [American Statistical Association's statistics project for grades 7-12](#). In order to assess students work and provide ongoing feedback the [rubric](#) provided by the ASA is a helpful tool.

It is important to remind students about digital citizenship and staying safe while using technology. The Madison Metropolitan School District has created a resource for high school students on [9 Elements of Digital Citizenship](#). I feel that it is important to provide this reminder at the beginning of this lesson.

References

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