

Lesson Plan

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Project Title: Developing an R Shiny Interactive Module for Teaching Statistical Power and Sample Size Calculation for High School Students

Project Track: Hybrid Content/Development

Project Team: Solo Project - Jeffery Painter

1 LESSON PLAN

1. Developed initial lesson plan and discussed with high school statistics teacher.
2. Designing the layout and process flow for the student interaction with the R Shiny application.
3. Working to determine appropriate assessment criteria and feedback to deliver to students as they progress on the data investigation

1.1 Lesson Plan Outline

Lesson Title: Maximizing Chicken Size: The Power of Quality Feed

Grade Level: High School

Duration: 90 minutes

Objective:

1. Students will understand the concept of statistical power and its role in making informed decisions.
2. Students will apply statistical power analysis to help a farmer decide if investing in more expensive chicken feed is worthwhile for marketing larger chickens.

Lesson Plan:

Introduction (10 minutes)

1. Begin by discussing the importance of data-driven decisions in agriculture and how it affects the food industry.
2. Introduce the concept of statistical power as a tool for decision-making.

Problem Scenario (10 minutes)

1. Present the scenario: "A farmer wants to sell the biggest chickens in town to high-end farm-to-table restaurants. To achieve this, he is considering investing in more expensive chicken feed."
2. Discuss with students what factors they believe might affect chicken size (e.g., diet, genetics, environment).

Interactive Activity - Part 1: Hypothesis Formulation (15 minutes)

1. Divide the students into groups and instruct them to formulate hypotheses about whether investing in more expensive feed will result in significantly larger chickens.
2. Encourage them to consider both the null hypothesis (no significant difference) and the alternative hypothesis (significant difference).

Interactive Activity - Part 2: Statistical Power Analysis (30 minutes)

1. Provide students with access to the R Shiny web application which contains data on the growth of chickens fed with regular and expensive feed.
2. Instruct each group to:
 - (a) Select an appropriate significance level (α) and effect size.
 - (b) Calculate the necessary sample size to achieve a desired level of statistical power (e.g., 0.80).
 - (c) Perform power calculations using statistical analysis software.
 - (d) Groups will present their findings, explaining their choices for α , effect size, and sample size.

Class Discussion (10 minutes)

1. Facilitate a class discussion:
2. Each group presents their results and explains whether they would recommend investing in more expensive feed.
3. Discuss factors like the cost of feed, practicality, and the impact on chicken size.

Conclusion and Reflection (10 minutes)

1. Summarize the importance of statistical power in decision-making.
2. Discuss the farmer's options and whether students' recommendations align with the farmer's goal of marketing the biggest chickens in town.

Homework/Extension Activity:

1. Assign students to research the impact of nutrition on chicken size and write a brief report with recommendations for the farmer.

Assessment:

1. Evaluate students based on their ability to formulate hypotheses, perform statistical power calculations, and provide well-reasoned recommendations to the farmer.