Putting Units 1-3 Into Practice

[Your Name Here]

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We are going to work through the following situation to put into practice everything that we've covered in Units 1-3. To assist us, I've created this R Markdown document with placeholders for R code and narrative interpretations.

The Context

We are members of the statistical consulting firm, STAT461 Inc., and we have been approached by a new client, J & N Toys.

J & N Toys manufactures a variety of children's plastic toys and would like to limit how much scrap content (i.e., defective toys) that gets generated in each production run. They have considered the introduction of a statistical process control (SPC) as well as an engineering process control (EPC) in order to achieve this aim at each of their nine manufacturing plants (located in different parts of three different regions). To assess the effects of these quality control practices, they have asked us to design and carry out an experiment over the course of a six-month period.

Of primary interest is the impact of using SPC, SPC + EPC, or no quality control on defect rate (measured as decrease in the number of defective toys per 1000 toys) at the end of the six month period.

What is the Statistical Research Question?

[Write a SRQ.]

Study Design

With our SRQ in mind, let us design an experiment which will allow us to answer the SRQ.

Key Elements

- Response: [fill in]
- Measurement Unit: [fill in]
- Factor: [fill in]
- Experimental Design:
    1) [fill in both the elements AND what goes here]
    2) [ditto]
    3) [ditto]
- What kind of design? [fill in]

Study Design Description

[Transform the Key Elements list into a descriptive narrative of how you will conduct the study]

Exploratory Data Analysis

[Your Data Explorations Go Here]

Statistical Inference Methods

[Explain how our study does or does not meet the base requirements of One-way ANOVA.]

Hypotheses

Given our statistical research question (), we may explore two hypotheses:

$$H_0 : y_{ij} = \mu_{..} + \epsilon_{ij}$$
$$H_1 : y_{ij} = \mu_{..} + \alpha_i + \epsilon_{ij}$$

for some $\alpha_i \neq 0$.

Method

To decide between the hypotheses and answer our research question, we will use [insert method choice here] with an Unusualness Threshold/Level of Significance of [value] $UT = 0.??$.

Assumptions

[List and discuss the assumptions of your selected method to get to a sampling distribution]

Results

[Write Up your results]

Discussion

[Discuss the implications of the results section in the context of the study. What will you tell the client?]

Code Appendix

```
# Setting Document Options
knitr::opts_chunk$set(
  echo = FALSE,
  warning = FALSE,
  message = FALSE,
  fig.align = "center"
)

# Add additional packages by name to the following list
packages <- c("tidyverse", "knitr", "kableExtra",
              "hasseDiagram", "car", "psych", "parameters")
lapply(
  X = packages,
  FUN = library,
  character.only = TRUE
)

# Set constraint
options("contrasts" = c("contr.sum", "contr.poly"))

options(knitr.kable.NA = "")

# Load the data
toyData <- read.table(
  file = "https://raw.github.com/neilhatfield/STAT461/master/dataFiles/toyProcessControl.dat",
  header = TRUE,
  sep = ","
)

# You'll have several code blocks here as you engage in EDA.
# You should create several data visualizations as well as
# tables of summary statistics.
# Create your Hasse Diagram here


# Apply your chosen method for the sampling distribution here

# Assess each of your assumptions and discuss your assessment

# Create a professional looking ANOVA Table, if applicable
```