FA9

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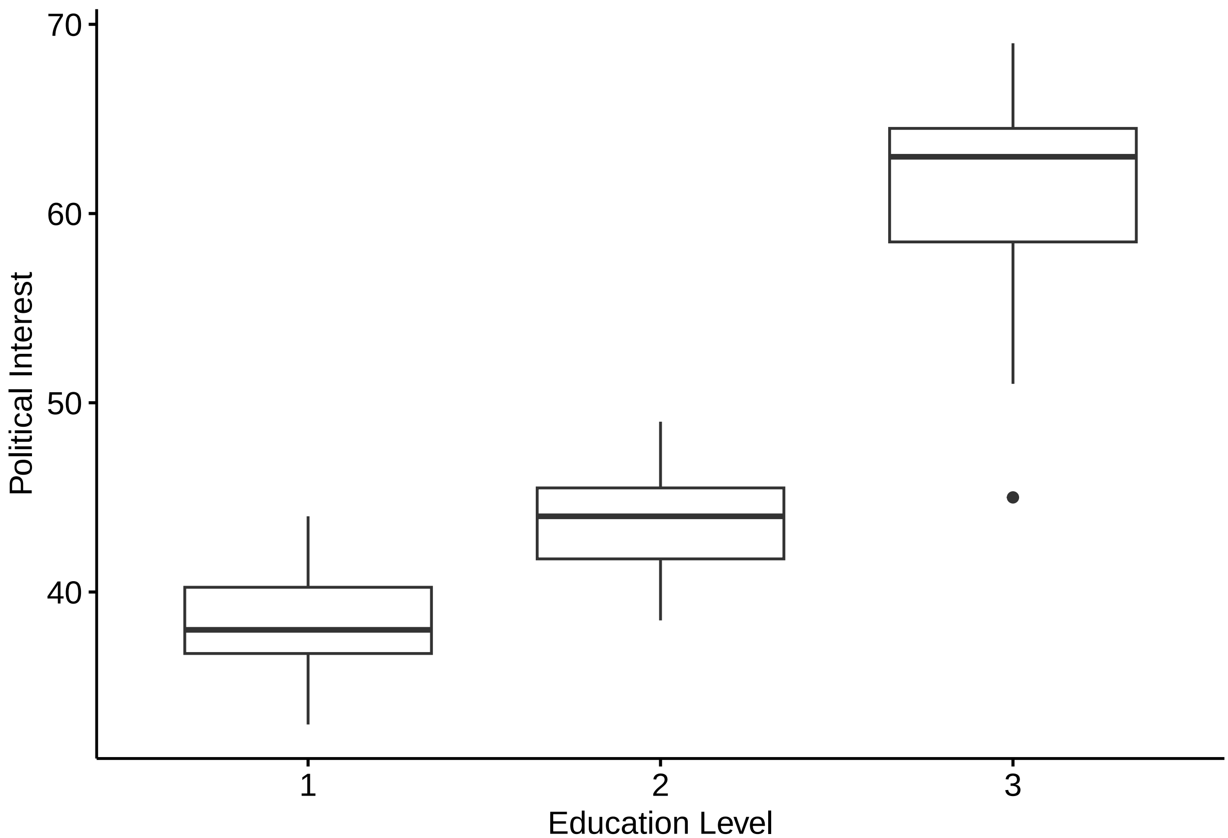
Data Exploration and Visualization

```
# Boxplot of Political Interest by Gender and Education Level
ggboxplot(political_data, x = "education_level", y = "political_interest",
          color = "gender", palette = "jco",
          xlab = "Education Level",
          ylab = "Political Interest",
          legend.title = "Gender")
```

```
## Warning: The following aesthetics were dropped during statistical transformation:
## colour.
## i This can happen when ggplot fails to infer the correct grouping structure in
##   the data.
## i Did you forget to specify a `group` aesthetic or to convert a numerical
##   variable into a factor?
```



Two-Way ANOVA

Assumptions

Normality

```
# Shapiro-Wilk test for each group
political_data %>%
  group_by(gender, education_level) %>%
  summarise(shapiro_p = shapiro.test(political_interest)$p.value)
```

```
## `summarise()` has grouped output by 'gender'. You can override using the
## `.groups` argument.
```

```
## # A tibble: 6 x 3
## # Groups:   gender [2]
##   gender education_level shapiro_p
##    <dbl>           <dbl>     <dbl>
## 1      1               1     0.895
## 2      1               2     0.761
## 3      1               3     0.191
## 4      2               1     0.819
## 5      2               2     0.819
## 6      2               3     0.668
```

Homogeneity of Variances

.

```
# Levene's Test
# Convert 'gender' and 'education_level' to factors
political_data <- political_data %>%
  mutate(
    gender = factor(gender, labels = c("Male", "Female")),
    education_level = factor(education_level, labels = c("Low", "Medium", "High"))
  )

# Verify structure
str(political_data)
```

```
## tibble [58 x 3] (S3: tbl_df/tbl/data.frame)
##  $ gender            : Factor w/ 2 levels "Male","Female": 1 1 1 1 1 1 1 1 1 1 ...
##  $ education_level   : Factor w/ 3 levels "Low","Medium",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ political_interest: num [1:58] 38 39 35 38 41 40 36 37 33 38 ...
```

```
# Perform Levene's Test
library(car)
leveneTest(political_interest ~ gender * education_level, data = political_data)
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value  Pr(>F)
## group  5  2.4301 0.04709 *
##       52
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Two-Way ANOVA

```r
# Perform the two-way ANOVA
anova_results <- aov(political_interest ~ gender * education_level, data = political_data)
summary(anova_results)
```

```
##                         Df Sum Sq Mean Sq F value  Pr(>F)
## gender                   1      4     4.3   0.308 0.58107
## education_level          2   5382  2691.1 191.893 < 2e-16 ***
## gender:education_level   2    227   113.7   8.109 0.00086 ***
## Residuals               52    729    14.0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

APA Reporting

```r
# Add unique identifier
political_data <- political_data %>%
  mutate(
    id = row_number(),  # Unique identifier
    gender = factor(gender, labels = c("Male", "Female")),
    education_level = factor(education_level, labels = c("Low", "Medium", "High"))
  )

# Run ezANOVA
library(ez)
anova_table <- ezANOVA(
  data = political_data,
  dv = political_interest,
  wid = id,  # Use the unique identifier
  between = c("gender", "education_level"),
  detailed = TRUE
)
```

```
## Warning: Converting "id" to factor for ANOVA.

## Warning: Data is unbalanced (unequal N per group). Make sure you specified a
## well-considered value for the type argument to ezANOVA().

## Coefficient covariances computed by hccm()
```

```r
# View results
anova_table
```

```
## $ANOVA
##                   Effect DFn DFd        SSn      SSd           F            p
## 1                 gender   1  52   11.16215 729.2444   0.7959361 3.764212e-01
## 2        education_level   2  52 5382.18706 729.2444 191.8929443 9.885183e-25
## 3 gender:education_level   2  52  227.43814 729.2444   8.1089293 8.604721e-04
##   p<.05        ges
## 1       0.01507571
## 2     * 0.88067535
## 3     * 0.23773626
##
## $`Levene's Test for Homogeneity of Variance`
##   DFn DFd      SSn      SSd        F          p p<.05
```

```
## 1   5  52 64.71073 276.9444 2.43006 0.04709226     *
```

Conclusion

Based on the results, we fail to reject/reject the null hypothesis. The findings suggest (add interpretation here).