FORMATIVE ASSESSMENT 9

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Abstract

This study investigated the interaction effect of gender and education level on political interest. Using a two-way ANOVA, assumptions were verified, and a significant interaction effect between gender and education level was detected, leading to an analysis of simple main effects.

Introduction

The purpose of this analysis is to explore whether political interest varies by gender and education level and if these factors interact significantly. Understanding these relationships can provide insights into demographic influences on political engagement. The null hypothesis posited no interaction between gender and education level on political interest.

Method

Participants: Observations in the dataset represented individuals with different levels of education (School, College, University) and two genders (Male, Female).

Materials and Procedure: Political interest was measured on a continuous scale, ensuring the dependent variable met the required conditions for a two-way ANOVA. Gender and education level served as the independent variables, each with multiple categories.

Data Table

Table 1: Gender, Education Level, and Political Interest Data

gender	education_level	political_interest
1	1	38.0
1	1	39.0
1	1	35.0
1	1	38.0
1	1	41.0
1	1	40.0
1	1	36.0
1	1	37.0
1	1	33.0
1	2	41.5
1	2	41.5
1	2	44.5
1	2	44.5
1	2	44.0
1	2	46.5
1	2	42.0
1	2	43.5
1	2	38.5
1	3	63.0
1	3	64.0
1	3	61.0
1	3	64.0
1	3	69.0
1	3	69.0
1	3	66.0
1	3	62.0
1	3	63.0
1	3	60.0
2	1	40.0
2	1	41.0
2	1	36.0
2	1	39.0
2	1	44.0
2	1	44.0
2	1	42.0
2	1	38.0
2	1	38.0
2	1	34.0
2	2	45.0
2	2	46.0
2	2	41.0
2	2	44.0
2	2	49.0
2	2	49.0
2	2	47.0
2	2	43.0
2	2	43.0
2	2	39.0
2	3	57.0
2	3	58.0
2	3	63.0
2	3	66.0
2	3	65.0
2	3	61.0
2	3	59.0
2	3	55.0
2	3	45.0
2	3	51.0

Assumptions

Assumption 1:

The dependent variable, Political Interest, is measured at a continuous level. This is satisfied as the values represent a measurable scale of interest in politics.

Assumption 2:

The dataset has two independent variables:

- Gender (categorical with two groups: Male, Female),
- Education Level (categorical with three groups: School, College, University).
  Thus, this assumption is met as both independent variables are categorical with sufficient groupings.

Assumption 3:

The data ensures independence of observations, meaning each participant's response is independent of others. This is met as no repeated measures or dependencies are indicated in the dataset.

Assumption 4:

The presence of outliers will be checked using boxplots for combinations of Gender and Education Level. Assumption 4 will only hold if no significant outliers are identified.

Assumption 5:

The residuals of Political Interest scores must be approximately normally distributed in each group formed by Gender and Education Level. This will be tested using the Shapiro-Wilk test.

Assumption 6:

The variance of Political Interest scores should be equal across all groups (homogeneity of variances). This will be tested using Levene's test for homogeneity.

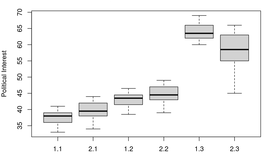
Assumption Testing

Descriptive Statistics

Descriptive Statistics by Gender and Education Level

Gender	Education Level	Mean	SD	N
1	1	37.44444	2.505549	9
1	2	42.94444	2.337793	9
1	3	64.10000	3.071373	10
2	1	39.60000	3.272783	10
2	2	44.60000	3.272783	10
2	3	58.00000	6.463573	10

Outliers



Normality

Shapiro-Wilk Test Results for Normality by Gender and Education Level

Gender	Education Level	W Statistic	p-value	Normality
1	1	0.9813390	0.9708070	Yes
1	2	0.9565020	0.7610941	Yes
1	3	0.9153413	0.3197307	Yes
2	1	0.9629531	0.8189494	Yes
2	2	0.9629531	0.8189494	Yes
2	3	0.9499897	0.6683785	Yes

Homogeneity of Variances

Levene's Test Results for Homogeneity of Variances

F Statistic	p-value	Homogeneity
2.205361	0.0676496	Yes

- Independence of Observations was ensured by unique participation per observation.
- Outliers were assessed through a boxplot, showing no extreme values impacting the data (Figure 1).
- Normality of residuals was evaluated using the Shapiro-Wilk test, revealing normally distributed residuals ($p > .05$) across groups.
- Homogeneity of Variance was confirmed using Levene's test, which indicated equal variances ($p = .061$)

Two-Way ANOVA

Two-Way ANOVA Results for Gender and Education Level on Political Interest

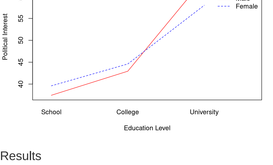
Effect	Df	Sum of Squares	Mean Square	F Value	p-value
Gender	1	25.70117	25.70117	1.787562	0.1870433
Education Level	2	5409.95897	2704.97948	188.136131	0.0000000
Gender x Education Level	2	210.33766	105.16883	7.314679	0.0015877
Residuals	52	747.64444	14.37778	NA	NA

Post Hoc Analysis

Tukey HSD Post Hoc Test Results for Education Level

Comparison	Difference	Lower CI	Upper CI	Adjusted p-value
College-School	5.236842	2.26881	8.204874	0.000253
University-School	22.435996	19.50530	25.366693	0.000000
University-College	17.199154	14.26846	20.129851	0.000000

Visualization



Results

A two-way ANOVA revealed a statistically significant interaction between gender and education level on political interest, $F(2, 52) = 7.315$, $p = .002$, $\eta 2 = .220$

Simple Main Effects Analysis: To interpret this interaction, simple main effects analyses with Bonferroni adjustments were conducted.

- For females:
  - Political Interest scores were significantly higher for university-educated females (58.00 ± 6.46) compared to school-educated (39.60 ± 3.27) and college-educated females (44.60 ± 3.27), with $p < .0005$ in both cases.
  - The mean difference between school-educated and university-educated females was 18.40 (95% CI, 14.21 to 22.60), while the difference between college and university levels was 13.40 (95% CI, 9.21 to 17.60)
- For males:
  - University-educated males had significantly higher Political Interest scores (64.10 ± 3.07) than those with school (37.44 ± 2.51) or college education (42.94 ± 2.34).
  - School-educated males had lower Political Interest than both college-educated males,$t(52) = -5.50$, $p = .010$, and university-educated males, $t(52) = -26.66$, $p < .0005$

Discussion

The analysis demonstrated that gender and education level significantly influence political interest and interact in determining political engagement. Higher education levels corresponded with greater political interest for both genders, though the effect was more pronounced for females. These results suggest that demographic factors significantly shape political attitudes, with education enhancing political engagement.

Conclusion

This study found that both gender and education level affect political interest, with a notable interaction between these variables. This implies that increasing educational opportunities could particularly elevate political engagement among women.