

Analyzing Gender-Based Perceptions of Corruption and Equity Among Engineering Students: Insights From a Multidisciplinary Data Mining Approach

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Abstract

In this study, we explored the differing perceptions of equity and corruption values between women and men through data mining analysis. Utilizing an extensive database of surveys, we applied advanced data mining techniques to identify significant patterns and differences in the perception of these values across genders. The results were derived from a survey initially designed as a result of a multidisciplinary and socially complex analysis, targeting engineering students at the National Polytechnic Institute in Mexico. The survey measured perceptions of corruption in educational institutions, businesses, the general public, as well as in public and private educational institutions. It was found that men perceived some of these entities as more corrupt. According to the results, women tend to have a more critical perception of acts of corruption and place a higher value on principles of equity. Additionally, students were asked why they were pursuing their careers, and the majority responded that it was to earn more money. These findings not only provide a deeper understanding of how men and women perceive equity and corruption but also inform the development of educational strategies and public policies. This study underscores the importance of considering gender in the study of social values and highlights its relevance for designing policies that effectively promote equity and combat corruption.

Keywords: Gender, Corruption, Values, Soft Skills

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Introduction

The topic of values is crucial in contemporary integral development, highlighting the importance of their implementation in educational settings to promote societal change and environmental protection (UNESCO, 2023). As part of soft skills development (Moreno et al., 2022), the aim is to foster values to “promote a more inclusive educational environment where learning occurs effectively” (UNESCO, 2024).

Traditionally, it has been thought that women are more sensitive due to greater activity in the right hemisphere of their brains. Recent studies (Jiang Xin, 2019) indicate that gender-related differences exist across the entire brain. Gender expectations, sociocultural influences, and life experiences may contribute to the formation of distinctive patterns. Carol Gilligan's research (1982) has demonstrated that moral reasoning varies by gender, with women placing a higher priority on interpersonal connections and caregiving responsibilities over abstract duty and rights. In other words, women's moral thinking is often shaped by interconnectedness, care, and empathy, while men's moral reasoning tends to be formal, legal, and impartial.

In the context of higher education institutions in Mexico, analyzing perceptions of equity and corruption among engineering students reveals gender differences. The focus on corruption arises from its prevalent status as a countervalue in Mexico (Martínez, 2017). This study targets students at the Instituto Politécnico Nacional (IPN) and applies a data mining approach to examine how men and women perceive these values in various contexts, including educational institutions, companies, and society at large. Results indicate that women tend to be more critical of corruption and place a higher value on equity principles compared to their male counterparts. Within brain functions, "ethical intelligence" is defined as the ability to understand all life and all human beings, a quality of consciousness that leads to either humanization or destruction (Seijo, 2012). Through statistical analysis, this research aims to provide a comprehensive perspective on potential gender differences in perceptions of corruption; its findings will contribute to the design of educational and public policies aimed at promoting equity and combating corruption, taking into account gendered perspectives.

About Corruption and Values

According to the CPI, carried out by Transparency International, Mexico is in position 126 (Transparency International, 2023) among the 180 countries evaluated, sharing the score with El Salvador, Kenya and Togo, all with 31/100 points. The highest CPI scores correspond to Denmark (90/100), Finland (87/100) and New Zealand (85/100). The worst-rated countries are South Sudan (13/100), Syria (13/100), Venezuela (13/100) and Somalia (11/100) with nations such as Bolivia, Kenya, Kyrgyzstan and Pakistan and above Azerbaijan, Gabon, Malawi, Mali and Russia.

Mexico has a lot of resources to be a rich country, the problem of inequity is a crisis of values (González, 2000). The focus on corruption arises from its prevalent status as a countervalue in Mexico (Martínez, 2017). One of the most important in Mexico is honesty.

Methodology

Data Mining

A survey was applied to 965 students by Google Forms. For the analysis of the results, data science (Aguilar, 2023) was employed as a multidisciplinary academic method to extract knowledge from data. Additionally, data mining (Navarro, 2020) was used to identify new relationships between variables and to summarize data sets in a comprehensible and useful manner, which is relevant in social research (Rivero, 2022). This technique allowed the identification of relevant patterns and trends regarding emotional needs, access to tutoring, and the academic challenges faced by students (UNESCO, 2024).

Analysis of Perceptions on Corruption and Equity

To conduct this analysis, survey responses on perceptions of corruption and equity were collected from Communications and Electronics Engineering students at the Instituto Politécnico Nacional. Respondents rated each question on a scale from 1 to 5, where 1 represents a low perception of integrity or morality, and 5 represents a high perception of corruption or moral influence in media, depending on the context of the question.

Dataset Description

The dataset includes perception-based questions covering various areas, such as public and private institutions, the educational system, and specific demographic groups.

The following describes the key columns in the dataset:

Gender: Gender of respondents (Male or Female).

Questions: Each question pertains to the perception of corruption, integrity, or morality in specific institutions and groups, as follows:

118: Overall perceived level of corruption.

119: Public institutions and officials.

120: Private companies.

121: Government schools at primary and secondary levels.

122: Private schools at primary and secondary levels.

123: Public universities.

124: Private universities.

125: General perception of the Instituto Politécnico Nacional (IPN).

126: Perception of ESIME Zacatenco.

127-137: Perceptions of specific groups, such as youth, individuals over 40, the wealthy, the poor, teachers, and the influence of media like television and Facebook.

Initial Analysis Focus Areas

Quantification of Response Counts

The number of responses received for each question was determined and broken down by gender, allowing for an understanding of the distribution of perceptions across demographic groups.

Descriptive Statistics

Descriptive statistics were calculated, including mean, median, standard deviation, minimum and maximum values, and percentiles for each question. These statistics help to observe perception trends and identify potential biases in perceptions between men and women.

Correlation Analysis

A correlation matrix was created among the responses to each question. This matrix identifies significant relationships between perceptions, suggesting, for instance, that respondents who perceive high levels of corruption in public institutions also tend to have similar perceptions of other sectors, such as the educational system and private companies. Pearson's correlation was used in this case, as it is insensitive to scale differences and allows measurement of the linear relationship between two variables.

This analysis provides a comprehensive understanding of how corruption and equity are perceived across different sectors and institutions and suggests patterns of perception among various groups and types of institutions.

Quantification of Response Counts

To analyze and visualize the distribution of responses for each perception question, a frequency count was conducted for each item in the dataset.

The analysis of the twelve questions in the dataset revealed: eighteen questions are related to perceptions of corruption and integrity across public and private institutions and social groups. Two specific questions address perceptions of whether television and Facebook propagate moral values. Subsequently, these frequency counts for responses by question were represented in a bar chart, providing a clear visualization of response distribution across each perception category.

Results and Analysis

Frequency Charts

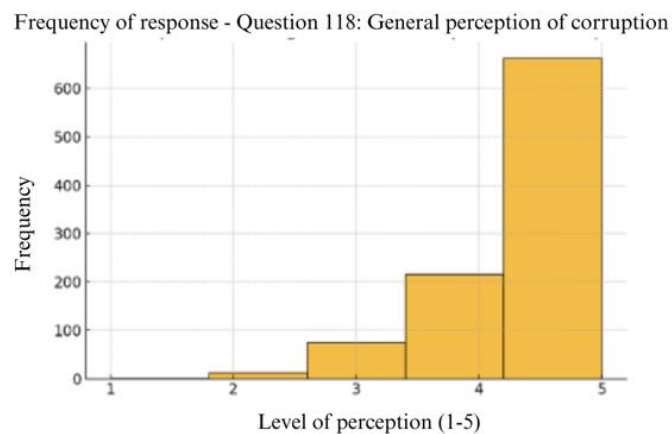


Figure 1: General Perception

Frequency of response - Question 119: Perception in public institutions and officials

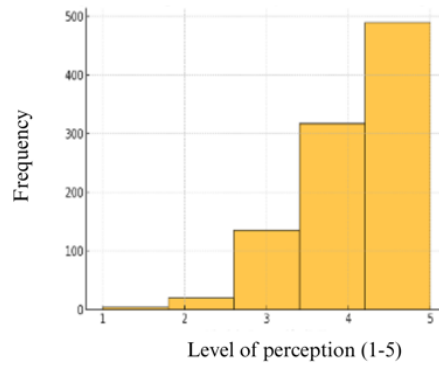


Figure 2: Perception in Public Institutions and Officials

Frequency of response - Question 122: Perception in private schools

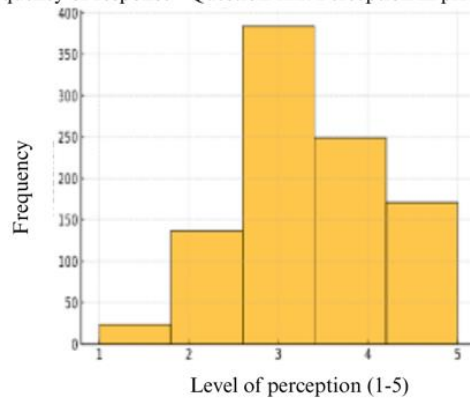


Figure 3: Perception in Private Schools

Frequency of response - Question 130: Perception of corruption among young people

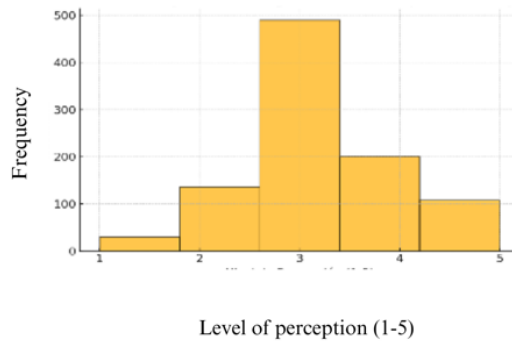


Figure 4: Perception Among Young People

Correlation Analysis

A correlation matrix was generated, shown in Figure 5, highlighting relationships among various aspects evaluated in the survey (correlations were rounded for clarity), correlation matrix among perception questions (question numbers).

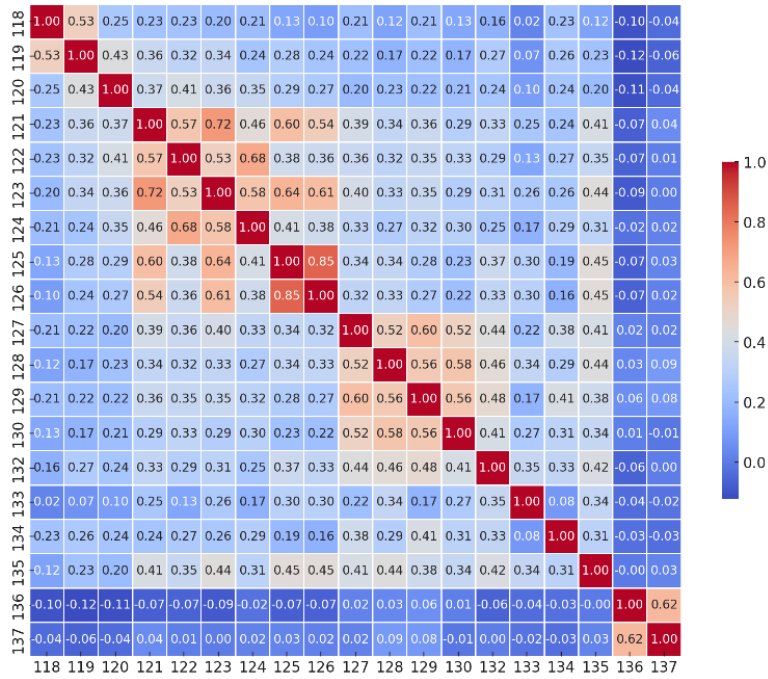


Figure 5: Question Correlation

A descriptive statistical analysis was conducted:

Table 1: Descriptive Statistical Analysis

Question number	Mean	Standard deviation	Percentile distribution
118	Women: 4.62, Men: 4.56	Women: 0.68, Men: 0.70	(25%, 50%, 75%) (4-5),
119	Women: 4.36, Men: 4.30	Women: 0.81, Men: 0.82	Most are grouped in 75%
120	Women: 3.91, Men: 3.84	Women: 0.93, Men: 0.90	Close to 4
121	Women: 3.27, Men: 3.34	Women: 1.01, Men: 1.05	Mixed options
122	Women: 3.45, Men: 3.41	Women: 0.95, Men: 1.04	Critical perceptions
123	Women: 3.25, Men: 3.16	Women: 1.07, Men: 1.10	Dispersion
125	Women: 2.72, Men: 2.73	Women: 1.07, Men: 1.13	Low and médium levels
126	Women: 2.59, Men: 2.54	Women: 1.06, Men: 1.13	Varied and dispersed
127	Women: 3.63, Men: 3.55	Women: 0.92, Men: 0.93	Madium levels
128	Women: 3.03, Men: 3.07	Women: 0.79, Men: 0.92	Medium levels
129	Women: 3.41, Men: 3.51	Women: 0.87, Men: 0.94	Mostly in levels 3 and 4
130	Women: 3.15, Men: 3.26	Women: 0.88, Men: 0.95	Mostly in levels 3 and 4

132	Women: 2.99, Men: 3.07	Women: 0.91, Men: 1.00	Diversity
133	Women: 2.47, Men: 2.59	Women: 1.02, Men: 1.13	Low and médium levels
134	Women: 3.93, Men: 3.92	Women: 0.96, Men: 0.95	Medium and high levels (3-5)
135	Women: 2.79, Men: 2.79	Women: 0.86, Men: 0.92	Medium levels
136	Women: 2.74, Men: 2.70	Women: 1.11, Men: 1.14	Low levels (2-3)
137	Women: 2.59, Men: 2.48	Women: 1.11, Men: 1.13	Low levels (2-3)

It was asked why they were studying their degree:

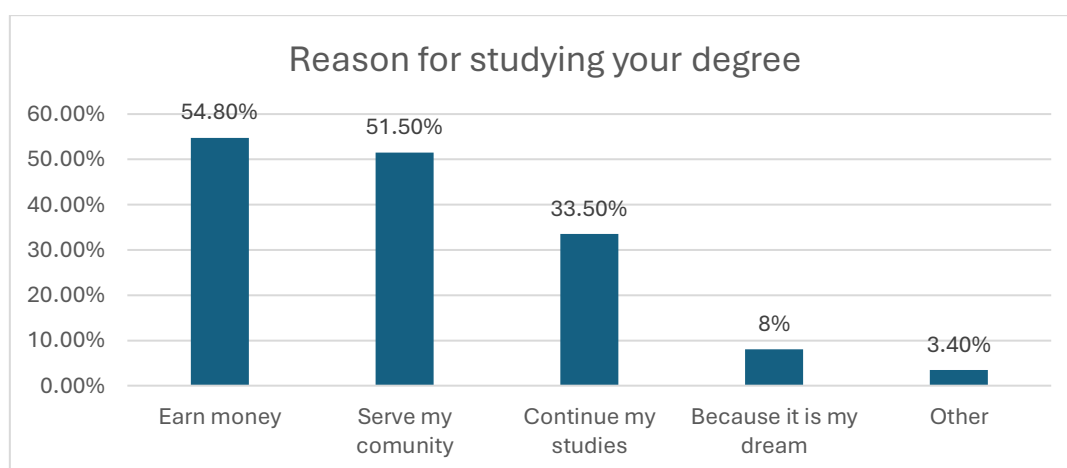


Figure 6: Degree Reason Chart

Results and Analysis

- General perception of corruption (Question 118): The perception is consistent and high across both genders, with a slight tendency for women to be more critical.
- Perception of public institutions and officials (Question 119): The perception is high and consistent, with a slight tendency for women to be more critical.
- Perception of private companies (Question 120): Women tend to view private companies more critically than men, who show greater variability in their responses.
- Perception of public schools (Question 121): Both genders perceive corruption in public education, with diversity in responses.
- Perception of private schools (Question 122): The perception of corruption in private schools is consistent and critical.
- Perception of public universities (Question 123): The perception is somewhat diverse, although women appear to be slightly more critical.
- Perception of the IPN in general (Question 125): Both genders perceive the IPN similarly (on average), with dispersed perceptions.
- Perception of ESIME Zacatenco (Question 126): Perceptions of ESIME Zacatenco show diversity, with women being slightly more critical.
- Perception of the general population (Question 127): The perception is moderate and similar across genders, with little variability.

- Perception of women (Question 128): The perception of women is moderate, with less variability in female responses.
- Perception of men (Question 129): Both genders view the integrity of men similarly, slightly lower than that of women, with moderate consensus in both distributions.
- Perception of youth (Question 130): The perception of youth is fairly uniform, with both genders showing similar views; it is moderate.
- Perception of people over 40 years (Question 132): Men tend to view individuals over 40 as slightly more integral than women.
- Perception of the poor (Question 133): The perception is low in both genders, with more diverse opinions among men.
- Perception of the rich (Question 134): The perception is similar across both genders, with somewhat dispersed opinions. It is higher than the perception of corruption among the poor.
- Perception of teachers (Question 135): The perception of teachers is low and similar across genders.
- Perception of television as a propagator of moral values (Question 136): Television is seen as a medium with low moral influence, with no significant differences between genders.
- Perception of Facebook as a propagator of moral values (Question 137): Facebook is seen as a medium with low moral influence, with a slightly more negative perception among women.

General Interpretation of the Correlation Matrix

Results With High Positive Correlation (close to +1).

- Public institutions and public schools (e.g., Questions 119 and 121): These questions tend to have positively correlated responses, suggesting that those who perceive high levels of corruption in public institutions also perceive corruption in public schools.
- Private companies and private universities (Questions 120 and 124): A positive correlation between these responses suggests that those who perceive corruption in private companies tend to also perceive high levels of corruption in private educational institutions.
- Moral values in television and Facebook (Questions 136 and 137): This high correlation suggests that respondents who believe that television propagates moral values tend to hold the same view about Facebook, reflecting a general perception of the moral influence of media.

Moderate Positive Correlation (between +0.4 and +0.7).

- Perception of corruption in general and in public institutions (Questions 118 and 119): There is a moderate positive correlation, indicating that those who perceive high levels of corruption in general tend to also perceive corruption in public institutions.
- Perception of youth and the poor (Questions 130 and 133): The moderate correlation between these perceptions suggests that those who hold a moderate or negative view of the integrity of youth tend to have a similar perception of the poor.
- Perception of the rich and teachers (Questions 134 and 135): Although the correlation is more moderate, those who view the rich with greater integrity tend to view teachers similarly.

Low or Negative Correlation (near 0 or negative).

- General corruption and moral values on facebook (Questions 118 and 137): The low correlation suggests that the general perception of corruption is not significantly related to the opinion on whether Facebook propagates moral values.
- Perception of the poor and the rich (Questions 133 and 134): The low correlation suggests that perceptions of these two groups are evaluated differently, with no clear relationship in opinions about their integrity.
- Perception of people over 40 and youth (Questions 132 and 130): The low correlation between these questions reflects that perceptions of integrity in these groups do not necessarily align, which could be due to stereotypes or differences in personal experiences.

The main reason why they are studying the degree in Communications and Electronics Engineering is because they want to make money (54.5%), followed by serving their community (51.5%).

Conclusion

The perception of corruption and moral values in various sectors and institutions in Mexico shows a critical consistency between genders, with a general tendency for women to be slightly more critical. It is perceived that men are more corrupt than women, and that the rich are more corrupt than the poor, as well as private schools and institutions being slightly more corrupt than public ones. The perceptions of corruption in both public and private institutions are correlated, suggesting a generalized distrust of organizations. Furthermore, there is a shared perception of the low moral influence of media such as television and Facebook. The evaluation of perceptions across different social groups, such as youth and the poor, suggests common stereotypes, while the lack of evaluation between others, such as the poor and the rich, indicates differentiated assessments of integrity. It is important to note that the IPN is a public institution aimed at children of workers from lower socioeconomic backgrounds, condition that may influence perceptions. The main reason why they are studying their Engineering degree is because they want to make money.

The study reflects a critical and complex view of integrity in Mexican society. Ideally, the absence of corruption should be perceived, though around 2.5 (halfway) or less is statistically moderate, and the results are generally not good. It is recommended that efforts be made to reduce the perception of corruption.

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