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NAVIGATING THE FUTURE, A COMPREHENSIVE STATISTICAL STUDY ON ACADEMIC PERFORMANCE AND CAREER CHOICES

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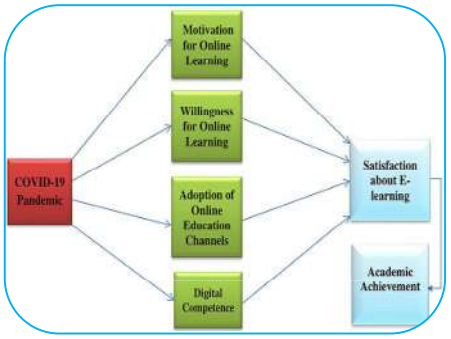
ABSTRACT :

Education is considered as one of the key factors for individual growth and social development. With the changing times, the education system has also evolved to cater to the diverse needs of society. As we navigate through the 21st century, it becomes essential to understand the impact of various factors on education, such as the type of school, medium of instruction, exam performances, gender bias, career aspirations, and so on.



KEYWORDS : *social development , medium of instruction, exam performances, gender bias.*

INTRODUCTION :

In recent years, there has been an increasing focus on the importance of education and its impact on career opportunities. With the changing landscape of the education system, it is essential to examine the various factors that influence a student's academic performance andcareer aspirations.

As **Nelson Mandela said, "Education is the most powerful weapon which you can use to change the world."** Therefore, it is vital to understand the factors that contribute to a student's success in the education system.

This research aims to contribute to the understanding of the impact of education on individuals and society, and to provide insights that could help shape the future of education.Through this study, we hope to provide a better understanding of the factors that influence education and career aspirations, and how we can navigate the future of education to achievea better tomorrow.

OBJECTIVES

1. To analyse the linkage between schooling type and student's marks.
2. To uncover the impact of schooling medium on student's marks.
3. To analyse the connection between secondary and higher secondary examperformance.
4. To analyse the impact of secondary and higher secondary marks on career path.
5. To analyse the bias in stream selection by gender after class 10^{th} and 12^{th}.
6. To find willingness to take a gap after completion U.G stream.
7. To find relationship between U.G stream and future career aspiration.

METHODOLOGY AND DATA COLLECTION

We collected primary data through a Google form, which was designed to capture information on various aspects such as age, gender, medium of schooling, type of schooling, SSC percentage, HSC percentage, post-graduation stream, and preferences after UG. The form was distributed to a diverse group of teenagers across different regions in India, and participation was voluntary.

To ensure confidentiality, the form did not require volunteers to disclose their personal information such as phone number, email ID, mark sheet number, or name. The data collected was used for testing purposes only, and the project team ensured that the data wasstored securely and used in compliance with ethical guidelines.

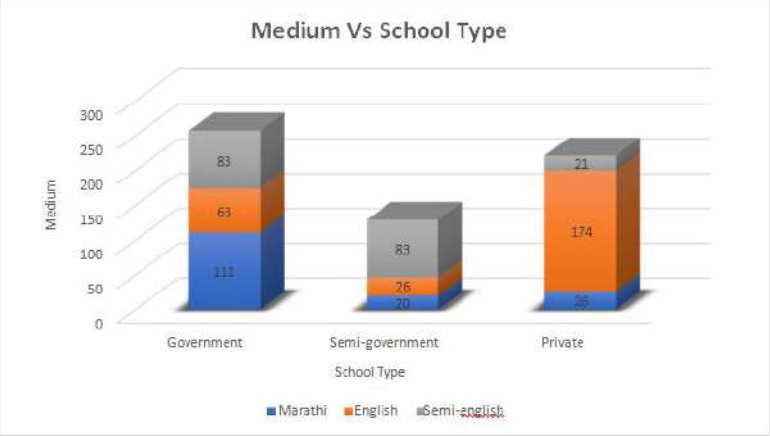
In total, the project recorded 607 observations, with 108 from Arts stream students, 123 from Commerce stream students, and 376 from Science stream students. This means that 17% of the observations were from Art stream students, 22% from Commerce stream students, and 61% from Science stream students. The data set was analysed using statistical techniques to identify patterns and trends related to academic performance and career choices.

SOFTWARE USED

1. R Software
2. Excel

Exploratory Data Analysis

1. Plot for medium and school type:



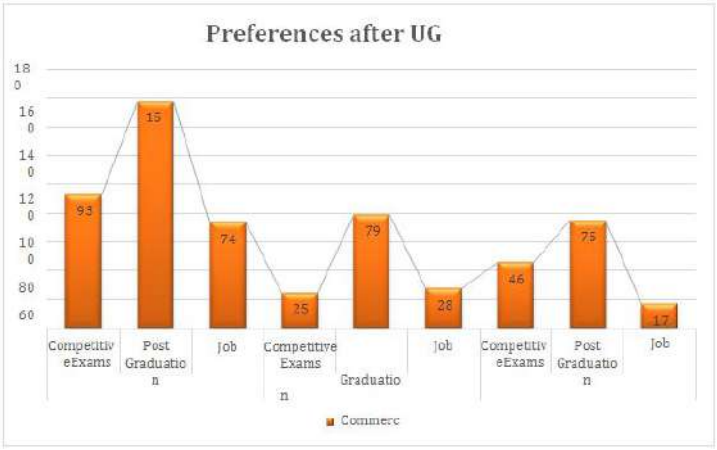
INTERPRETATION:

- In Government Schools, we see Marathi medium students are more as compare toEnglish and Semi-English medium, moreover English and Semi-English Mediumstudents are almost equal.
- In Semi-Government Schools, the proportion of Semi English Medium Students arehigh and Marathi and English Medium Students proportion are almost equal
- In Private Type of Schooling, English Medium Students Ratio is very high ascompare to Marathi and Semi-English Students.

2. Sunburst of Reasons for choosing the current degree:

INTERPRETATION:

- Most of the students feel empowered and capable of making their own career decisions in the modern era. This could be due to increased access to information andresources, as well as a shift in societal values towards individual autonomy and self- determination.
- However, it is also worth noting that a significant proportion of students still value theadvice and guidance of others, such as career counsellors or family and friends, when making their career decisions. This suggests that although students may be more independent in their decision-making, they still recognize the importance of seeking outside perspectives and support.



- Finally, the fact that the smallest proportion of students make their career decision based on their financial background could indicate that financial considerations arenot the primary factor in career decision-making for most students. Instead, other factors such as personal interests, skills, and values may play a larger role.

3. Plot for gender and stream after 10th standard:

INTERPRETATION:

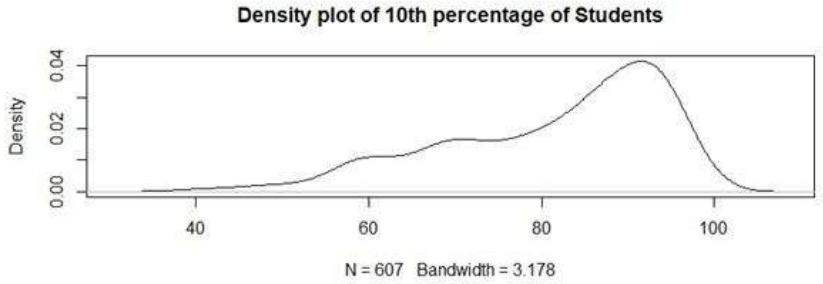
- In Science stream we see almost equal number of male and female students , but thenumber of female is slightly high
- In Commerce stream female students are more interested than male students.
- In Arts stream proportion of male and female students are same.

4. Plot for preferences after UG-Degree:

INTERPRETATION:

- Science Stream: In Science stream we observed that Students prefer Post-Graduation more as compare to other Preferences after Under Graduation.
- Commerce Stream: Commerce students are more interested in doing Post-Graduation after UG degree completion. Their inclination towards Job and Competitive exams arealmost equal but lesser than Post Graduation
- Arts Stream: Arts students are more likely to do Post Graduation and CompetitiveExams after them under graduation as compared to job.

5.Density Plot:



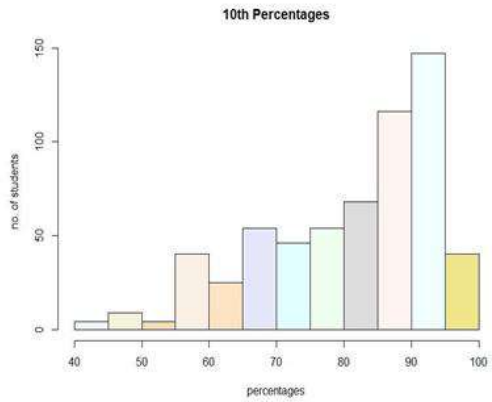
INTERPRETATION:

- The density plot of the 10th percentage distribution shows that there is a higher density of students with percentages between 80 and 100. This means that there aremore students in this range than in any other range of percentages.
- The second highest density of students is between 60 and 80 percent, which means that there are fewer students in this range than in the 80-100 range, but more studentsthan in the 40-60 range.
- Finally, the lowest density of students is between 40 and 60 percent. This indicatesthat there are fewer students in this range than in the other two ranges mentioned.
- Overall, the density plot tells us that most students scored between 80-100 percent onthe 10th-grade examination, with fewer students scoring between 60-80 percent and even fewer students scoring between 40-60 percent.

Testing Theory And Procedures

Testing normality of data:

Histogram:



The above histogram is not symmetric so we can conclude that data is not normallydistributed.

Shapiro Wilk Test :
H0: Data is normally distributed.
H1: Data is not normally distributed.

p-value =2.2e-16

Test procedure:
Reject H0 if p-value < level of significance

Decision:
At 5% level of significance
p-value = 2.2e-16 < 0.05
At 1% level of significance
p-value =2. .2e-16 < 0.01

We reject H_0.

Conclusion:
Data is not normally distributed.
Our data does not meet the criteria for normal distribution. Therefore, we cannot useparametric test to test the various hypothesis and hence, we have used several Non- parametric test for testing various hypothesis.
Non-Parametric tests does not require the assumption of normality.

NON-PARAMETRIC TESTS

Introduction:

Non-parametric tests are statistical tests that are used when the assumptions of a parametric test are violated, such as when the data does not meet the criteria for normal distribution or equal variance. Non-parametric tests are also useful when the data is measured on an ordinalor nominal scale rather than on a continuous scale.

Do marks of student are affected by type of school: Public or private?

In this study, we aim to explore whether there is a significant difference in10th grade student achievement based on the type of school they attend.

KRUSKAL-WALLIS TEST:

Introduction:

The Kruskal–Wallis test by ranks is a non-parametric method for testing whether samples originate from the same distribution. It is used for comparing three or more independent samples . It is an extensionof the Mann–Whitney U test, which is used for comparing only two groups. The parametric equivalent of the Kruskal– Wallis test is the one-way analysis of variance.

Hypothesis:

H0: The median of 10^{th} percentages of students from different type of schooling are equal. H1: The median of 10^{th} percentages of students from different type of schooling are not equal.

Test Statistics:

$$H = \left[\frac{12}{N(N+1)} \sum_{j=1}^{C} \frac{Tj^2}{n_j}\right] - 3(N+1)$$

n = sum of sample sizes for all samples,c = number of samples,
T_j = sum of ranks in the jth sample,
n_j = size of the jth sample.

Decision:

p-value =3.695e-06

At 5% level of significance

p-value =3.695e-06 < 0.05At 1% level of significance
p-value =3.695e-06< 0.01

∴ We reject H_0

At both level of significance.

Conclusion:

There is a significant difference in the median of 10th percentage scores among the different types of schooling (Private, Government, Semi-government).

Post Hoc:

Dunn's Test:

Introduction:

If the results of a Kruskal-Wallis test are statistically significant, then it's appropriate toconduct **Dunn's Test** to determine exactly which groups are different.

Dunn's Test performs pairwise comparisons between each independent group and tells uswhich groups are statistically significantly different at some level of α.

The Dunn's test (also called Bonferroni-Dunn test) can be used for both equal and unequal sample sizes. It is equivalent post hoc-test to Bonferroni approach.

Hypothesis:

Ho: There is no significant difference in 10th percentage of students studying ingovernment, private & Semi-government school.
H1: There is a significant difference in 10th percentage of students studying ingovernment, private & Semi-government school.

Test Statistics:

$$z = \frac{|\bar{R}_i - \bar{R}_j|}{s.e.} \qquad \bar{R}_j = \frac{R_j}{n_j}$$

$$s.e. = \sqrt{\frac{n(n+1)}{12}\left(\frac{1}{n_i} + \frac{1}{n_j}\right)}$$

And standard error is

Here, ni and nj are the sizes of group being compared and n=total sample size

Conclusion:

At 5% level of significance, Government and private school & Government and Semi-government school are the two groups that are significantly different from each other (i.e p.adj-value=0.00003 & 0.00029) which is less than 0.05. Therefore, it suggests that there is a significant difference in median 10th percentage scores among Government and private school as well as Government and semi-government school.

Is there any difference in academic performance of 10th grade students studying in different mediums?

In this study, we aim to investigate whether the medium of instruction in schools has a significant impact on the academic achievement of 10th gradestudents.

KRUSKAL-WALLIS TEST:

Hypothesis:

H0: The median of 10th percentages of students from different mediums are equal. H1: The median of 10th percentages of students from different mediums are not equal.

Decision:

p-value = 2.2e-16

At 5% level of significance

p-value =2.2e-16< 0.05At 1% level of significance
p-value == 2.2e-16< 0.01

∴ We reject H_0

At both level of significance.

Conclusion:

In our case, the p-value of the Kruskal-Wallis test is 2.2e-16, which is extremely small. This indicates that there is significant difference between the groups being compared (i.e., the medium of schooling in Marathi or English or semi-english). Therefore, you can reject the null hypothesis.

Post Hoc:

Mann-Whitney U test:

Introduction:

The Mann-Whitney U test is a non-parametric statistical test used to compare two independent groups of continuous data. It is used to determine if there is a significant difference between the median values of the two groups .

We will be performing a Mann-Whitney U test to compare the 10th percentage of students in English medium and Marathi medium. This test will help us understand if there is a significant difference in the academic performance of students in English medium versus Marathi medium at the 10th grade level.

Hypothesis:

H_0: There is no significant difference in the 10^{th} percentage of students in English medium and Marathi medium.

H_1: There is a significant difference in the 10^{th} percentage of students in English medium and Marathi medium.

Test Procedure:

At 5% level of significance

p-value = 0.2014506 > 0.05

At 1% level of significance

p-value = 0.2014506 > 0.01

Decision:

∴ We accept H_0

At both level of significance.

Conclusion:

There is no significant difference in the 10^{th} percentage of students in English medium and Marathi medium.

Chi-Square test of independence

Introduction:

The chi-square test of independence is a statistical test used to determine if there is a significant association between two categorical variables. It is used when you have two categorical variables and want to test if they are independent of each other or if they arerelated.

Do you think 10^{th} marks influence the choice of stream amongstudents after 10^{th}?

Chi-square Test of Independence

Stream / percentage	Science	Arts	Commerce	Total
Below 60	10	25	9	44
60-70	25	14	37	76
70-80	46	17	38	101
80-90	135	25	24	184
Above 90	160	27	15	202
Total	376	108	123	N=607

Hypothesis:

H0: There is no association between 10th percentage and selection of stream by the student after class 10th.

H1: There is an association between 10th percentage and selection of stream by the student after class 10th.

Test statistics:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where,

χ^2 is the chi-square test statistic

O□ is the observed frequency in cell iE□ is the expected frequency in cell i**Test procedure:**

Reject H0 if χ^2 > χ^2
$(cal)(r-1)(c-1)$
Here,

$$\chi^2_{(cal)} = 147.5$$

$$\chi^2_{(r-1)(c-1)} = 15.50731$$

So, $\chi^2 > \chi^2$
(cal) $(r-1)(c-1)$

Decision:

Reject H_0.

Conclusion:
There is an association between 10th percentage and selection of stream by the student after10th.

Interpretation:
It can be said that 10th percentage can be an important factor in determining the stream selection of students. This suggests that students with higher 10th percentage are more likely to select certain streams as compared to students with lower 10th percentage. This finding could be used by educational institutions and policy makers to develop better programs that cater to the needs of students based on their academic performance.

Introduction:
Cramer's V coefficient is a measure of association that is used to determine the strength of association between two categorical variables.

To measure the strength of association between 10th percentage and streamselected by student after class 10th we have used crammer v coefficient.

$$v = \sqrt{\frac{\chi^2}{N * (min(C, R) - 1)}}$$

χ^2 is the chi-squared statisticN is the total sample size
C is the number of columns in the contingency tableR is the number of rows in the contingency table
Here,

$$v = \sqrt{\frac{147.53}{607*2}}$$

v = 0.3486027

Conclusion:
A Cramer's V coefficient of 0.3486027 indicates a moderate degree of association betweenclass 10th percentage and selection of stream by students after class 10th.

Interpretation:
This suggests that a student's academic performance in class 10th is one of the factors thatmay influence their selection of stream.

Overall, the findings suggest that students who perform well in class 10th are more likely to choose certain streams over others.

Analysing the bias in stream selection by Gender after class 10th:

Chi square test of independence:

Stream / Gender	Science	commerce	Arts	Total
Male	168	39	51	258
Female	208	84	57	349
Total	376	123	108	607

Hypothesis:

H0: There is no association between gender and selection of stream by the student after 10thstandard.

H1: There is an association between gender and selection of stream by the student after 10th standard.

Here,

Decision:

Reject H_0.

Conclusion:

There is an association between gender and selection of stream by the student after 10th.

Interpretation:

In social terms, our data indicate that there are gender-based preferences or biases that affect the selection of stream after 10th class. For example, it may suggest that certain streams are considered more suitable for one gender over another, leading to gender disparities in educational opportunities or outcomes.

Pearson's contingency coefficient:

Introduction:

The Pearson contingency coefficient, also known as the contingency coefficient, is a measureof association between two categorical variables in a contingency table

In our project, we aim to investigate the association between gender and selection of stream by students after class 10th using the Pearson contingency coefficient.

$$C = \frac{\chi^2}{\sqrt{\chi^2 + n}}$$

$$C = \frac{7.5599}{\sqrt{7.5599 + 607}}$$

Conclusion:

C = 0.11090536

A Pearson contingency coefficient (also known as the contingency coefficient) is 0.1109055 suggests that there is a weak or very low association between gender and selection of stream by students after class 10th.

Interpretation:

This result suggests that gender does not play a significant role in determining the selection of streams by students. This may be viewed as a positive development, as it implies that students are making choices based on their interests and abilities rather than societal expectations or gender stereotypes.

Do 12th marks influence the choice of stream among students after 12th?

Chi square test of independence:

Stream / percentage	Science stream	Arts stream	Commercestream	Total
Below60	14	12	14	40
60-70	38	24	38	100
70-80	90	21	47	158
80-90	135	50	27	212
Above 90	54	34	9	97
Total	331	141	135	N=607

Hypothesis:

H0: There is no association between 12th percentage and selection of stream by the student after class 12th.

H1: There is an association between 12th percentage and selection of stream by the student after class 12th.

Here,

$$\chi^2_{(cal)} = 58.675$$

$$\chi^2_{(r-1)(c-1)} = 5.991465$$

So, $\chi^2_{(cal)} > \chi^2_{(r-1)(c-1)}$

Decision:

Reject H_0.

Conclusion:

There is an association between 12th percentage and selection of stream by the student.

Interpretation:

This result based on our data suggests that performance of students in their 12th examination is likely to influence their choice of stream. In other words, it may indicate that students who have performed well in 12th standard are more likely to choose streams that require a higher level of academic proficiency such as science or commerce stream, while students who performed poorly in their 12th grade may opt for humanities.

Crammer V coefficient of association:

To measure the strength of association between 12th percentage and streamselected by student after class 12th we have used crammer v coefficient.

$$v = \sqrt{\frac{58.675}{607*2}}$$

$v = 0.21984540$

Conclusion:

A Cramer V value 0.21984540 indicates a weak association between the percentage scored in 12th exams and the selection of stream after class 12th.

Interpretation:

From a societal perspective, a weak association between the percentage scored in 12th exams and the selection of stream after class 12th indicates that students' career choices are not solely based on academic performance. This suggests that there are other factors that influence career decisions, such as personal interests, social and cultural values, economic factors, and availability of opportunities.This highlights the need for a more comprehensive and holistic approach to career counselingand guidance that takes into account not just academic performance but also a range of other factors that influence career choices.

Analysing the bias in stream selection towards Gender after class12th:

Chi square test of independence:

Stream / Gender	Science	Commerce	Arts	Total
Male	141	52	64	257
Female	179	83	77	339
Total	320	135	141	596

Hypothesis:

H0: There is no association between gender and selection of stream by the student after 12th.H1: There is an association between gender and selection of stream by the student after 12th.

$$\chi^2_{cal)} = 1.5776$$

$$\chi^2_{(r-1)(c-1)} = 5.991465$$

So, $\chi^2_{(cal)} < \chi^2_{(r-1)(c-1)}$

Decision:

Accept H_0.

Conclusion:
There is no association between gender and selection of stream by the student after 12th.

Interpretation:
This result suggests that both male and female students are equally likely to choose any stream, and there is no gender bias in the selection process.

Investigating the Link between Secondary and Higher SecondaryExam Performance:
Investigating the correlation between 10th and 12th-grade marks can shed light on the potential relationship between these two key stages of education.

In this study, we aim to investigate the relationship between 10th and 12thMarks of student.

Pearson Correlation Coefficient:

$\rho = 0.6491924$

Conclusion:
There is moderately strong positive linear relationship between 10th percentage of studentsand 12th percentage of student.

Interpretation:
This could have important implications for educational policies and interventions. For example, schools and educational systems may want to focus on identifying and supporting students who are struggling in 10th grade to ensure they receive the help they need to improve their performance in 12th grade. It could also suggest that standardized testing or other measures of academic performance in 10th grade could be useful predictors of academic success in 12th grade.

Mapping the Trajectory of Decisions taken after undergraduation:
In this study, we aim to examine the decision-making process of recent graduates from various academic disciplines and explore the factors thatinfluence their career trajectories.

Chi square test of independence:

Career pref. After U.G / U.GStream	Competitive exams	Job	Post Graduation	Total
Arts	37	16	55	108
Commerce	24	27	72	123
science	109	79	188	376
Total	170	122	315	N=607

Hypothesis:
H0: There is no association between U.G stream and career preference after U.G.
H1: There is an association between U.G stream and career preference after U.G.

$\chi^2_{cal)} = 7.9973$

$\chi^2_{(r-1)(c-1)} = 9.487729$

So, $\chi^2_{(cal)} < \chi^2_{(r-1)(c-1)}$

Decision:

Accept H_0.

Conclusion:
There is no association between U.G stream and career preference after U.G.

Interpretation:

This interpretation may suggest that students' decisions regarding career paths, further education, or job search behavior are primarily driven by their personal interests, abilities,

and experiences. Overall, accepting the null hypothesis would highlight the importance of providing graduates with the tools and resources to make informed decisions that align with their unique goals and aspirations.

CONCLUSIONS

After conducting research on the navigation of the future of education, several key findings were discovered. Firstly, it was found that there is a significant difference in the median of 10th percentage scores among different types of schooling, including private, government, and semi-government. Additionally, there is a significant difference in the median of tenth marks between groups being compared based on the medium of schooling in Marathi or English or semi-English. This suggests that the medium of schooling plays a crucial role instudent performance.

Regarding bias in selecting a stream by gender, it was found that there is a weakor very low association between gender and selection of stream by students afterclass 10th. Similarly, there is no association between gender and selection of stream by students after 12th. This indicates that gender does not have a significant impact on students' stream selection.

However, there is an association between 10th percentage and selection of stream by the student after 10th. A moderate degree of association between class 10th percentage and selection of stream by students after class 10th was found. Additionally, there is a weak association between the percentage scoredin 12th exams and the selection of stream after class 12th.

It was also discovered that there is no association between U.G stream and career reference after U.G.

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