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"Statistical study on Effectiveness of 2019 credit system"

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Abstract

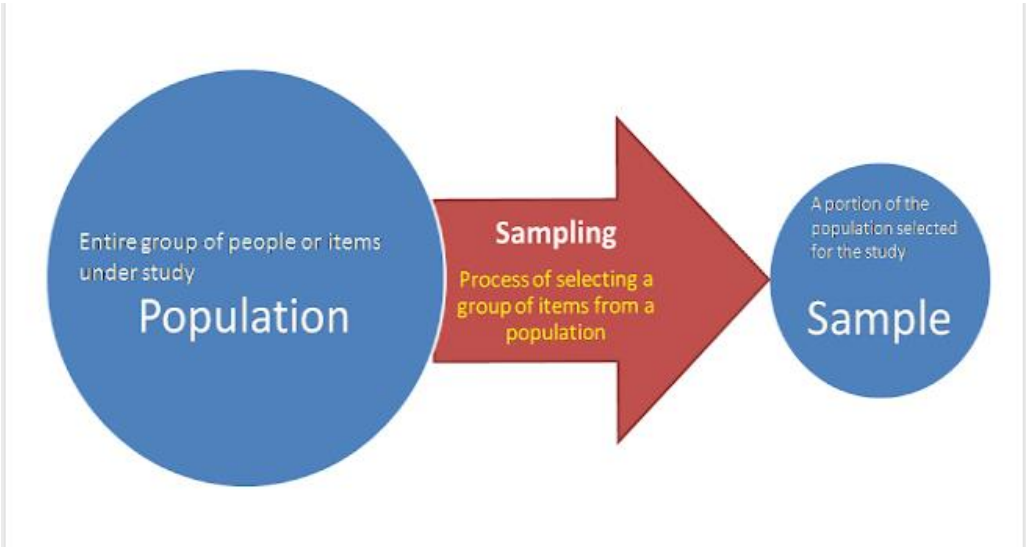
In this study I collect the primary data through questionnaire method and study by that which sampling technique is appropriate for this data to do my further analysis. This study is all based on how we can select the sample in our population.

In this study we find sample size by fixing the confidence interval (95% confidence interval) and margin of error (0.05). By using Chi -Squared test we check whether the variables are independent or dependent of each other. We also visualized the data by using pie chart and bar diagrams.

Introduction

Sampling is the process of selecting a group of individuals from a population for studying. To study and characterize the whole population, sampling is used. It is a statistical tool that has implications in many fields. For example, if a student planning to conduct a project on social media influence among students in a specified area or an institution he can make use of the sampling methods.

The population of his study area will be huge so he cannot complete the project on time by meeting all individuals in the population. So here comes the help of sampling. He can take a sample from the population. This sample represents the whole population and can collect data from these samples and complete the project.



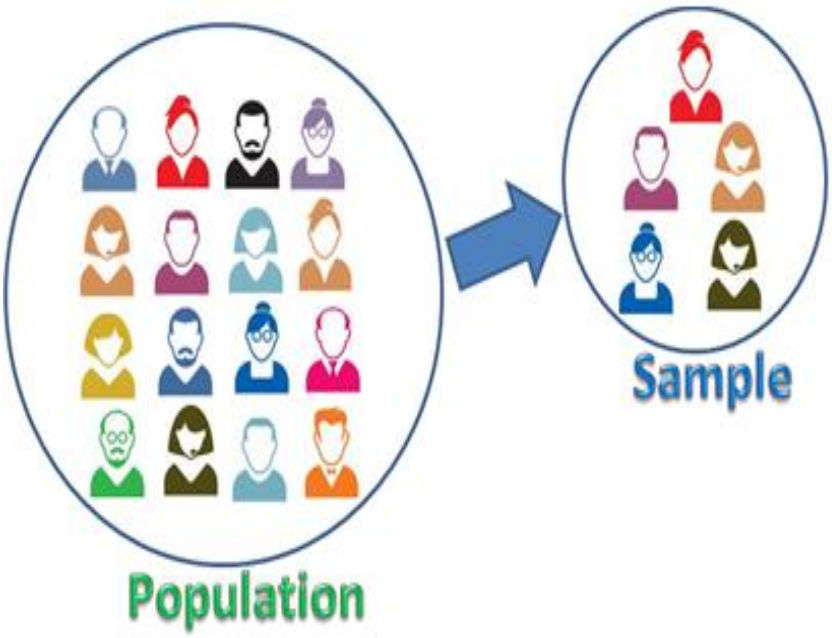
Objectives

- We want to draw a sample of appropriate size which represents the population accurately.
- We want to check whether our sample drawn is represents population or not, which will minimize cost as well as manpower to study whole population.
- To study the problems faced by students to earn extra credits.
- To check whether the 2019 credit pattern is effective for students.
- To study the interrelation between various attributes related to students' opinion about the 2019 credit system.

❖ What is sampling?

Sampling is a technique of selecting individual members or a subset of the population to make statistical inferences from them and estimate the characteristics of the whole population. Different sampling methods are widely used by researchers in market research so that they do not need to research the entire population to collect actionable insights.

It is also a time-convenient and a cost-effective method and hence forms the basis of any research design. Sampling techniques can be used in a research survey software for optimum derivation.



❖ Sampling

Sampling is the process of selecting a group of individuals from a population to study them and characterize the population.

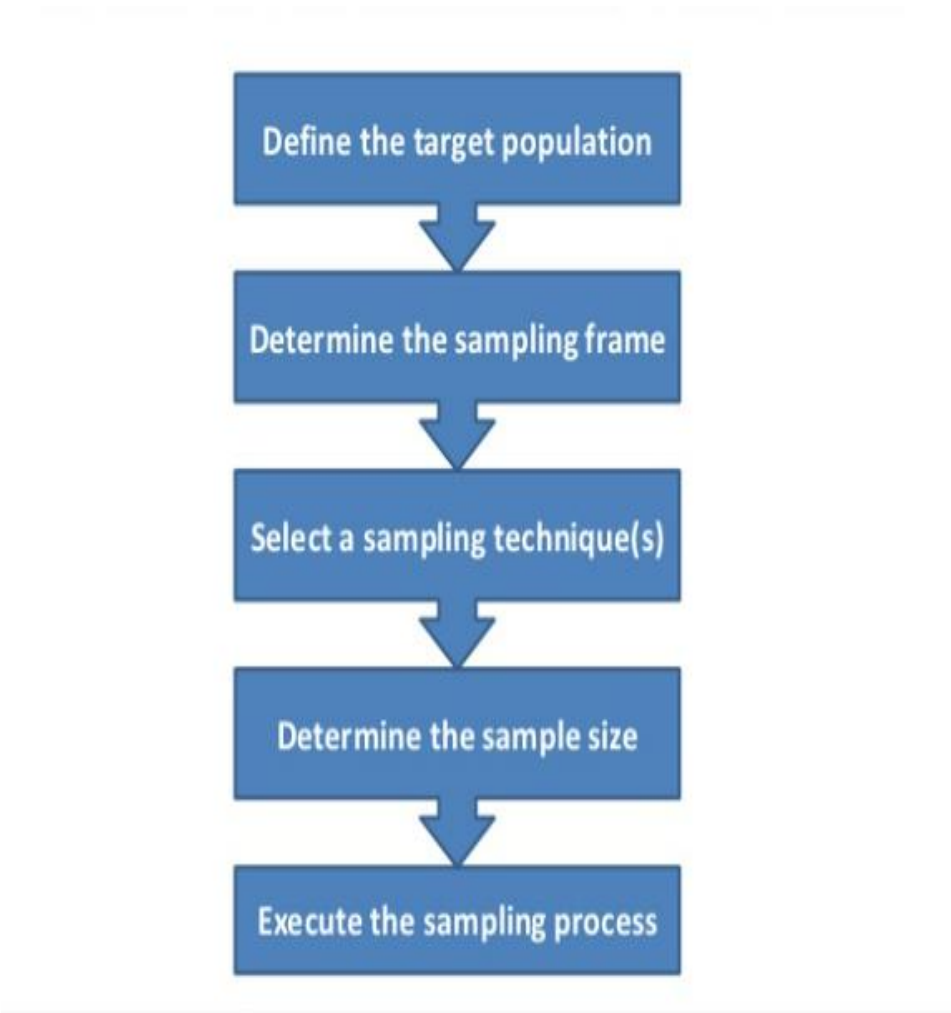
The population includes all members from a specified group, all possible outcomes or measurements that are of interest. The exact population will depend on the scope of the study.

The sample consists of some observations drawn from the population, so a part of a subset of the population. The sample is the group of elements who participated in the study.

A good sample should satisfy the below conditions-

1. Representativeness: The sample should be the best representative of the population under study.
2. Accuracy: Accuracy is defined as the degree to which bias is absent from the sample. An accurate (unbiased) sample is one that exactly represents the population.
3. Size: A good sample must be adequate in size and reliability.

Sampling Designing Process



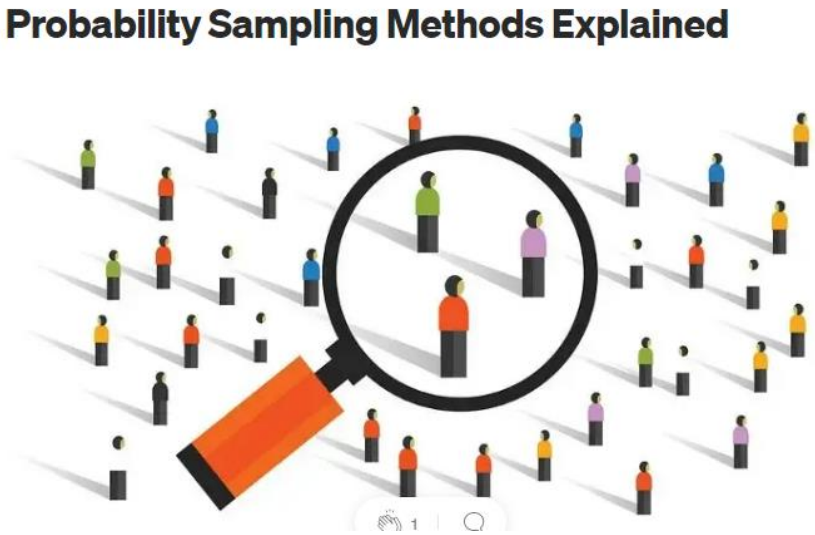
Step 1: The first stage in the sampling process is to clearly define the target population.

Step 2: The sampling frame is the information that locates and defines the dimensions of the universe.

Step 3: Generally probability sampling methods are used because every student has equal chance of getting selected in the sample irrespective of his/her class .

❖ Probability Sampling

Probability sampling is normally preferred when conducting major studies, especially when a population frame is available, ensuring that we can select and contact each unit in the population. Probability sampling allows us to quantify the standard error of estimates, confidence intervals to be formed and hypotheses to be formally tested.



Step 4 : The sample size is defined as the number of observations used for determining the estimations of a given population. The size of the sample has been drawn from the population. Sampling is the process of selection of a subset of individuals from the population to estimate the characteristics of the whole population.

Determination of Sample Size :

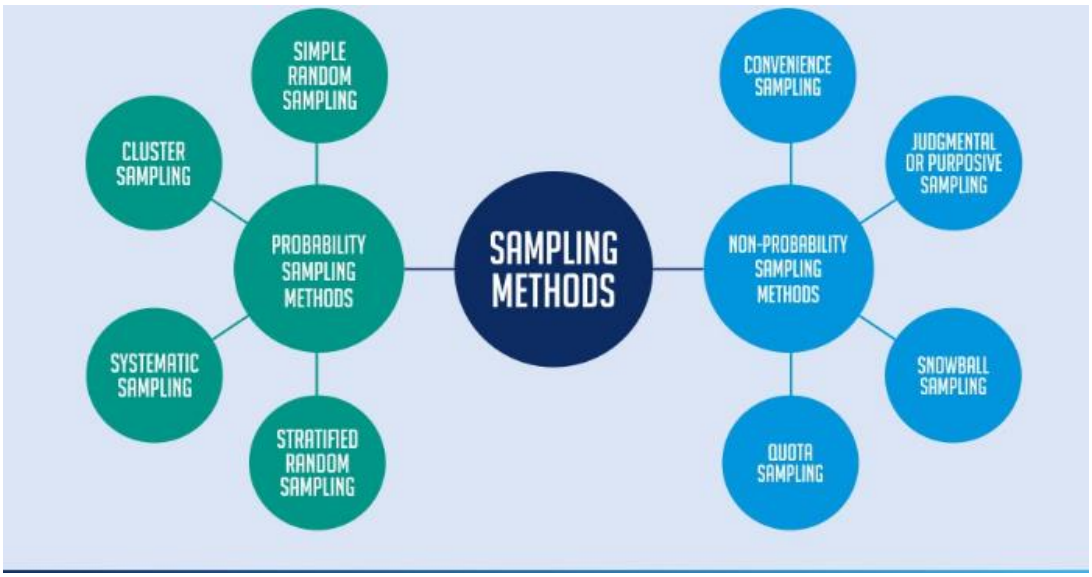
population size	**217**
Critical value (95% confidence level) (z)	**1.96**
Margin of error	**0.05**
Sample proportion(uncertain)(p)	**0.5**
sample proportion(p)	**0.5**
sample size	**138**

Step 5 : Once the target population ,sampling frame , sampling technique and sample size have been established , the next step is to collect data from the sample .

Data Collection Method :

We used questionnaire method to collect the data through online platform as well as one-to-one communication .

❖ Different Types of Sampling Techniques



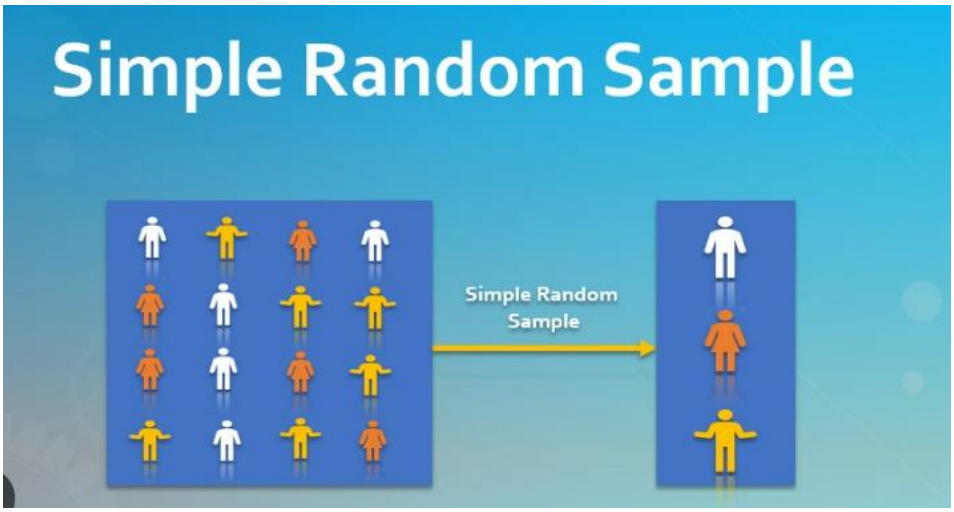
Types of Probability Sampling

❖ Simple random sampling

In Simple Random Sampling, each observation in the population is given an equal chance of selection, and every possible sample of a given size has the same probability of being selected. One possible method of selecting a simple random sample is to number each unit on the sampling frame sequentially and make the selections by generating numbers from a random number generator.

Simple random sampling can involve the units being selected either with or without replacement. Replacement sampling allows the units to be selected multiple times whilst without replacement

only allows a unit to be selected once. Without replacement, sampling is the most commonly used method.



Applications: -

1) Train and test split in machine learning problems.
2) Lottery methods

Advantages: -

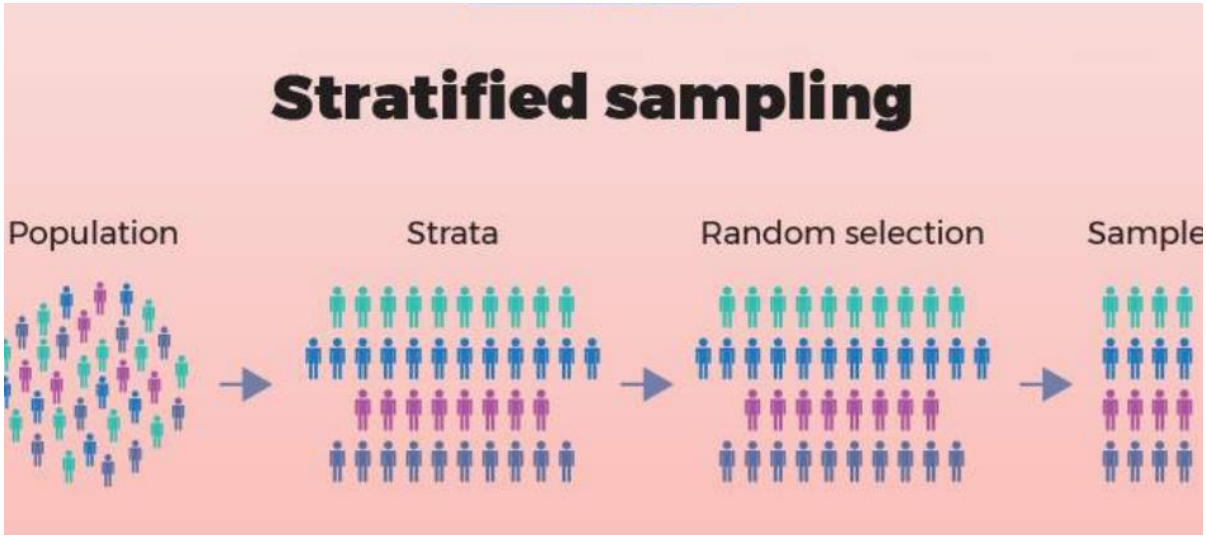
1. Minimum sampling bias as the samples are collected randomly
2. Selection of samples is simple as random generators are used
3. The results can be generalized due to representativeness

Disadvantages: -

1. The potential availability of all respondents can be costly and time consuming
2. Larger sample sizes.

❖ Stratified random sampling

In Stratified random sampling, the entire population is divided into multiple non-overlapping, homogeneous groups (strata) and randomly choose final members from the various strata for research. Members in each of these groups should be distinct so that every member of all groups get equal opportunity to be selected using simple probability.



❖ Proportional Allocation

If the strata sizes are different, proportional allocation could be used to maintain a steady sampling fraction throughout the population. The total sample size, n, should be allocated to the strata proportionally to their sizes.

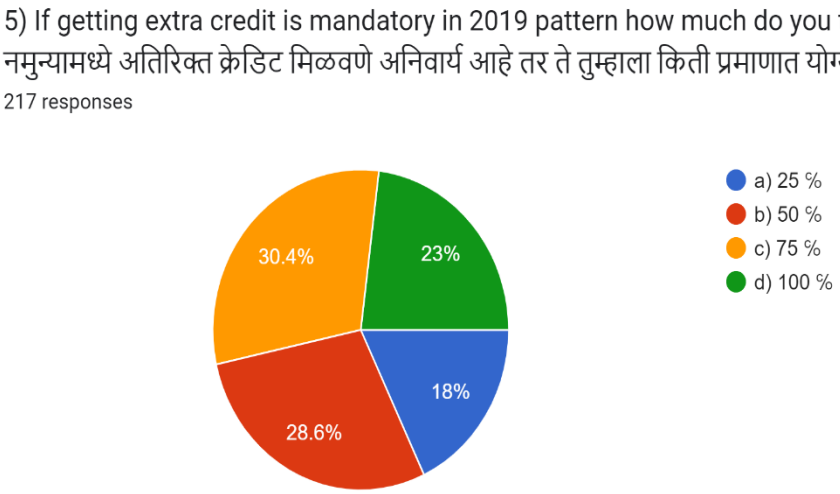
Formula for calculating sample size in proportional allocation

ni =n * pi or ni= Ni/N *n

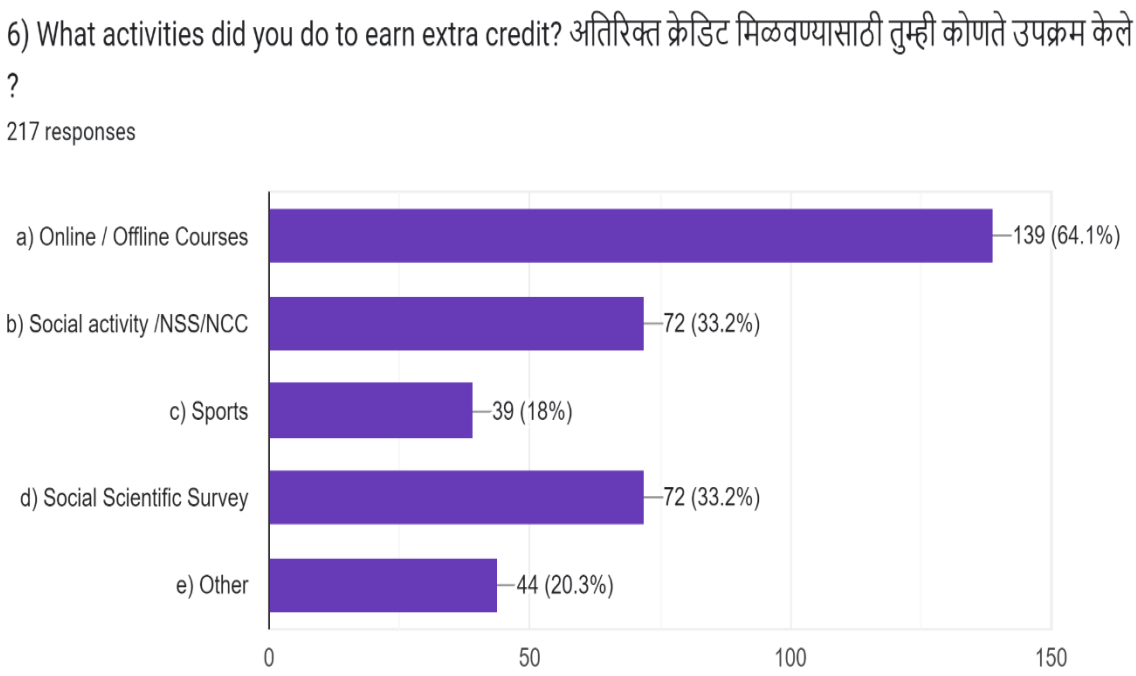
Variance of proportional allocation is given as

Var(x)=∑((1/n) -(1/N)) wisi^2

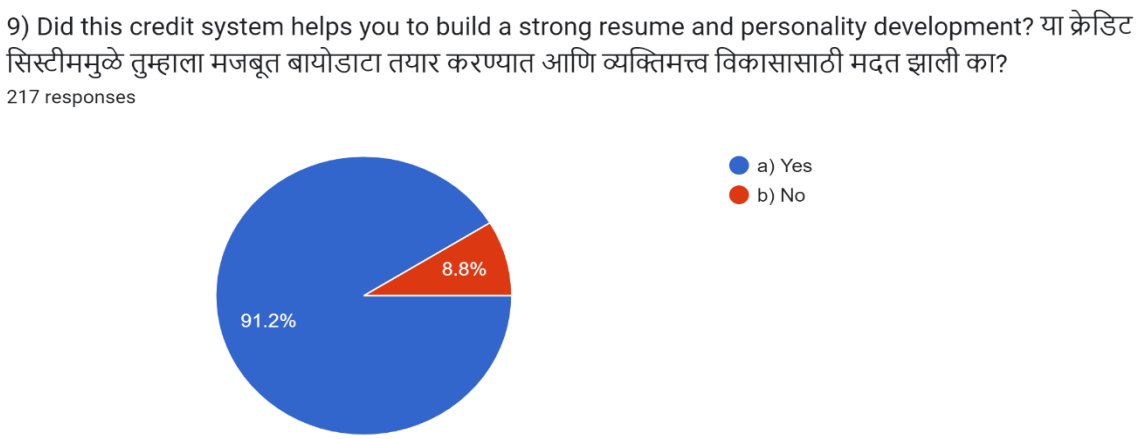
Data Visualization



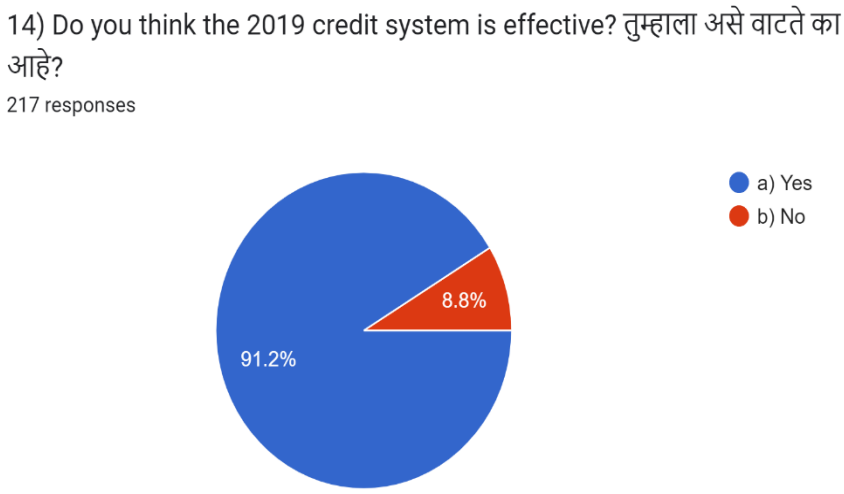
Conclusion : Maximum student's opinion about 2019 credit system is, this system is 75% fair.



Conclusion: - 64% students did online and offline courses to earn their extra credits. Most of the students thought that the online and offline courses will beneficial for them and it is easy way to earn extra credit. Also 33% students did social activities, NSS, NCC and social/scientific survey.



Conclusion: - Maximum students thought that credit system helps them to build a strong resume and personality development. Due to this credit system students did extra activities other than regular academic activities which helps them in personality development.



Conclusion: About 91% students' opinion is that 2019 credit system is effective for them in academic point of view as well as in overall progress. Because UGC allows students to choose inter-disciplinary, Intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interest and aptitude) , and more flexibility for students.

❖ Chi -Squared Test:

Hypothesis testing:

H_0: Suitable educational pattern and effectiveness of 2019 credit system are independent of each other.

Vs

H_1: Suitable educational pattern and effectiveness of 2019 credit system are dependent of each other.

```
> y=matrix(nrow=2, ncol=2,data=c(15,183,10,9),byrow=T);y
     [,1] [,2]
[1,]   15  183
[2,]   10    9

> X0=chisq.test(y,correct=F);X0
Warning message:
In chisq.test(y, correct = F) : Chi-squared approximation may be incorrect

        Pearson's Chi-squared test

data:  y
X-squared = 34.525, df = 1, p-value = 4.207e-09
```

P-value: - 4.207e-09

Decision: - Here, p-value is less than 0.05. Hence, reject H_0 at 5% level of significance.

Conclusion: - Thus we conclude that suitable educational pattern (2013 pattern or 2019 pattern) and effectiveness of 2019 credit system are related with each other.

❖ Sampling Techniques:

Simple Random Sampling:

For Population Mean

x	f	xf
25	39	975
50	62	3100
75	66	4950
100	50	5000
Total	217	14025
	mean	**64.63134**

For Sample Mean

population mean	**64.63134**
sample mean	**64.13043**

Interpretation:

From the above we conclude that sample mean is an unbiased estimator of population mean.

❖ Comparison for Variance:

SRSWOR	**1.760804**
SRSWR	**4.814349**
Var (SRSWR) > Var (SRSWOR)	

Interpretation: - Here the variance for SRSWOR is less than SRSWR. Therefore, the SRSWOR is more precise than SRSWR.

❖ **Sample mean sum of square and population mean sum of square**

Expected value of sample mean sum of square	**664.8766**
Population means sum of square	**667.4561**
sample mean sum of square for different samples	
sample mean sum of square for different samples	S^2
s1	702.158
s2	704.8027
s3	621.1322
s4	631.4133

y using Simple Random sampling

Population mean sum of square	**667.4560505**
Sample mean sum of square	**664.8765604**

x	**f**	**xf**
25	27	675
50	39	1950
75	39	2925
100	33	3300
Total	138	8850
	mean	**64.13043**

Interpretation: - Sample mean sum of square is an unbiased estimator for the population sum of square.

❖ **Stratified Random sampling:**

❖ **Proportional Allocation**

ybar i	Si^2	$wi*si^2$
65.74074	776.3533	139.5262
64.10256	373.0233	106.5765
60.89744	651.1471	198.0464
68.18182	674.7159	155.4613
	Total	599.6104

STRATUM	Stratum Name	Ni	Ni/N	Sample(ni)
1	25	39	0.179724	27
2	50	62	0.285714	39
3	75	66	0.304147	39
4	100	50	0.230415	33

Ni/N	ybari.	Ni/N*ybari.
0.17972	65.74074	11.81492593
0.28571	64.10256	18.31474359
0.30415	60.89744	18.52195513
0.23041	68.18182	15.70977273
sample mean		64.36139737

Interpretation:

From the above we conclude that sample mean is an unbiased estimator of population mean.

Variance for proportional allocation

Population size(N)	217
sample size(n)	138

variance using proportional allocation	1.581821271

Interpretation: - The variance of proportional allocation is less than that of simple random sampling with replacement and without replacement.

Conclusion

1] Sample mean is an unbiased estimator of the population mean.

2]Sample mean sum of square is an unbiased estimator of population mean.

3]Variance of SRSWOR is less than variance of SRSWR Hence SRSWOR is more precise than SRSWR.

4]Variance of proportional allocation is less than variance of simple random sampling. Hence proportional allocation is more precise than simple random sampling.

5]. Most of the students thought that the online and offline courses will be beneficial for them, and it is easy way to earn extra credit. Also 33% students did social activities, NSS, NCC and social/scientific survey.

6] Maximum students thought that credit system helps them to build a strong resume and personality development. Due to this credit system students did extra activities other than regular academic activities which helps them in personality development.

7] About 91% students' opinion is that 2019 credit system is effective for them in academic point of view as well as in overall progress.

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