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ORIGINAL ARTICLE

THE JOY OF LEARNING STATISTICS-
"WITHOUT TEARS"

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Abstract:

It would be difficult to find an area of modern life which would not be seriously impaired if the collection of statistical data and the application of statistical process were suddenly forbidden. Statistics has three main functions: description, generalization and measurement of relationships. With this backdrop, a practical approach combined with real-world examples can help students grasp the intricacies of the subject and make it more interesting. Every student entering first statistics class posses a question to their senior "is statistics interesting or boring?". Statistics is definitely a subject for all young students and it is considered as an important subject that helps in making decision in life. In all walks of life, be it Agriculture, Education, Government sector, Media, Advertisement, Business & Commerce, Economics, Medicine, Biology, Social Science Research, Statistics plays a vital role. Everyone is convinced about the power of the subject.

KEYWORDS:

Data, Frequency, Mean, Median, Mode, Ogives, Histogram, Quartiles, Deciles, Percentiles, Standard Deviation, Variance, Skewness, Kurtosis, Correlation & Regression, Sample, Probability, Estimation.

INTRODUCTION

Statistics has already done much to give man "power" over him-self. We are all familiar with the important role which statistics plays in contemporary life. The reporting, record keeping and computing of vital statistics is a hallmark of good government and plays a large role in the protection of the health of our citizens.

Insurance would be sheer gambling but for accurate statistics of mortality and morbidity which enable actuaries to set premiums that are both fair and profitable. Consumer research, the foundation of modern merchandising, and many of its subsidiary activities such as advertizing and production & inventory control are dependent upon one form or another of statistics.

The entertainment field relies on statistical polls of its audiences to estimate the popular appeal of artists and productions. Politics would limp if statistical research did not suggest where to concentrate money and manpower so as to win votes and elections.

Modern warfare uses statistics to discover how best to utilize available military material and personnel. The stock market carefully hoards every little statistics of its daily operations to fashion indices and trends to guide the anxiety trader.

Science is just as devoted to statistical inquiry and turns to it for help in studying the behavior of

both the nuclear components of the atom and the nuclear mitosis of the cancer cell, for constructing and evaluating psychological tests and for grading the progress of pupils in learning, for hiring personnel in industry and for diagnosing ailments in hospitals, for conducting surveys in sociology and for estimating the age of ancient archeological relics.

It would be difficult to find an area of modern life which would not be seriously impaired if the collection of statistical data and the application of statistical process were suddenly forbidden.

During the nineteenth century, the science of statistics became firmly established, thoroughly proved and widely applied. The fact remains, however, that it was the cupidity of gamblers rather than the curiosity of scientists which gave statistics its beginnings and it has ever since retained its original close relationship to the laws of chance.

Mathematics shows us the naked truth; statistics clothes it and harnesses it to the realities of experience. In addition, statistics enables us for an additive factor into our experience, by accumulating, describing, classifying and then evaluating it, forces us to look at experience objectively instead of subjectively. It corrects and redirects. Many a practitioner of a vocation becomes convinced from personal experience that a certain rule or principle holds true, but when he puts it to the test of controlled experimentation, he may find that it is spurious because of some subjective factor, some distortion of his vision.

Statistics has three main functions: description, generalization and measurement of relationships.

We use statistics to describe when we wish to portray a large body of data in terms of its essential inherent characteristics.

Second, we use statistics to generalize when we base knowledge about a large population upon limited observations of a small portion of it. We cannot measure the height of all the men in the world, but we can form a fairly good estimate by making careful measurements of several moderate-sized groups and then treating these measurements statistically. Statistical generalizations are made in almost all research work because the money, manpower, time and materiel allotted to the statistician must be utilized efficiently. Statistics help us to determine when generalizations are sound.

Third, we use statistics to determine whether there is any relationship between two or more factors which are present in a situation and if how large the relationship is. This is perhaps the most fruitful realm of statistics and it has made a great contribution both to our knowledge and to our power to manipulate the forces in our environment. It helps the medicals researcher to know whether a certain treatment, given to some patients and withheld from others, who form a control group, is effective; it tells an advertising company which has conducted a coupon-return campaign in a number of different mass media which medium brings the greatest return per dollar spent; it tells farmers at what point the addition of fertilizer to the soil ceases to bring a proportionate yield; it tells manufacturers of articles it is wise to produce and it has a host of other applications in a host of other fields.

Statistical refinements are limitless, but so are the possibilities for error and misuse. That is why the biblical truth, "the fear of the Lord is the beginnings of knowledge" applies with especial pertinence of the field of statistics. The integrity of the statistician is the indispensable ingredient in the credibility of his findings. The consumer of statistics needs to have sufficient background to evaluate the offering and decide for himself what to accept and what to reject. With producers of integrity and consumers who are both alert and knowledgeable, the value of statistics in modern life can indeed be great.

With this backdrop, a practical approach combined with real-world examples can help students grasp the intricacies of the subject and make it more interesting. Every student entering first statistics class posses a question to their senior "is statistics interesting or boring?". It is true with me.

I posed this question to myself when I placed my hands on my statistics text book. Now, after a long journey in the field of statistics, my affirmative answer to young, curious, scared minds is "Statistics is a very interesting and joyful subject which helps in taking decisions about any damn thing in life, if the subject is taught the right way".

In India, high school students start studying statistics, starting from definition, functions and descriptive statistics, which include classification of data, Average (Mean), Median, Mode, Diagrammatic Graphical Representation of data, Graphical method of calculating median using ogives and calculation of Mode using histogram etc.

It is full of numbers, calculations, formulae for different types of data such as Un-grouped, Grouped frequency data and grouped class – interval frequency data. A teacher who introduces different concepts to the students should always relate with practical application and its utility in understanding the subject. For example:

Classification is required to concise the whole massive data
Average or mean reduces the huge data into a single number:
Median divides the whole data series into two equal parts. helps to know how many students are above 50% and how many are below 50 %.
Mode is the most frequently occurring number which has its practical application in readymade garments, foot wares, bangles, rings, etc. The sizes are determined based on the modal value.

These concepts should imprint in the young minds. Once the concepts are clear, computation is not very tedious as calculators are available. But, the students have to practice for perfection with joy and students must be good at basic mathematics (of all operations). Always examples concerned to our day–to-day life have to be related while introducing and any concept; and however complex it is. The art of teaching, is breaking the complex concepts into small simple steps with simple examples and finally synthesize meaning of it, which help the students to grasp the intricacies of the subject and its application in the real world in much better way.

Wrong Notion

Sadly, statistics is portrayed as a subject filled with lot of formulae, numbers, cumbersome calculations, graphs, diagrams etc. Computing the descriptive statistics such as various measures of central tendency i.e mean, median, mode, quartiles, deciles, percentiles, standard deviation, variance, skewness, kurtosis and relationship between two variables i.e. correlation, regression is a joyous calculation provided the thumb rule application of a particular formula for specific situation is made clear to the students.

Lucid and Practical Approach

What is clearly lacking here is a practical approach to the subject. Every topic in statistics must be intertwined with a practical approach, not to be presented merely as huge numerical data i.e. using daily statistical entities such as monthly expenditure of the house hold, classification adopted in admission procedure to the colleges to various programme and making different sections according to ID numbers etc. these are some of the examples. Statistics will continue to be called "Dry and boring" to many, unless and until the subject is portrayed to be a number gaming mathematical science.
The value of statistics in the economic life of every nation has attained universal recognition. The economist, administrator or politician requires statistics, to support their argument and to elucidate the problem one handles. Even an ordinary citizen today is un willing to accept, a proposition unless it is supported by facts and figures. As statistician relate the facts, they are the raw materials on which conclusion can be based and principles enunciated.
The social life in the modern age is so complex and sweeping changes are taking place through scientific and technological progress that many ideas cannot be the basis of human endeavors. In order to give a concrete shape of idea, we require detailed statistics relating to the particular aspect of social life which is intended to be tackled. We require not only a correct evaluation of the problem, but also a correct assessment of needs in order to initiate measure for satisfying them. The failure of many schemes of social betterment is traceable to a lack of real connection between actual condition and remedies adopted. So the value of up-to-date statistics to study the progressive schemes of social development is very important.

Sampling and Estimation

In order to illustrate the need of the concept of sampling and estimation, a small incident that took place during the First World War is narrated here. Due to war, there were many broken families, widows, children, sick & aged became homeless. So British Government opened refugee camps in many places. In order to feed the people of all ages, they used to supply all food items to the refugee camp. But every time the officials in charge of refugee camp used to complain about the shortage of supply. The British officer in-charge of camps gave a serious thought and called up the Head of Indian Statistical Institute, Calcutta. The Head visited one of the camps and collected all the necessary information from the officer in charge of the camp and people living in the camp. One day he personally went into the kitchen and took the sample of the food cooked and enquired about the amount of salt used in everyday cooking for all the meals to inmates in the camp. With the collected information about salt used, he estimated all other ingredients required to prepare the food items. Like this he calculated the ingredients required for a square meal and hence for the number of people in the camp for a day and month. Further he checked for the amount of groceries received in the camp and linked/ related both facts and figures and proved that the pilferage is taking place and he

singled it down by supervising the whole day. Based on the study undertaken, he sent the report with facts and figures to the British officer who assigned the job. On seeing the report, British officers were very happy about the unveiling of the whole scenario by the brainy statistician and appreciated the beauty of the subject.

When new concepts are introduced, one must bring real life situation to make the students understand about the concept. Such things stay in the minds of the students. The most simple and common example for sampling is tasteing a little bit while selecting a sweet item or a savory item in a shop.

Probability

People literally raise their eyebrows by just listening to the word "Probability". The very next reaction after listening to the word probability is "It is dry, boring and absurd". To make it more interesting one must inculcate the power of "imagination" while introducing the concept of probability. We must always introduce the concept of probability with the help of set theory, permutation and combination. These concepts are simple and can be understood very easily. With this introduction the classical definition of ratio of number of favorable events to the total number of events is to be made clear. One must clearly state that total number of events is a case of Universal set and number of favorable events is a case of sub set in simple words. Probability is a branch of statistics which deals with measure of chance factor or uncertainty factor.

This can be illustrated with a simple example of probability of getting a head, when a coin is tossed. The answer is very simple and is "½". In this particular case, the number of favorable is equal to 1 i.e., getting head, total number of case is equal to 2 because when a coin is tossed we can get either head or tail. Similarly in case of throwing a dice the probability of getting 5 is 1/6 or selecting an Ace card from a pack of 52 cards is 4/52 (there are 4 types of Ace cards i.e. Clubs, Spade, Heart and Diamond).

Suppose a student is asked "What is the probability of getting 53 Sundays in a leap year?" in this case we have to break-up the problem into two parts. First we should know that:

Leap year = 366 days
= 52 full weeks + 2 days
= 52 Sundays + Sunday-Monday,
Monday-Tuesday,
Tuesday-Wednesday,
Wednesday-Thursday,
Thursday-Friday,
Friday-Saturday,
Saturday-Sunday.

So, number of favorable event is equal to 2 and total number of events is equal to 7. Therefore the probability of getting 2 Sunday in a leap year is "2/7" by definition. On the similar lines, the answer for getting 53 Sundays in an ordinary year is 1/7 and holds good for other days also. For studying statistics one should have patience, comprehensive and analytical ability. Once the problem is understood, it can be tackled very easily. Probability theory is the heart and soul to a clear understanding of the present day situation of climate change and shift in rainfall and is a crucial to building a successful career in actuary science i.e., insurance.

Statistics is definitely a subject for all young students. Let it be considered as an important subject that helps in making decision in life.

In all walks of life, be it Agriculture, Education, Government sector, Media, Advertisement, Business & Commerce, Economics, Medicine, Biology, Social Science Research, Statistics plays a vital role. Now everyone is convinced about the power of the subject. Now after reading this article confidently one should start enjoying to play with numbers more accurately with interest. The art of interpretation of data with good communication skill is a must for all statisticians.

A person with statistics background is looked high in the society as it is a subject of intelligence. Choose the subject and start enjoying it "bit by bit".

Lastly we can say "People survey for people development and Joyfully Project Socio-Economic life through Statistics."

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