Unit 1: Statistics in Educational Research

Definition and need of Statistics in Educational Research

1.1. Introduction: Statistics is a discipline of mathematics concerned with the collection, analysis, and interpretation of data. Statistics can be used to forecast the future, calculate the likelihood of a given occurrence occurring, or answer survey questions. Statistics is utilized in a wide range of disciplines, including business, health, biology, psychology, education, and the social sciences. Statistics is an important field because it enables us to comprehend broad trends and patterns in a particular data collection. Statistics can be used to analyze data and draw conclusions. It can also make predictions about future events and behaviours. Statistics also assist us in understanding how things change over time. Statistics are classified into two kinds. One type is descriptive statistics, which focus on data summarization. Inferential statistics, on the other hand, focus on drawing conclusions about populations based on samples.

Statistics are an essential element of our daily lives. It is commonly utilized in the workplace and in everyday life. Statistics are frequently utilized in the workplace to analyze what works best for a company's marketing plan or how to distribute work among employees. Statistics can be used in everyday life to analyze what food to buy at the grocery store or how much money you spend on purchases each week. Statistics are all around us, and they help us make sense of our surroundings.

The term "statistics" comes from the Latin word "status," which means "condition or status." As a result, the process of enumeration by which a state or condition is determined is known as statistics. In actuality, statistics are the only way to learn about a state, its population, and its numerous sources of income and expenditure.

1.2. Definitions of Statistics:

- **"Statistics may be defined as the collection, presentation, analysis and interpretation of numerical data."**

- "Statistics comprises the collection, tabulation, presentation and analysis of an aggregate of the facts, collected in methodical manner, without bias and related to predetermined purpose." – Sutcliffe

- **According to Prof. A.L. Bowley:** "Statistics may be called the science of counting."

- **According to Boddington:** "Statistics is the science of estimates and probabilities."

- **According to Lovitt:** "Statistics is the science which deals with the collection, classification and tabulation of numerical facts as the basis for explanation, description and comparison of phenomena."

1.3. Need, Importance and Uses of Statistics:

1. Group Comparison:

A class's achievements are not uniform across subjects. It has been discovered that one class is progressing quicker in one subject while another is progressing in another. Even different portions of the same class do not progress in the same manner.

2. Individual Comparison:

Statistics aids in the individual comparison of students of varying ages, talents, and IQ levels. Statistics explain why students who are similar in every other way do not attain the same level of success in one topic.

3. Educational and Vocational Guidance:

Every student differs from others in terms of intellectual capacity, interests, attitude, and mental abilities. Students are offered educational and vocational counselling in order to make the most use of their qualities, and the process of guidance is based only on statistics.

4. Educational Experiments and Research:

The goals, curricula, and methods of teaching change as the location, line, and conditions change. Without the use of statistics, research and experimentation cannot become accurate and valid.

5. Essential for Professional Efficiency:

The responsibility of the teacher does not cease when he teaches a certain subject in the classroom. His responsibilities include instructing the students, acquiring the appropriate level of knowledge for himself, and analyzing the achievement of behaviour modification.

6. Basis of Scientific Approach to Problems:

Statistics forms the basis of scientific approach to problems of Educational Psychology.

1.4. Types of Statistics

The two main branches of statistics are:

- Descriptive Statistics
- Inferential Statistics

Descriptive Statistics – Through graphs or tables, or numerical calculations, descriptive statistics uses the data to provide descriptions of the population.

Inferential Statistics – Based on the data sample taken from the population, inferential statistics makes the predictions and inferences.

1.5. Characteristics of Statistics

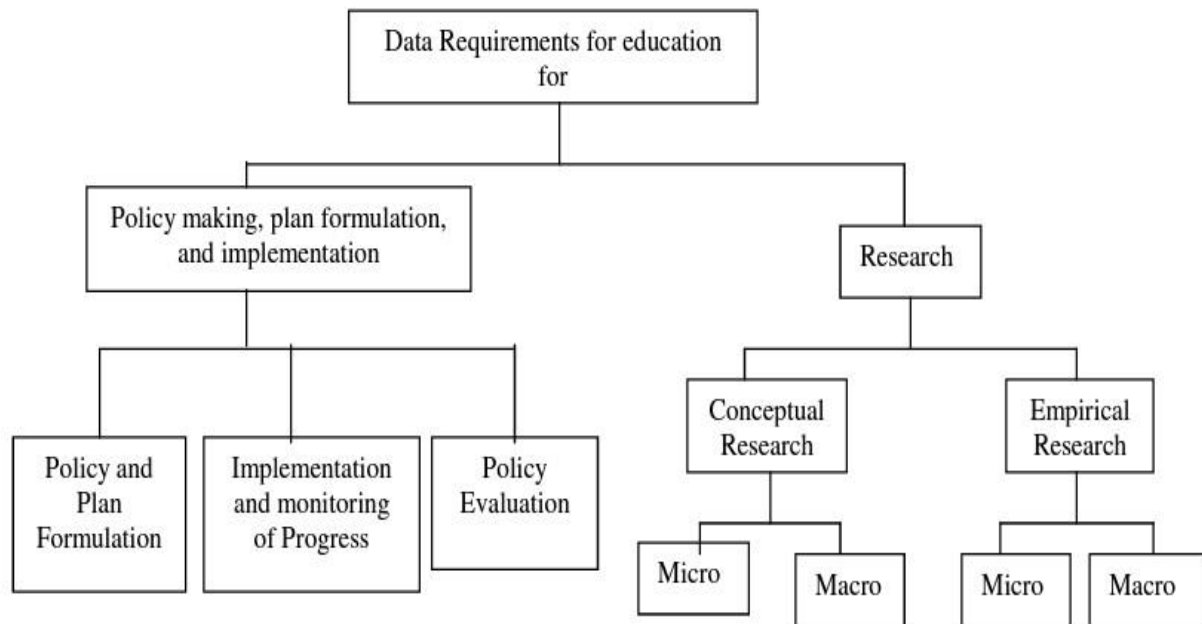The important characteristics of Statistics are as follows:

- Statistics are numerically expressed.
- It has an aggregate of facts
- Data are collected in systematic order
- It should be comparable to each other
- Data are collected for a planned purpose

1.6. Purposes: One can identify four purposes for which educational statistics are important:

(a) for making sound policies and effective plans,

(b) for efficient administration and management,

(c) for research, and

(d) for information, and dissemination of information.

For the purposes of proper policymaking, planning, and management and for research, very reliable and elaborate statistical base is critical. The various purposes for which education statistics are required by the planners, policymakers and researchers can be grouped into two broad categories, as shown in Figure 1.

Figure 1: Purpose for which Educational Statistics are Required

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                    │ Data Requirements for education│
                    │             for             │
                    └─────────────────────────────┘
                          │                    │
        ┌─────────────────────────┐      ┌──────────────┐
        │ Policy making, plan      │      │   Research   │
        │ formulation, and         │      └──────────────┘
        │ implementation           │         │        │
        └─────────────────────────┘   ┌──────────┐ ┌──────────┐
         │         │         │        │Conceptual│ │Empirical │
   ┌────────┐┌──────────┐┌────────┐   │ Research │ │ Research │
   │Policy  ││Implement-││ Policy │   └──────────┘ └──────────┘
   │and     ││ation and ││Evalua- │    │       │    │      │
   │Plan    ││monitoring││ tion   │  ┌─────┐┌─────┐┌─────┐┌─────┐
   │Formula-││of        │└────────┘  │Micro││Macro││Micro││Macro│
   │tion    ││Progress  │            └─────┘└─────┘└─────┘└─────┘
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1.7. The Importance of Statistics in Education (With Examples)

The field of **statistics** is concerned with collecting, analyzing, interpreting, and presenting data.

In an education setting, statistics is important for the following reasons:

Reason 1: Statistics allows educators to understand student performance using descriptive statistics.

Reason 2: Statistics allows educators to spot trends in student performance using data visualizations.

Reason 3: Statistics allows educators to compare different teaching methods using hypothesis tests.