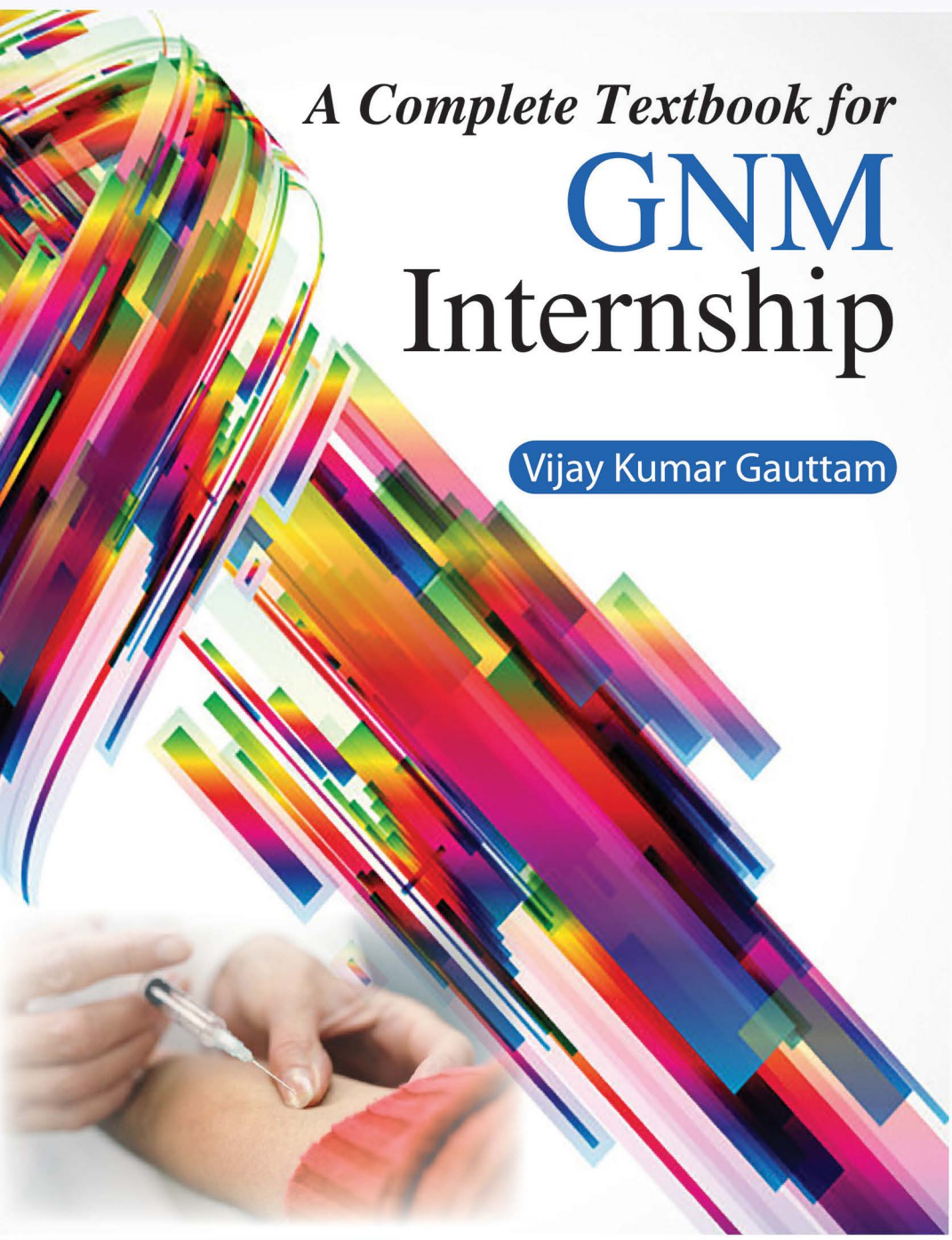




A Complete Textbook for **GNM** Internship

Vijay Kumar Gauttam



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Introduction to Research Process

4 unit

■ INTRODUCTION

Research is a careful investigation leading to the discovery and interpretation of information. There are many different types of research that discover or reinterpret information collected by experimentation or observation and suggest practical applications or theoretical implications of that information. In scientific fields, research often involves experimentation which tests a researcher's hypothesis. Research is a process because in some sense it is never finished. The process begins with interest sparked by an observation or question, the desire to discover and learn more, and to come to a new understanding because of what has been discovered. The steps in the research process are identification and definition of the problem or opportunity, planning the research design, selecting a research method, selecting a sampling procedure, data collection, evaluating the data and finally preparing and presenting the research report.

■ STEPS OF RESEARCH PROCESS

Research process consists of series of actions or steps necessary to effectively carry-out research and the desired sequencing of these steps.

The research process consists of a number of closely related activities. The following order concerning various steps provides a useful procedural guideline regarding the research process:

- Formulating the research problem
- Extensive literature survey
- Developing the hypothesis
- Preparing the research design
- Determining sample design

- Collecting the data
- Execution of the project
- Analysis of data
- Hypothesis testing
- Generalizations and interpretation
- Preparation of the report or presentation of the results, i.e. formal write-up of conclusions reached.

A brief description of the above stated steps will be helpful

- *Formulating the research problem:* There are two types of research problems, viz., those which relate to states of nature and those which relate to relationships between variables. At the very outset the researcher must single out the problem he wants to study, i.e. he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into. Initially the problem maybe stated in a broad general way and then the ambiguities, if any, relating to the problem be resolved. Then, the feasibility of a particular solution has to be considered before a working formulation of the problem can be set-up. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry. Essentially two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view.

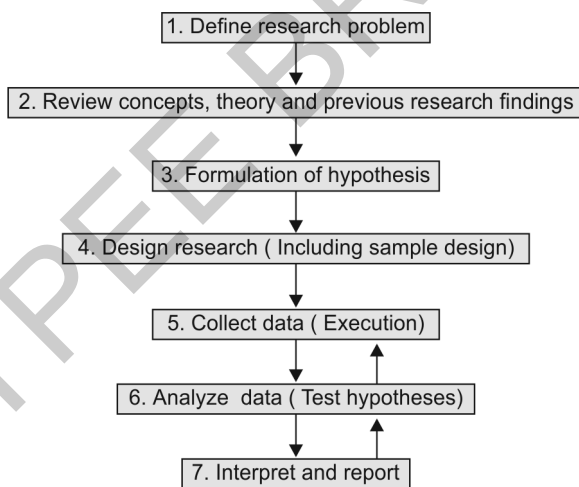
The best way of understanding the problem is to discuss it with ones own colleagues or with those having some expertise in the matter. In an academic institution the researcher can seek the help from a guide who is usually an experienced man and has several research problems in mind. Often, the guide puts forth the problem in general terms and it is up to the researcher to narrow it down and phrase the problem in operational terms. In private business units or in governmental organizations, the problem is usually earmarked by the administrative agencies with which the researcher can discuss as to how the problem originally came about and what considerations are involved in its possible solutions.

The researcher must at the same time examine all available literature to get himself acquainted with the selected problem. He may review two types of literature—the conceptual literature concerning the concepts and theories, and the empirical literature consisting of studies made earlier which are similar to the one proposed. The basic outcome of this review will be the knowledge as to what data and other materials are available for operational purposes which will enable the researcher to specify his own research problem in a meaningful context. After this the researcher rephrases the problem into analytical

or operational terms, i.e. to put the problem in as specific terms as possible. This task of formulating, or defining, a research problem is a step of greatest importance in the entire research process. The problem to be investigated must be defined unambiguously for that will help discriminating relevant data from irrelevant ones. Care must: however, be taken to verify the objectivity and validity of the background facts concerning the problem.

The statement of the objective is of basic importance because it determines the data which are to be collected, the characteristics of the data which are relevant, relations which are to be explored, the choice of techniques to be used in these explorations and the form of the final report. If there are certain pertinent terms, the same should be clearly defined along with the task of formulating the problem. In fact, formulation of the problem often follows a sequential pattern where a number of formulations are set-up, each formulation more specific than the proceeding one, each one phrased in more analytical terms, and each more realistic in terms of the available data and resources.

Flow chart 4.1: Research process



- *Extensive literature survey:* Once the problem is formulated, a brief summary of it should be written down. It is compulsory for a research worker writing a thesis for a PhD degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval. At this juncture the researcher should undertake extensive literature survey connected with the problem. For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to. Academic

journals, conference proceedings, government reports, books, etc. must be tapped depending on the nature of the problem. In this process, it should be remembered that one source will lead to another. The earlier studies, if any, which are similar to the study in hand, should be carefully studied. A good library will be a great help to the researcher at this stage.

- *Development of working hypotheses:* After extensive literature survey, researcher should state in clear terms the working hypothesis or hypotheses. Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. As such the manner in which research hypotheses are developed is particularly important since they provide the focal point for research. They also affect the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis. In most types of research, the development of working hypothesis plays an important role. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested. The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track. It sharpens his thinking and focuses attention on the more important facets of the problem. It also indicates the type of data required and the type of methods of data analysis to be used.

How does one go about developing working hypotheses? The answer is by using the following approach:

- Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution.
- Examination of data and records, if available, concerning the problem for possible trends, peculiarities and other clues.
- Review of similar studies in the area or of the studies on similar problems.
- Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals with a view to secure greater insight into the practical aspects of the problem.

Thus, working hypotheses arise as a result of a priori thinking about the subject, examination of the available data and material including related studies and the counsel of experts and interested parties. Working hypotheses are more useful when stated in precise and clearly defined terms. It may as well be remembered that occasionally we may encounter a problem where we do not need working hypotheses, especially in the case of exploratory or formulative researches which do not aim at testing the hypothesis. But as a general rule, specification of working hypotheses in another basic step of the research process in most research problems.

- *Preparing the research design:* The research problem having been formulated in clear-cut terms, the researcher will be required to prepare a research design, i.e. he will have to state the conceptual structure within which research would be conducted. The preparation of such a design facilitates research to be as efficient as possible yielding maximal information. In other words, the function of research design is to provide for the collection of relevant evidence with minimal expenditure of effort, time and money. But how all these can be achieved depends mainly on the research purpose. Research purposes may be grouped into four categories, viz. (i) Exploration, (ii) Description, (iii) Diagnosis, and (iv) Experimentation. A flexible research design which provides opportunity for considering many different aspects of a problem is considered appropriate if the purpose of the research study is that of exploration. But when the purpose happens to be an accurate description of a situation or of an association between variables, the suitable design will be one that minimizes bias and maximizes the reliability of the data collected and analyzed.

There are several research designs, such as, experimental and non-experimental hypothesis testing. Experimental designs can be either informal designs (such as before-and-after without control, after-only with control, before-and-after with control) or formal designs (such as completely randomized design, randomized block design, Latin square design, simple and complex factorial designs), out of which the researcher must select one for his own project.

The preparation of the research design, appropriate for a particular research problem, involves usually the consideration of the following:

- The means of obtaining the information.
- The availability and skills of the researcher and his staff (if any).
- Explanation of the way in which selected means of obtaining information will be organized and the reasoning leading to the selection.
- The time available for research.
- The cost factor relating to research, i.e. the finance available for the purpose.
- *Determining sample design:* Sampling is the process of selecting units (e.g. people, organizations) from a population of interest so that by studying the sample we may fairly generalize our results back to the population from which they were chosen. Population is the set of individuals, items, or data from which a statistical sample is taken it is also called universe. Sample is representative part of the population which contains each characterizes that entire population possesses.

Researchers rarely survey the entire population for two reasons. The cost is too high, and the population is dynamic in that the

individuals making up the population may change overtime. The three main advantages of sampling are that the cost is lower, data collection is faster, and since the data set is smaller it is possible to ensure homogeneity and to improve the accuracy and quality of the data.

All the items under consideration in any field of inquiry constitute a universe or population. A complete enumeration of all the items in the population is known as a census inquiry. It can be presumed that in such an inquiry when all the items are covered no element of chance is left and highest accuracy is obtained. But in practice this may not be true. Even the slightest element of bias in such an inquiry will get larger and larger as the number of observations increases. Moreover, there is no way of checking the element of bias or its extent except through a resurvey or use of sample checks. Besides, this type of inquiry involves a great deal of time, money and energy, not only this; census inquiry is not possible in practice under many circumstances. For instance, blood testing is done only on sample basis. Hence, quite often we select only a few items from the universe for our study purposes. The items so selected constitute what is technically called a sample.

The researcher must decide the way of selecting a sample or what is popularly known as the sample design. In other words, a sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population. Thus, the plan to select 12 of a city's 200 drugstores in a certain way constitutes a sample design. Samples can be either probability samples or non-probability samples. With probability samples each element has a known probability of being included in the sample but the non-probability samples do not allow the researcher to determine this probability.

Probability samples are those based on simple random sampling, systematic sampling, stratified sampling, cluster/area sampling whereas non-probability samples are those based on convenience sampling, judgment sampling and quota sampling techniques.

A brief mention of the important sample designs is as follows:

- *Deliberate sampling/purposive sampling:* Deliberate sampling is also known as purposive or non-probability sampling. This sampling method involves purposive or deliberate selection of particular units of the universe for constituting a sample which represents the universe. When population elements are selected for inclusion in the sample based on the ease of access, it can be called convenience sampling. If a researcher wishes to secure data from, say, gasoline buyers, he may select a fixed number of petrol stations and may conduct interviews at these stations. This would be an example of convenience sample

of gasoline buyers. At times such a procedure may give very biased results particularly when the population is not homogeneous. On the other hand, in judgment sampling the researcher's judgment is used for selecting items which he considers as representative of the population. For example, a judgment sample of college students might be taken to secure reactions to a new method of teaching. Judgment sampling is used quite frequently in qualitative research where the desire happens to be to develop hypotheses rather than to generalize to larger populations.

- *Simple random sampling*: This type of sampling is also known as chance sampling or probability sampling where each and every item in the population has an equal chance of inclusion in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected. For example, if we have to select a sample of 300 items from a universe of 15,000 items, then we can put the names or numbers of all the 15,000 items on slips of paper and conduct a lottery. Using the random number tables is another method of random sampling. To select the sample, each item is assigned a number from 1 to 15,000. Then, 300 five digits random numbers are selected from the table. To do this we select some random starting point and then a systematic pattern is used in proceeding through the table. We might start in the 4th row, second column and proceed down the column to the bottom of the table and then move to the top of the next column to the right. When a number exceeds the limit of the numbers in the frame, in our case over 15,000, it is simply passed over and the next number selected that does fall within the relevant range. Since the numbers were placed in the table in a completely random fashion, the resulting sample is random. This procedure gives each item an equal probability of being selected. In case of infinite population, the selection of each item in a random sample is controlled by the same probability and that successive selections are independent of one another.
- *Systematic sampling*: In some instances the most practical way of sampling is to select every 15th name on a list, every 10th house on one side of a street and so on. Sampling of this type is known as systematic sampling. An element of randomness is usually introduced into this kind of sampling by using random numbers to pick-up the unit with which to start. This procedure is useful when sampling frame is available in the form of a list. In such a design the selection process starts by picking some random point in the list and then every n th element is selected until the desired number is secured.
- *Stratified sampling*: If the population from which a sample is to be drawn does not constitute a homogeneous group, then stratified sampling technique is applied so as to obtain a representative sample.

In this technique, the population is stratified into a number of non-overlapping subpopulations or strata and sample items are selected from each stratum. If the items selected from each stratum is based on simple random sampling the entire procedure, first stratification and then simple random sampling, is known as stratified random sampling.

- *Quota sampling:* In stratified sampling the cost of taking random samples from individual strata is often so expensive that interviewers are simply given quota to be filled from different strata, the actual selection of items for sample being left to the interviewer's judgment. This is called quota sampling. The size of the quota for each stratum is generally proportionate to the size of that stratum in the population. Quota sampling is thus an important form of non-probability sampling. Quota samples generally happen to be judgment samples rather than random samples.
- *Cluster sampling and area sampling:* Cluster sampling involves grouping the population and then selecting the groups or the clusters rather than individual elements for inclusion in the sample. Suppose some departmental store wishes to sample its credit card holders. It has issued its cards to 15,000 customers. The sample size is to be kept say 450. For cluster sampling this list of 15,000 card holders could be formed into 100 clusters of 150 card holders each. Three clusters might then be selected for the sample randomly. The sample size must often be larger than the simple random sample to ensure the same level of accuracy because in cluster sampling procedural potential for order bias and other sources of error are usually accentuated. The clustering approach can, however, make the sampling procedure relatively easier and increase the efficiency of field work, especially in the case of personal interviews.
- Area sampling is quite close to cluster sampling and is often talked about when the total geographical area of interest happens to be big one. Under area sampling we first divide the total area into a number of smaller non-overlapping areas, generally called geographical clusters, then a number of these smaller areas are randomly selected, and all units in these small areas are included in the sample. Area sampling is especially helpful where we do not have the list of the population concerned. It also makes the field interviewing more efficient since interviewer can do many interviews at each location.
- *Multi-stage sampling:* This is a further development of the idea of cluster sampling. This technique is meant for big inquiries extending to a considerably large geographical area like an entire country. Under multi-stage sampling the first stage maybe to select large primary sampling units such as states, then districts, then towns and finally certain families within towns. If the technique of random-sampling

is applied at all stages, the sampling procedure is described as multi-stage random sampling.

- *Sequential sampling*: This is somewhat a complex sample design where the ultimate size of the sample is not fixed in advance but is determined according to mathematical decisions on the basis of information yielded as survey progresses. This design is usually adopted under acceptance sampling plan in the context of statistical quality control.
- In practice, several of the methods of sampling described above may well be used in the same study in which case it can be called mixed sampling. It may be pointed out here that normally one should resort to random sampling so that bias can be eliminated and sampling error can be estimated. But purposive sampling is considered desirable when the universe happens to be small and a known characteristic of it is to be studied intensively. Also, there are conditions under which sample designs other than random sampling may be considered better for reasons like convenience and low costs.

The sample design to be used must be decided by the researcher taking into consideration the nature of the inquiry and other related factors.

Collecting the Data

In dealing with any real life problem it is often found that data at hand are inadequate, and hence, it becomes necessary to collect data that are appropriate. There are several ways of collecting the appropriate data which differ considerably in context of money costs, time and other resources at the disposal of the researcher. Primary data can be collected either through experiment or through survey. If the researcher conducts an experiment, he observes some quantitative measurements, or the data, with the help of which he examines the truth contained in his hypothesis. But in the case of a survey, data can be collected by anyone or more of the following ways:

- *By observation*: This method implies the collection of information by way of investigators own observation, without interviewing the respondents. The information obtained relates to what is currently happening and is not complicated by either the past behavior or future intentions or attitudes of respondents. This method is no doubt an expensive method and the information provided by this method is also very limited. As such this method is not suitable in inquiries where large samples are concerned.
- *Through personal interview*: The investigator follows a rigid procedure and seeks answers to a set of pre-conceived questions through personal interviews. This method of collecting data is usually carried out in a structured way where output depends upon the ability of the interviewer to a large extent.

- *Through telephone interviews:* This method of collecting information involves contacting the respondents on telephone itself. This is not a very widely used method but it plays an important role in industrial surveys in developed regions, particularly, when the survey has to be accomplished in a very limited time.
- *By mailing of questionnaires:* The researcher and the respondents do come in contact with each other if this method of survey is adopted. Questionnaires are mailed to the respondents with a request to return after completing the same. It is the most extensively used method in various economic and business surveys. Before applying this method, usually a Pilot Study for testing the questionnaire is conducted which reveals the weaknesses, if any, of the questionnaire? Questionnaire to be used must be prepared very carefully so that it may prove to be effective in collecting the relevant information.
- *Through schedules:* Under this method the enumerators are appointed and given training. They are provided with schedules containing relevant questions. These enumerators go to respondents with these schedules. Data are collected by filling up the schedules by enumerators on the basis of replies given by respondents. Much depends upon the capability of enumerators so far as this method is concerned. Some occasional field checks on the work of the enumerators may ensure sincere work.
- The researcher should select one of these methods of collecting the data taking into consideration the nature of investigation, objective and scope of the inquiry, financial resources, available time and the desired degree of accuracy. Though he should pay attention to all these factors but much depends upon the ability and experience of the researcher. In collection of statistical data common sense is the chief requisite and experience the chief teacher.

Execution of the Project

Execution of the project is a very important step in the research process. If the execution of the project proceeds on correct lines, the data to be collected would be adequate and dependable. The researcher should see that the project is executed in a systematic manner and in time. If the survey is to be conducted by means of structured questionnaires, data can be readily machine-processed. In such a situation, questions as well as the possible answers maybe coded. If the data are to be collected through interviewers, arrangements should be made for proper selection and training of the interviewers. The training maybe given with the help of instruction manuals which explain clearly the job of the interviewers at each step. Occasional field checks should be made to ensure that the interviewers are doing their assigned job sincerely and efficiently.

A careful watch should be kept for unanticipated factors in order to keep the survey as much realistic as possible. This, in other words, means that steps should be taken to ensure that the survey is under statistical control so that the collected information is in accordance with the pre-defined standard of accuracy. If some of the respondents do not cooperate, some suitable methods should be designed to tackle this problem. One method of dealing with the non-response problem is to make a list of the non-respondents and take a small sub-sample of them, and then with the help of experts vigorous efforts can be made for securing response.

Analysis of Data

After the data have been collected, the researcher turns to the task of analyzing them. The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences. The unwieldy data should necessarily be condensed into a few manageable groups and tables for further analysis. Thus, researcher should classify the raw data into some purposeful and usable categories. **Coding** operation is usually done at this stage through which the categories of data are transformed into symbols that maybe tabulated and counted. **Editing** is the procedure that improves the quality of the data for coding. With coding the stage is ready for tabulation. **Tabulation** is a part of the technical procedure wherein the classified data are put in the form of tables. The mechanical devices can be made use of at this juncture. A great deal of data, especially in large inquiries, is tabulated by computers. Computers not only save time but also make it possible to study large number of variables affecting a problem simultaneously.

Analysis work after tabulation is generally based on the computation of various percentages, coefficients, etc. by applying various well defined statistical formulae. In the process of analysis, relationships or differences supporting or conflicting with original or new hypotheses should be subjected to tests of significance to determine with what validity data can be said to indicate any conclusion(s). For instance, if there are two samples of weekly wages, each sample being drawn from factories in different parts of the same city, giving two different mean values, then our problem maybe whether the two mean values are significantly different or the difference is just a matter of chance. Through the use of statistical tests we can establish whether such a difference is a real one or is the result of random fluctuations. If the difference happens to be real, the inference will be that the two samples come from different universes and if the difference is due to chance, the conclusion would be that the two samples belong to the same universe. Similarly, the technique of analysis of variance can help us in analyzing whether three or more varieties of seeds grown on certain fields yield significantly different results or not.

In brief, the researcher can analyze the collected data with the help of various statistical measures.

Hypothesis-testing

After analyzing the data as stated above, the researcher is in a position to test the hypotheses, if any, he had formulated earlier. Do the facts support the hypotheses or they happen to be contrary? This is the usual question which should be answered while testing hypotheses. Various tests, such as Chi square test, t-test, F-test, have been developed by statisticians for the purpose. The hypotheses maybe tested through the use of one or more of such tests, depending upon the nature and object of research inquiry. Hypothesis-testing will result in either accepting the hypothesis or in rejecting it. If the researcher had no hypotheses to start with, generalizations established on the basis of data maybe stated as hypotheses to be tested by subsequent researches in times to come.

Generalizations and Interpretation

If a hypothesis is tested and upheld several times, it maybe possible for the researcher to arrive at generalization, i.e. to build a theory. As a matter of fact, the real value of research lies in its ability to arrive at certain generalizations. If the researcher had no hypothesis to start with, he might seek to explain his findings on the basis of some theory. It is known as interpretation. The process of interpretation may quite often trigger off new questions which in turn may lead to further researches.

Preparation of the Report or the Thesis

Finally, the researcher has to prepare the report of what has been done by him. Writing of report must be done with great care keeping in view the following:

- *The layout of the report should be as follows:* (i) The preliminary pages; (ii) the main text, and (iii) the end matter. In its preliminary pages the report should carry title and date followed by acknowledgments and foreword. Then there should be a table of contents followed by a list of tables and list of graphs and charts, if any, given in the report.
 - The main text of the report should have the following parts:
 - *Introduction:* It should contain a clear statement of the objective of the research and an explanation of the methodology adopted in accomplishing the research. The scope of the study along with various limitations should as well be stated in this part.
 - *Summary of findings:* After introduction there would appear a statement of findings and recommendations in non-technical language. If the findings are extensive, they should be summarized.

A Complete Textbook for **GNM Internship**

This book *A Complete Textbook for GNM Internship* covers following topics:

- Part I: Educational Methods and Media for Teaching in Practice of Nursing
- Part II: Introduction to Research
- Part III: Professional Trends and Adjustment
- Part IV: Administration and Ward Management
- Part V: Health Economics

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ISBN 978-93-5152-786-2

