



Teaching Material of B. Ed. in Special Needs Education

Research Methods in Special Needs Education

Office of the Dean
Faculty of Education
Tribhuvan University
Kathmandu, Nepal
2015~2020



CHANGWON NATIONAL UNIVERSITY



Leading University Project for International Cooperation



Ministry of Education



National Research Foundation of Korea

Research Methods in Special Needs Education

Reference Book

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May, 2018

Table of Contents

Unit 1: Introduction to Research in Special Needs Education	i
1.1 Concept of Research	1
1.2 Importance of Research in Special Needs Education	3
1.3 Operational Terms in Research	4
1.3.1 Variables in Research	4
1.3.2 Statement of the Problem	6
1.3.3 Research Objectives	9
1.3.4 Research Questions.....	10
1.3.5 Hypothesis	11
1.3.6 Limitations and Delimitations	14
1.3.7 Literature Review	15
1.4 Quantitative Research.....	17
1.4.1 Survey Research.....	19
1.4.2 Correlational Research	21
1.5 Qualitative Research.....	24
1.5.1 Case Study.....	25
1.5.2 Phenomenological Research	27
Unit-end Activities	30
Unit 2: Research Designs in Special Needs Education.....	32
2.1 Concept of Research Design	32
2.2 Elements of Research Design	33
2.3 Withdrawal Designs	35

2.3.1 Baseline Logic	36
2.3.2 A-B Design	36
2.3.3 A-B-A Design	39
A-B-A-B Design	40
2.4 Multiple Baseline Designs	43
2.4.1 Multiple Baseline Design across Behaviors	45
2.4.2 Multiple Baseline Design across Subjects	47
2.4.3 Multiple Baseline Design across Settings	48
Unit-end Activities	49
Unit 3: Population and Sampling in Behavioral Research	52
3.1 Population, Sample, and Sampling	52
3.2 Sampling Methods	54
3.2.1 Probabilistic Sampling Methods	55
3.2.2 Non-probabilistic Sampling Methods	58
3.3 Sample Size	61
3.4 Ethical Guidelines in Special Needs Education Research.....	62
Unit-end Activities	65
Unit 4: Data Collection, Analysis, and Interpretation	67
4.1 Concept of Research Tools	67
4.1.1 Questionnaire	67
4.1.2 Interview Schedule	71
4.1.3 Observation	74
4.1.4 Focus Group Discussion	76
4.2 Simple Analysis and Interpretation of Data	78

4.2.1 Process of Quantitative Data Analysis and Interpretation	79
4.2.2 Process of Qualitative Data Analysis and Interpretation.....	80
Unit-end Activities	81
Unit 5: Research Proposal and Report Writing.....	83
5.1 Proposal Writing.....	83
5.1.1 Importance of Proposal	83
5.1.2 Elements of Proposal	84
5.1.3 Preparation of Proposal on Any Critical Area of Special Needs Education	89
5.2 Report Writing	95
5.2.1 Preliminary Section	95
5.2.3 Main Section	96
Unit-end Activities	99
References.....	101

Unit 1: Introduction to Research in Special Needs Education

1.1 Concept of Research

The scientific study of human behavior, at first, started in the field of psychology and physiology. When psychology and physiology became sciences, the initial experiments were performed on individual organisms, and the results of these pioneering endeavors remain relevant to the scientific world today. The importance of previous research lies in the demonstration that important findings with wide generality are gleaned from single organisms. Since the time of the Individuals with Disabilities Education Act (IDEA) and No Child Left Behind Act (NCLB), evidence-based practice has been the guiding principle for determining whether a treatment or instructional program should be implemented or maintained. Different research methods and designs yield different types of data and different professionals and researchers have different opinions as to which type of research methodology yields the most reliable and valid results that will generalize across individuals, conditions, and time. In behavioral sciences, trustworthiness, or credibility of research findings is based on the rigor of the scientific method employed and the extent to which the research design controls for alternative explanations. The scientific method requires investigator objectivity, reliability of measurement, and independent replication of findings.

There is general agreement among researchers that different research questions or objectives required different research approaches. However, for behavioral scientists, specific research methods and designs are deemed superior to others when generalizing findings to individuals or groups. This judgment is based on the degree to which data-collection procedures, data analyses, and data reporting are viewed as objective, reliable, and valid, and the extent to which it is believed that the study could be replicated and yield similar findings. In the field of special needs education, applied behavior analysts have historically held themselves accountable for designing and employing curricula, interventions, and educational/therapeutic approaches that bring about positive behavior change.

The word research is composed of two syllables, 're' and 'search'. The dictionary defines the former as a prefix meaning again, a new or over again and the later as a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles. Thus,

research is a systematic inquiry generally carried out for seeking facts through scientific and verifiable methods in order to discover the relationship among different variables.

Research comprises defining problems, determining objectives, formulating hypothesis, collecting, organizing and evaluating data, making deductions and conclusions, and finally carefully testing the conclusions to determine whether they are matched with formulated hypothesis or not. In other words, the term 'Research' refers to a critical, careful, and exhaustive investigation to revise established conclusions and discover new facts. Thus, research indicates any sort of careful, systematic, patient study, and investigation in some field of knowledge, undertaken to discover or establish facts and principles. It is a systematic process of collecting and logically analyzing information for some purpose. Different specialists define research in following way:

According to Kaul (2009), "Research is a systematic attempt to obtain answers to meaningful questions about phenomena or events through the application of scientific procedures".

According to Kerlinger (1979), "scientific research is systematic, controlled, empirical, and critical investigation of hypothetical proposition about the presumed relation among natural phenomena".

According to Best and Kahn (2007), "Scientific research is a systematic and objective analysis and recording of controlled observations that may lead to the development of generalizations, principles, and theories".

Research is a careful and systematic inquiry into any subject matter. It is an endeavor to discover valuable facts which would be useful for solving problems from different aspects of human life including people with disabilities. Research has been carried out for different purposes such as formulating new educational theories, discovering new instructional techniques, modifying old concepts, and the like. As a whole, research has following characteristics:

- Research is directed toward the solution of a problem.
- Research is highly purposive,
- Research involves the quest for answers to unsolved problems.
- Research is characterized by patient and unhurried activity.
- Research is logical and objective.
- Research is carefully recorded and reported.
- Research is based upon observable or empirical evidence.
- Research demands accurate observation and description.
- Research involves gathering new data from primary sources, or using existing data for a new purpose.

- Research activities are more often characterized by carefully designed procedures, always applying rigorous analysis.
- Research applies every possible test to validate the procedures employed, the data collected, and the conclusions reached.

1.2 Importance of Research in Special Needs Education

Special education research has contributed significantly for developing and improving knowledge and practice not only for the individuals with disabilities but also for all learners. Special educators have had dual responsibilities such as: (a) designing interventions that meet the diversified needs of the learners at general education classrooms and (b) developing intensive interventions to meet the individual learning needs of students with disabilities. One of the most successful examples of special education research influencing general education organization, instruction, and practice has been Response to Intervention (RtI). It has been described as an approved method for identifying learning disabilities and enhancing performance of all students including the children with disabilities. The Individuals with Disabilities Education Improvement Act (2004) has also stated it as an effective method to identify and solve classroom problems where classroom teachers, special education teachers, and other specialists work together. RtI approach proceeds through a process of screening, assessment, and intervention that relate to both prevention and remediation of students at risk for academic and behavioral difficulties. Despite various difficulties, special education research has made considerable achievements in knowledge and practice. Research influences the roles of educators and the institutions in many ways. The points given below reflect the importance of special education research that has been carrying out for decades.

- Research provides guidelines to the educators to formulate very relevant policies in the field of special education.
- Research helps identify the people with special needs in society and schools for the purpose of providing special services as per their needs.
- Research assists to develop effective intervention approaches to improve academic performance of the students with special needs.
- Research suggests evidence-based instructional practices to the teachers and other service provides working in the field of special needs education.

- Research supports to develop and use different assistive technologies to make disabled people daily activities more comfortable.
- Research helps provide proper educational services to the children with special needs.
- Research helps develop reliable and valid assessment tools useful to diagnose different types of disabilities.

1.3 Operational Terms in Research

Any person who wants to conduct research any field should have basic knowledge about different operational terms of the research. Considering the fact; different terms such as variables in research, statement of the problem, research objectives, research questions, hypothesis, delimitation and limitations, literature review, and quantitative and qualitative research. These terms are discussed below respectively:

1.3.1 Variables in Research

Variable is a term frequently used in research projects. It is pertinent to define and identify the variables while designing research projects. Generally speaking, a variable is a construct or a characteristic that can take on different quantity, values or scores. Researchers study variables and the relationships that exist among variables. Intelligence is one example of a variable; it can vary in an individual with disabilities from one time to another, among individuals with disabilities at the same time, among the averages for groups from special school, and so on. Social class, gender, vocabulary level, intelligence, learning styles, learning disabilities, hyperactive behavior, intellectual disability, and physical disability are other examples of variables.

A variable, as the name implies, is something that varies. It may be weight, height, health condition, anxiety levels, income, body temperature, achievement score, and so on. Each of these properties varies from one person to another. Some variables can be quite concrete and clear, such as gender, age, blood group, etc. while others can be considerably more abstract and vague. Thus, variable is a property that takes on different values. It is also a logical grouping of attributes. Attributes are characteristics or qualities that describe an object. For example if gender is a variable then male and female are the attributes. If residence is the variable then urban, semi-urban, rural become the attributes. So attributes here describe the residence of an individual. It is pertinent for a researcher to know as how certain variables within a study are related to each other. It is thus

important to define the variables to facilitate accurate explanation of the relationship between the variables. There is no limit to the number of variables that can be measured, although the more variables, the more complex the study and the more complex the statistical analysis. Moreover the longer the list of variables, the longer the time required for data collection. Therefore, researcher should determine manageable number of variables while carrying out particular research.

❖ **Types of Variables**

There are different types of variables and having their influence differently in a study. The major types of variables generally applied in research are independent variables, dependent variables, and extraneous variables. Each of them has been discussed below respectively:

- ***Independent variables***

The independent variable is the antecedent while the dependent variable is the consequent. If the independent variable is an active variable then we manipulate the values of the variable to study its effect on another variable. For example, disability of an individual affects his/her achievement score. In this regard, disability of an individual is an example of independent variable and achievement score is an example of dependent variable. Independent variables are antecedent to dependent variables. Independent variables directly influence the dependent variable, which is the outcome. In experimental studies, the treatment is the independent variable and the outcome is the dependent variable.

- ***Dependent variables***

Dependent variable refers to the presumed effect in an experimental study. The values of the dependent variable depend upon another variable, the independent variable. Dependent variable is the variable that is affected by the independent variable. The dependent variable is dependent on the independent variable. The exam score is an example of the dependent variable. The experimenter is hypothesizing that the exam scores will partially depend on how the students were taught weather forecasting. In this case, freshman status is a constant. Let's see another example, if a researcher was looking at how studying influences test scores, the amount of studying would be the independent variable and the test scores would be the dependent variable. The test

scores vary based on the amount of studying prior to the test. The researcher could change the independent variable to identify its impact on dependent variable.

- ***Extraneous variables***

Variables that may affect research outcomes but have not been adequately considered in the study are termed as extraneous variables. Extraneous variables exist in all studies and can affect the measurement of study variables and the relationship between independent and dependent variables. Extraneous variables are not recognized until the study is in process. Sometimes, researcher can recognize them before carrying out the study but cannot have control on them. Such variables are referred to as confounding variables. Certain external variables may influence the relationship between the research variables, even though researcher cannot see it. These variables are called intervening variables. For example, a disabled girl's knowledge and practices helps in maintaining menstrual hygiene. Here, motivation, mother and friends, mass media, etc. are some examples of intervening variables which may also help in maintaining menstrual hygiene. Thus, if these two factors are not controlled properly then it would be impossible to know what the underlying cause really is.

In non-experimental studies, it is often more difficult to label independent and dependent variables. In a study of the relationship between teacher experience and students' achievement scores, teacher experience would be considered as independent variable. But sometimes it would be illogical to say that student achievement is influenced teacher experience. More importantly, it is possible for a variable to be an independent variable in one study and a dependent variable in another. Whether a variable is independent or dependent depends on the purpose of the study. If you investigate the effect of motivation on achievement, then motivation is the independent variable.

1.3.2 Statement of the Problem

Skill in doing research is to a large extent a matter of making wise choices about what to investigate. This skill takes time and repeated effort to develop. In order to ask questions that

research can answer, one should have knowledge or experience in an area. Unless a researcher has knowledge or experience in an area, he/she does not know what additional knowledge is needed or how to obtain it through empirical investigation. Furthermore, the question chosen for investigation should hold deep interest or be one about which the researcher is really curious. For example, a teacher teaching in a special school may be interested in finding a more effective way to teach reading content to the dyslexic children. A high school science teacher may want to know if using computer simulations would improve problem-solving skills of the students with special needs. After determining the general area of investigation, the researcher then narrows it down to a specific statement of the research question. Once the researcher has selected a problem area and clearly articulated a question or problem statement, he/she has accomplished one of the most difficult phases of the research process. Any research should consider following points to select a relevant research problem in his/her study area:

- ***The research problem should be significant to contribute in the field of knowledge:*** The research problem should make a contribution to educational theory or practice. The problem may fill gaps in current knowledge or help resolve the inconsistencies in previous research.
- ***The problem should open door for further research:*** A good study usually generates a number of other questions that need investigation. Good research avoids trivial problems that have little or no relationship to theory or previous research.
- ***The problem must be researchable:*** A researchable problem is one that can be studied empirically. Through a researchable problem, it is possible to gather data that answer the question. Many interesting questions in education cannot be answered by scientific research. Questions such as is there any relationship between disability and the action that was carried out in previous birth? Should schools give more attention to character education?, and the like. These questions cannot be answered by gathering and analyzing data in empirical way.
- ***The problem should be suitable for the researcher:*** The problem may be excellent from the perspectives of the previously discussed criteria but inappropriate for the researcher. First, the problem should be one in which the researcher have a genuine interest. It should be a problem whose solution is personally important because of what it could contribute to our knowledge base or to improve educational practice. One must have the necessary research skills to carry out the study successfully. One may have to develop and validate instruments or do complex statistical analyses. Another consideration is whether researcher will have

access to participants and the data necessary to answer the research question. Lastly, one should choose a problem that can be investigated in the allotted time and with the resources available. Do not select a problem that is too large or vague, and be sure to allow adequate time for constructing instruments, administering instruments, conducting interviews or observations, analyzing data, and writing the report.

- ***The problem should be ethically appropriate:*** The problem should be one that researcher can investigate without violating ethical principles. Educational researchers generally deal with human subjects who must be treated ethically. For this purpose, researcher should receive consent from the intended subjects. Subjects should be able to choose whether they wish to participate in the study or not. Obtain consent from subjects after taking steps to ensure that they have a complete understanding of the procedures to be used, any risks involved, and any demands that will be placed on them. In addition, a researcher should preserve the privacy of subjects as minimally as possible.

❖ **Stating the Research Problem**

After selecting the research problem, the researcher must state the problem in a form amenable to investigation. Beginning researchers often have a general idea of what they want to investigate but have trouble articulating it as a workable problem. They cannot make progress until they can state unambiguously what they are going to do. The statement of the problem varies according to the type of research. The problem statement in quantitative research specifies the variables and the population of interest. The problem statement can be a declarative such as: this study investigates the effect of computer simulations on the science achievement of integrated school students. The statement can ask a question about a relationship between the two or more variables. The previous problem might be restated as what is the relationship between use of computer simulations and achievement of students in science? The problem can be further clarified by operationally defining the variables involved. In the previous example, researcher should specify what computer simulations will be used, how science achievement will be measured, and how the sample of middle school students will be selected.

On the other hand, qualitative problem statement or question indicates the general purpose of the study. Formulation of a qualitative problem begins with the identification of

a general topic or an area that researcher want to know more about. Such general topic of interest is sometimes referred to by qualitative researchers as the focus of inquiry. This initial broad focus may be changed in the study proceeds. As the researcher gathers data and discovers new meanings, the general problem narrows to more specific topics and new questions may arise. In qualitative research, the statement may be somewhat general in the beginning, but it will become more focused as the study proceeds.

1.3.3 Research Objectives

The primary objective should be coupled with the statement of the problem. Study objectives define the specific aims of the study and should be clearly stated in the introduction of the research protocol. Research is an organized investigation of a problem in which there is an attempt to gain solution to a problem. To get right solution of a right problem, clearly defined objectives are very important because clearly stated objectives enlighten the way in which the researcher has to proceed. The research objective should be clear, concise, declarative statement, which provides direction to investigate the variables. Generally, research objective focus on the ways to measure the variables, such as to identify or describe. Sometimes objectives are directed towards identifying the relationship or difference between two variables. Two types of objectives are formulated in research process as below:

❖ **General objective**

General objective is broad goal to be achieved throughout the research process. Such objective of the research expects to achieve by the study in general terms. Number of general objectives is usually less as compared to specific objectives.

❖ **Specific objectives**

The specific objectives of a research are stated in short term, which only focus on narrow area. General objectives can be broken into small logically connected parts to form specific objectives. The specific objectives are more in number and they systematically address various aspects of problem as defined under the statement of problem. They should specify what the researcher will do in the study, where, and for what purpose.

Research objectives are the results sought by the researcher at the end of the research process. Therefore, objective of the research should be closely related to the statement of the problem. A good research objective should be specific, measurable, attainable, realistic, and time bound. The formulation of the objectives help researcher:

- Be focused on the study.
- Avoid the collection of data which are not strictly necessary for understanding and solving problems.
- Organize the study in clearly defined phases or chapters.
- Facilitate the development of research methodology.
- Collect, analyze, interpret, and report data in systematic way.

1.3.4 Research Questions

Researcher must be familiar with the subject to be studied that helps define an appropriate research question for a study. However, questions arise from a perceived knowledge deficit within a subject area or field of study. Increasing one's knowledge about the subject of interest can be accomplished in many ways. Appropriate methods include systematically searching the literature, in-depth interviews, and focus groups with patients, interviews with experts in the field, and so on. In-depth knowledge about a subject may generate a number of questions. It then becomes necessary to ask whether these questions can be answered through one study or if more than one study needed. Additional research questions can be developed, but several basic principles should be taken into consideration. All questions, primary and secondary, should be developed at the beginning and planning stages of a study. It must be kept in mind that within the scope of one study, the presence of a number of research questions will affect and potentially increase the complexity of both the study design and subsequent statistical analyses, not to mention the actual feasibility of answering every question. The research questions in the study should be clearly stated at the time of preparing proposal. Generally, research questions are determined by considering the objectives and statement of the problem determined while preparing research proposal.

Research questions are very important especially in qualitative research because research questions are formulated instead of research hypothesis. No research questions or poorly

formulated research questions will lead to poor research activities. If researcher does not specify clear research questions, there is a great risk that his/her research will be unfocused and will be unsure about what the research is about and what types of data are collecting for. It does not matter how well researcher design a questionnaire or how skilled an interviewer he/she is. But he/she must be clear about research questions. Research questions are crucial because they will:

- Guide researcher to search literature
- guide for making decision on what data he/she need to collect
- guide researcher to analyze collected data meaningfully
- guide to write report systematically
- stop research moving unnecessary directions

1.3.5 Hypothesis

Hypothesis is generally stated in quantitative research in the substitution of research questions. Hypothesis generally declares the relationships between two or more variable in operational way. In other words, the hypothesis presents the researcher's expectations about the relationship between variables within the question. Research may find support for a hypothesis, but it does not prove a hypothesis. A hypothesis is a prediction of the possible outcomes of a study. Researcher can state research question and hypothesis on a problem differently as given below:

- **Research question:** What is the effect of preschool training on the achievement of children with disabilities?
- **Hypothesis:** Disabled children who have had preschool training achieve higher achievement as compared the children who have not had preschool training.

Although hypotheses serve several important purposes, some research studies may proceed without them. Hypotheses are tools in the research process, not ends in themselves. Studies are often undertaken in areas in which there is little accumulated background information. A researcher may not know what outcome to predict. For example, a study going to carry out for the purpose of identifying opinions of people with disabilities towards particular phenomenon often proceeds without any hypothesis. There are two reasons for stating a hypothesis before the data-gathering phase of a quantitative study. They are:

- Well-grounded hypothesis indicates that the researcher has sufficient knowledge in the area to undertake the investigation.
- The hypothesis gives direction to for collecting and interpreting data. It means, hypothesis tells the researcher what procedure to follow and what type of data to gather.

❖ Characteristics of Good Hypothesis

The final worth of a hypothesis cannot be judged prior to empirical testing, but there are certain useful criteria for evaluating hypotheses, which are also known as major characteristics of a good hypothesis. These are given below:

- ***A hypothesis states the expected relationship between variables:*** A hypothesis should assume the relationship between two or more variables. An expected relationship could be described as excessive alcohol use by pregnant mother may trigger a birth of a child with intellectual disabilities. This hypothesis would then be stated as there will be a positive relationship between health of pregnant woman and new born baby.
- ***A hypothesis must be testable:*** A good hypothesis must be testable. A testable hypothesis is verifiable, and deductions, conclusions, or inferences can be drawn from the good hypothesis in such a way that empirical observations either support or do not support the hypothesis.
- ***A hypothesis should be consistent with the existing body of knowledge:*** Hypotheses should not contradict previously well-established knowledge. The hypothesis 'excessive height of an individual may cause severe type of disability.' This statement may satisfy previous criteria but is so contrary to established knowledge. Therefore, the hypothesis should agree with knowledge already well-established in the field. Again, this highlights the necessity for a thorough review of the literature so that hypotheses are formulated on the basis of already established knowledge.
- ***A hypothesis should be stated as simply and concisely as possible:*** A hypothesis should be presented in the form of a concise declarative statement. A complete and concisely stated hypothesis makes clear what the researcher needs to do to test it. It also provides the framework for presenting the findings of the study. If a researcher is exploring more than one relationship, he/she needs to state more than one hypothesis. The general rule is to state only one relationship in any one hypothesis.

❖ Types of Hypothesis

Hypothesis in educational research is classified into three categories such as research hypothesis, null hypothesis, and alternative hypothesis. Each of these categories is explained below respectively:

1) *The research hypothesis*

Research hypothesis is generally developed from observation, literature review, and/or from the theory described in the study. A research hypothesis states the relationship one expects to find as a result of the research. It may be a statement about the expected relationship between the variables in the study. A hypothesis about children's IQs and academic achievement of the children with special needs could be stated: 'there is a positive relationship between IQ and the academic achievement of the children with special needs.' Research hypotheses may be stated in a directional or non-directional form. A directional hypothesis states the direction of the predicted relationship or difference between the variables. A non-directional hypothesis, in contrast, states that a relationship or difference exists but without specifying the direction or nature of the expected finding. Examples of directional and non-directional research hypothesis are given below:

- *Directional hypothesis:* IQ has positive impact on the academic achievement of the children with special needs.
- *Non-directional hypothesis:* There is a relationship between IQ and academic achievement of children with special needs.

2) *Null hypothesis*

It is impossible to test research hypotheses directly. Researcher therefore must first state a null hypothesis. The null hypothesis is a statistical hypothesis. It is called the null hypothesis because it states that there is no relationship between the variables. A researcher may hope to show that after an experimental treatment, two populations will have different means, but the null hypothesis would state that after the treatment the populations' means will not be different. Statistical tests are used to determine the

probability that the null hypothesis is true. If the tests indicate that observed relationships had only a slight probability of occurring by chance, the null hypothesis becomes an unlikely explanation and the researcher rejects it. Researchers aim to reject the null hypothesis as they try to show there is a relationship between the variables of the study. The statement 'there is no relationship between IQ and academic achievement of children with special needs' is an example of null hypothesis.

3) *Alternative hypothesis*

Alternative hypothesis is generally formulated after the rejection of null hypothesis. Inferential statistics indicate that the null hypothesis is unlikely to be true in almost all the cases. If researcher rejects null hypothesis then he/she formulates alternative hypothesis. When inferential statistics indicate that observed differences between the means of the two instructional groups could easily be a function of chance, then null hypothesis is retained, and researcher decides that insufficient evidence exists for concluding there is a relationship between the dependent and independent variables. For example, when the statement 'there is no relationship between IQ and academic achievement of children with special needs' is rejected, then alternative hypothesis is formulated such as 'there is significant relationship between IQ and academic achievement of children with special needs.' Thus, alternative hypothesis is formulated in the substitution of null hypothesis especially in statistical test.

1.3.6 Limitations and Delimitations

Limitations are potential weaknesses of the research and cannot be controlled by researcher. We find limitations in almost everything we do. It means, no researcher can make his/her study completely perfect and some limitations are accepted. However, researcher should provide appropriate rationales behind the limitations. If a researcher is using convenience sampling method instead of simple random sampling method, then the results of the study cannot be generalized into a larger population. This is taken as a limitation of the research. If a researching is going to carry out his/her study on one aspect, achievement of the disabled children for example, then the study is only concerned to the achievement of the children with disabilities but it does not encompass information beyond this attribute. This can be considered

as another limitation of the research. Another limitation of study is time. Therefore, the researcher should explain how he/she intends to deal with the limitations.

The delimitations of a research are those characteristics that limit the scope and define the boundaries of particular study. The delimitations exist under the control of researcher. Delimiting factors include the choice of objectives, the research questions, variables of interest, theoretical perspectives that researcher adopted (as opposed to what could have been adopted), and the population chosen by researcher to investigate something he/she interested in. First delimitation of any study is the choice of problem itself. There are so many other related problems that could have been chosen for the study but the researcher decides to investigate particular one. Sample size, study tools, etc. can be considered as other delimitations of the study.

1.3.7 Literature Review

A literature review is usually a critique of the status of knowledge on a carefully defined educational topic. The literature review enables a researcher to gain further insights from the purpose and the results of a study. Literature can be reviewed from various sources such as professional journals, reports, scholarly books, government documents, thesis and dissertation, and the like. Literature reviews is a part of the research. The researcher builds theoretical foundations for his/her hypothesis, research questions, and interview questions on the basis of literature review. Through literature review, a researcher can get insight into what was written about the certain topic, what are the missing aspects and gaps in the literature and what he/she should introduce in his/her research with the aim of fulfilling such gaps. Researcher should review literature carefully to make his/her study more systematic and meaningful. Generally researcher should consider the following points while reviewing literature:

- Begin with the most recent studies and then work backward through earlier volumes.
- Read abstract or summary section to determine the relevancy.
- Read superficially to those sections that are related to research questions.
- Make note directly on file cards.
- Write out the complete bibliographic reference.
- Do not put more than one reference on each card.
- Be sure about direct quotations and own paraphrases.

Review of related literature is a requirement for every research whether qualitative or quantitative study. However, literature review is neither qualitative nor quantitative method, but a review of related works in the field of study which can fall under qualitative design or quantitative design. It serves as an argument for research study to problem to be properly analyzed. The premise of literature review is on the understanding that knowledge is an incremental exercise. Main purposes of literature review are given below:

- To provide an organized overview of existing research on a specific topic
- To take a critical and evaluative perspective toward published research
- To summarize, synthesize, and analyze the arguments of other authors
- To uncover similarities and differences or consistencies and inconsistencies within existing research
- To identify a gap within the body of research
- To help you generate and justify your research question and hypotheses

Thus, a review of the literature serves several purposes in research. Knowledge from the literature is used in stating the significance of the problem, developing the research design, relating the results of the study to previous knowledge, and suggesting further research. A review of the literature enables a research to:

- ***Define and limit the problem:*** Most studies that add to educational knowledge investigate only one aspect of the larger topic. The researcher initially becomes familiar with the major works in that topic and the possible breadth of the topic. The research problem is eventually limited to a subtopic within a larger body of previous theory, knowledge, or practice and stated in the appropriate terms.
- ***Avoid unintentional and unnecessary replication:*** A thorough search of the literature enables the researcher to avoid unintentional replication and to select to different research problem. The researcher, however, may deliberately replicate a study for verification. A research topic that has been investigated with similar methods that failed to produce significant results indicates a need to revise the problem or the research design.
- ***Select promising methods and measures:*** As researchers sort out the knowledge on a subject, they assess the research methods that have established that knowledge. Previous investigations provide a rationale and insight for the research design. Analysis of measures, sampling, and methods of prior research may lead to a more sophisticated

design, the selection of a valid instrument, a more appropriate data analysis procedure, or a different methodology for studying the problem.

- ***Relate the findings to previous knowledge and suggest further research:*** The results of a study are contrasted with those of previous research in order to state how the study added additional knowledge. If the study yielded non-significant results, the researcher's insights may relate to the research problem or to the design.

1.4 Quantitative Research

Research methods in education are often divided into two main types: quantitative and qualitative methods. Quantitative research is 'explaining phenomena by collecting numerical data that are analyzed using mathematically based methods.' In quantitative research researcher collects numerical data. It means, quantitative research relies primarily on numbers as the main unit of analysis. It is more commonly used as a primary method in scientific and clinical research. Although quantitative methods (survey research, correlational research for examples) are used in educational research, the vast majority of research is relatively small scale, intensive, focused on change and involves human perceptions. Educational research relies much more heavily on qualitative methods. One of the most common instruments to gather numerical data in education is the questionnaire survey, using a series of closed questions to which responses are given by the respondents participated in the research process. Large amounts of data can be gathered from a wide number of people and the results can be analyzed by using different statistical methods. There are four types of research question that quantitative research is particularly suited to find an answer. These are given below:

1) ***When researcher wants a quantitative answer***

When a researcher wants to explore quantitative answer from the whole research process then he/she should use quantitative research method. Researcher cannot use qualitative research method in some research questions because of the necessity of the numerical data and statistical tests. Researcher can use quantitative research method to answer following questions:

- How many children with disabilities get entry into higher education?
- How many special teachers do we need and how many have we got in our schools till the date?

2) Numerical change can only accurately be studied using quantitative methods

When a researcher tries to explore the numerical change on particular phenomena then he/she should use quantitative research method instead of qualitative. Some examples of such research questions are given below:

- Are the numbers of students with disabilities in integrated and special schools in Nepal rising or falling?
- Is achievement of students with special needs going up or down?

3) When researcher wants to find out about the state of something

Researcher should use quantitative research method when he/she wants to explain phenomena or try to find out the state of something. Many statistical techniques have been developed that allow researchers to predict scores on one factor or variable (e.g. teacher recruitment) from scores on one or more other factors or variables (e.g. unemployment rates, pay, conditions). Some questions for examples are given below:

- What factors predict the recruitment of special education teachers in Nepal?
- What factors are related to changes in student achievement over time?

4) Quantitative research is especially suited for testing hypotheses

If a researcher wants to carry out research to explain something through the formulation of hypothesis then he/she need to apply quantitative research. Some questions given below demand quantitative research:

- What is the relationship between a pupil's disability and his/her academic achievement?
- Is there any relationship between poverty and learning disabilities?

Researcher has to design quantitative study appropriately after taking decision to use it. There are two main types of quantitative research design, experimental designs and non-experimental designs. Experimental designs are sometimes known as 'the scientific method' due to their popularity in scientific research where they originated. Within these two categories, different quantitative research designs have been included. Among them, survey research and correlational research have been discussed below respectively.

1.4.1 Survey Research

In survey research, the researcher selects a sample of respondents from a population and administers a standardized questionnaire to them to gather data. Questionnaire is a main tool used to gather data in survey research. The questionnaire can be a written document that is completed by the person being surveyed. Survey research sometimes also uses interview schedule to gather information from groups of individuals. Surveys permit the researcher to summarize the characteristics of different groups or to measure their attitudes and opinions toward some issue. Researchers in education and the social sciences use surveys widely. For example, an educational researcher might ask a group of parents about what kind of educational services should be provided to their children with disabilities.

Survey research is a process in quantitative research in which researchers administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviors, or other characteristics of the population. While conducting survey research, the researcher collects quantitative data by using questionnaires or interview, and then analyzes the data systematically to describe trends about responses to questions and to test research questions or hypotheses. Researcher generally uses survey research to describe trends, to determine individual opinions about policy issues, and to identify important beliefs and attitudes of individuals. The survey permits researcher to gather information from a large sample of population relatively quickly and inexpensively. Careful planning, implementation, and analysis are required to conduct survey research successfully. Generally following steps are applied while conducting survey research:

1) Planning

Survey research begins with a question that the researcher believes can be answered most appropriately by means of the survey method. The research question in survey research typically concerns the beliefs, preferences, attitudes, or other self-reported behaviors of the people participated in the study. A literature review reveals what other researchers have learned about the question. For examples, researcher can use survey research to answer following questions:

- How do special teachers in Nepalese schools feel about the facilities that have been providing to them for years?

- How many children with disabilities can get employment after completing their school education?

2) Defining the population

One of the first important steps is to define the population under study. The population defined for survey research may be quite large, or it may be rather limited. Once the population has been defined, the researcher must obtain or construct a complete list of all individuals in the population. This list, called the sampling frame, can be very difficult and time-consuming to construct if such list is not already available. For example, the population might be

- all special teachers teaching in integrated and special schools in Nepal.
- all the students with disabilities who completed their school education.

3) Sampling

Most of the cases, it is not possible to carry out survey research in total population. Therefore, researchers should select a sample from that population. It is very important to select a representative sample that will provide results similar to the entire population. The sampling procedure that is most likely to yield a representative sample is some form of probability sampling. Probability sampling permits researchers to estimate how far sample results are likely to deviate from the population values. Researchers can use different sampling methods for selecting representative sample from the study population; some of them are given below:

- simple random sampling method
- stratified sampling method
- cluster sampling method
- systematic sampling method

4) Constructing data collection instruments

A major task in survey research is constructing the instruments that will be used to gather the data from the sample. The two basic types of data-gathering instruments generally used in survey research are interviews and questionnaires. Therefore, researchers should construct these instruments by considering the background of respondents.

5) Conducting the survey

Once the data-gathering instruments are prepared, they must be tested through pilot study to determine whether they will provide the desired data or not. In this step, training is also provided to data collectors to gather essential information in reliable and valid way. They are

generally taught about the technique of using instruments, distributing questionnaires, conducting interview, and verifying the accuracy of data gathered.

6) *Analyzing the data*

This step includes coding the data, statistical analysis, interpreting the results, and deriving the conclusions. Researchers should consider research objectives and research questions while analyzing the data. They can use different statistical methods (both descriptive and inferential) to analyze the data gathered from different sources.

7) *Reporting the results*

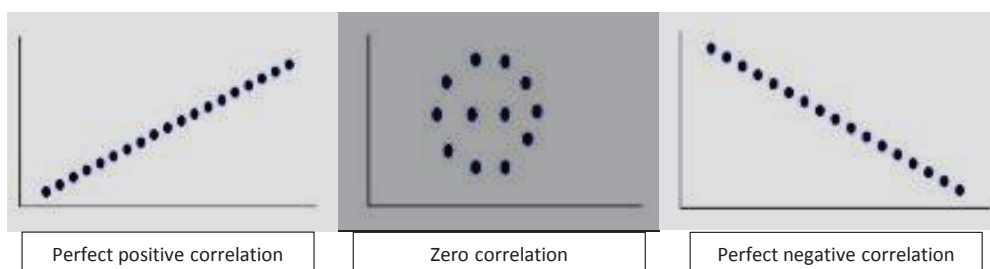
At last, researchers should prepare the report to convey findings and conclusions of the research to the audiences. Researchers should consider the academic background while preparing report and they should write the report in such a way that can be understandable by the targeted readers.

1.4.2 Correlational Research

Correlational research involves collecting data in order to determine whether and to what degree of relationship exists between two or more quantifiable variables. Correlational research gathers data from individuals on two or more variables and then seeks whether the relationship between two variables is exists or not. While conducting correlational research, three types of correlations (positive correlation, negative correlation, and zero correlation) are found between variables studied from the research. The degree of relationship is expressed as a numeric index called the coefficient of correlation. This research can also be used in the field of special needs education to study whether two variables are correlated or not. In this regard, one can study the relationship between intelligence and achievement in mathematics in special schools in Nepal. Correlational research generally investigates the possibility of relationships between two or more variables. This research is also sometimes referred to as a form of descriptive research because it describes an existing relationship between variables. Generally, three types of correlations are found in correlational research as mentioned below:

- Positive correlation
- Negative correlation
- Zero or no correlation

Correlation between two variables may range from -1 to $+1$. The sign (+ or $-$) of the coefficient indicates the direction of the relationship. If the coefficient has a positive sign, this means that as one variable increases, the other also increases. For example, the correlation between height and weight is positive because tall people tend to be heavier and short people tend to be lighter. A negative coefficient indicates that as one variable increases, the other decreases. The correlation between the time employed to watch television and academic achievement may be negative; as TV watching time increases, achievement in the exam decreases. The size of the correlation coefficient indicates the strength of the relationship between the variables. The coefficient can range in value from $+1.00$ (indicating a perfect positive relationship) through 0 (indicating no relationship) to -1.00 (indicating a perfect negative relationship). A perfect positive relationship means that if variable 'A' is increased then variable 'B' is also increased. A perfect negative relationship indicates that if variable 'A' is increased then variable 'B' is decreased. A zero correlation means there is no effect of one variable into another. These three types of correlations are given below:



In correlational research, researchers try to identify the relationship between two variables. In correlational research researchers see patterns that go together, but they usually cannot infer what causes what. In addition, with correlational research they can examine only two variables at a time, no more and no less. For example, the researchers may ask people how much of their income they spend on others or donate to charity, and then asked them how happy they are. In this problem, researchers try to identify the relationship between the more money people spend on others and their happiness. Following steps should be carried out while conducting correlational research in the field of special needs education.

1) *Select a research problem*

At first, researcher should select appropriate problem for correlational research. The research should have some reason for thinking certain variables may be related. In general, three major types of problems are the focus of correlational studies as given below:

- Is variable X related to variable Y?
- How well does variable P predict variable C?
- What are the relationships among a large number of variables, and what predictions can be made that are based on them?

2) Selection of sample

The sample for a correlational study should be selected carefully and, if possible, randomly. The first step in selecting sample is to identify an appropriate population, one that is meaningful and from which data on each of the variables of interest can be collected. The minimum acceptable sample size for a correlational study is considered by most researchers to be no less than 30. Researcher should select large sample size if possible to manage from the perspective of time, money, resources, etc.

3) Construct data collection tools

The tools used to measure the two or more variables involved in a correlational study may take any one of a number of forms, but they must yield quantitative data. Generally, testes, questionnaire, observation, etc. are used to gather quantitative data in correlational study. Any tool should gather reliable and valid data for the research. If the tool does not truly measure the intended variables, then any correlation that is obtained will not be an indication of the intended relationship.

4) Determine research design and procedures

The design used in a correlational study is quite straightforward. Generally, two or more scores are obtained from each individual in the sample, one score for each variable of interest. The pair scores are correlated, and the resulting correlation coefficient indicates the degree of relationship between the variables. Thus, different numbers of variables can be investigated in correlational studies, and sometimes quite complex statistical procedures are used.

5) Data collection

After making decision about the design and procedures, research should collect data from different sources by using data collection instruments developed in advance. In correlational research, all the data on both variables are usually collected within a fairly short time. If a researcher was interested in measuring the relationship between verbal aptitude and memory, a test of verbal aptitude and another of memory are administered closely together to the same group of individuals.

6) *Data analysis and interpretation*

As we discussed before, when variables are correlated a correlation coefficient is produced. If the sign is positive, the relationship is positive, indicating that high scores on the one variable tend to go with high scores on the one variable tend to go with high scores on the other variable. If the sign is negative, the relationship is negative, indicating that high scores on the one variable tend to go with low scores on the other variable. Coefficients that are at or near .00 indicate that no relationship exists between the variables involved.

1.5 Qualitative Research

Qualitative Research is used to gain an understanding of underlying reasons, opinions, and motivations. It provides insights into the problem or helps develop ideas on potential issue. Qualitative research is also used to uncover trends in thought and opinions. Qualitative data collection methods vary using unstructured or semi-structured techniques. Some common methods include focus groups (group discussions), individual interviews, and participation/observations. The sample size is typically small, and respondents are selected by considering the purpose of the study.

Qualitative researchers seek to understand a phenomenon by focusing on the total picture rather than breaking it down into variables. The goal of qualitative research is to explore a holistic picture and depth understanding on particular issue rather than a numeric analysis of data. The question "How do students with disabilities perceive their academic experience in the integrated schools?" can be explored by using qualitative methodology. Researchers would focus on a few disabled students and study them in great detail through observation and in-depth interviews. There are many different types of qualitative research. Among them only two (case study and phenomenological research) are discussed within this topic.

A qualitative researcher is willing to ask more open-ended questions, design a study to explore different ways in which the questions may be answered, and explore the implications of each result. A qualitative study may produce a rich and well documented account of a situation and rely on readers to determine whether the findings apply to their situations. Qualitative researchers are also open to the possibility that the initial question may need to change after data collection begins and the researcher understands more about the phenomenon or situation under study. Major characteristics of qualitative research are given below:

- Exploring a problem and developing a detailed understanding at each stage of the research process.
- Stating the purpose and research questions in a general and broad way so as to the participants' experiences.
- Collecting data based on words from a small number of individuals so that the participants' views are obtained.
- Analyzing the data for description and themes using text analysis and interpreting the larger meaning of the findings.
- Writing the report using flexible, emerging structures and evaluative criteria, and including the researchers' subjective reflexivity and bias.

1.5.1 Case Study

A case study is a type of qualitative research that focuses on a single unit, such as one individual, one group, one organization, or one program. The goal is to arrive at a detailed description and understanding of the case. Case studies use multiple methods, such as interviews, observation, document analysis, etc. to gather in-depth information. Researchers from the field of education and psychology have used the case study widely. Case studies can answer descriptive questions (what happened) or attempt to explain why something happened by looking at a process. The researcher believes that something can be learned in specific case. A specific unit may be selected because it is unique or typical or for a variety of other reasons. As a research design, the case study claims to offer a richness and depth of information not usually offered by other methods. By attempting to capture as many variables as possible, case studies can identify how a complex set of circumstances come together to produce a particular manifestation. It is a highly versatile research method and employs any and all methods of data collection from testing to interviewing. Case study possesses following qualitative characteristics:

- Collection of verbal data through interview, focus groups, observation notes, and notes based on data of record.
- Research questions that involve 'how' and 'why' a complex phenomenon works or occurs.
- Lack of researcher control of variables.
- Purposive/theoretical sampling methods rather than random sampling strategies.

- Flexibility of design in that the study goes where the data indicate it should go.
- Analysis of data within context rather than separating specific variables from their context.

The greatest advantage of a case study is the possibility of depth; it seeks to understand the whole case in the totality of the environment. Case study not only probes the present actions of an individual but it also explores his/her past, environment, emotions, and thoughts. Case studies often provide an opportunity for an investigator to develop insight into basic aspects of human behavior. The intensive probing characteristic of this technique may lead to the discovery of previously unsuspected relationships. On the other hand, case study has several limitations. One of the criticisms aimed at case study research is that the case under study is not necessarily representative of similar cases and therefore the results of the research are not generalizable. Case study is time consuming and may be quite costly. Additionally, subject dropout may occur during this type of study. Whenever a study is carried out over an extended period, loss of subjects must be considered. A person may move from the locality or simply decide to discontinue participation in the study. Researcher should follow following steps while conducting case study:

1) *Establish research question*

First of all, researcher should determine the research question to be answered in the research process. In this regard, researcher can establish the 'how' and 'why' research questions that drive case studies.

2) *Decide the nature of study*

Researcher should decide whether the study is to be exploratory, descriptive, or explanatory and establish one or more theories, each having multiple theoretical proportions that the study will test.

3) *Determine the type of case study design*

In third step, researcher should determine the specific type of case study design. There are several case study designs such as single case/single unit of analysis, single case/embedded units of analysis, multiple case/single unit of analysis, and multiple case/embedded units of analysis. Therefore, researcher should be clear what type of design need to be use make study result more meaningful.

4) *Select the case*

Researcher should select appropriate case to carry out case study research. He/she can use purposive or theoretical sampling method to select the cases according to established theoretical criteria and gain access to the sites.

5) *Data collection*

Researcher should develop a case study protocol while collecting data from the chosen case. After preparing the protocol, researcher should review it to ensure that it meets specific principles of data collection. Furthermore, training should be provided to study team, pilot study should be conducted, and finally data should be collected objectively by using prepared tools.

6) *Data analysis*

After completing data collection process, researcher should analyze the data for each theoretical proposition using a pattern-matching, explanation or time-series analysis strategy.

7) *Compose the study report*

At the end of research process, report should be prepared by including the research procedures, data analysis and interpretation, findings and conclusions, etc. researcher should use simple language while writing the report by considering the academic background of the readers.

1.5.2 Phenomenological Research

Phenomenology is a science to study the world as experienced by individual. Phenomenology literally means the study of phenomena. It is a way of describing something that exists as part of the world in which we live. Phenomena may be events, situations, experiences or concepts. We are surrounded by many phenomena, which we are aware of but not fully understand. Therefore, a phenomenological research is designed to describe and interpret an experience by determining the meaning of the experience as perceived by the people who are participated in the research process. This research tries to answer distinct question such as: what is the experience of an activity or concept from the perspective of particular participants? The central research question aims to determine the essence of the experience as “perceived by the participants.” Phenomenology moves from individual experience to a universal essence and always asks what is the nature or meaning of something. Interviewing multiple individuals is the typical data collection approach in phenomenological research.

The purpose of phenomenological research is to generate clear, systematic and precise descriptions of the meaning of experience. Phenomenological studies begin with the assumption that multiple realities are rooted in subjects' perspectives. Thus, an experience has different meanings for each person. Suppose, a phenomenological researcher is going to conduct a study on the integration of special needs children into a regular classroom. Then he/she can focus on asking what this experience means to the parties involved: the special needs children, other students, and the teacher. In the process of phenomenological research, the researcher must first identify a problem for which an examination of shared experience is necessary. Interview data are typically collected from those who have experienced the phenomenon, but other data sources may be used, including observations, art, poetry, music, journals, drama, films, and the like. The concept of bracketing is used in phenomenological research to reduce the biases of the researcher. Bracketing involves the researcher intentionally setting aside his or her own experiences, suspending his or her own beliefs in order to take a fresh perspective based on data collected from persons who have experienced the phenomenon. Following steps should be followed while conducting phenomenological research:

1) *Discovering research topic and question*

First of all, researcher should appropriate topic to carry out phenomenological research in the field of special needs education. Phenomenological research only studies the meaning and essence of human experiences. That's why all research problems cannot be suited for phenomenological research. More importantly, key words of the research topic should be defined clearly.

2) *Review of literature*

At the second stage, researcher should review related literature to gain in-depth understanding in phenomenological research. Literature review supports to the researcher to refine study problem, to determine appropriate objectives, to determine more reliable and valid research methodology, to find out the ways to analyze gathered information systematically and meaningfully.

3) *Selection of co-researchers*

In third step of phenomenological research, researcher should make decision about the informants without whom research project cannot be possible. Phenomenological research attaches more value to informants as compare to other research designs. That's why they are

taken as co-researcher in the research process. The informants chosen for the research must be familiar with the problem to be studied from the research project.

4) Clarify the purpose of research

After selecting co-researchers, researcher should clarify the purpose of research to them including their roles in research. Consent must be taken from informants to collect information and publicize them publicly. Research should not gather information without clarifying the purpose of research.

5) Construct a set of questions for interview

In phenomenological research, open-ended interview is applied as a sole method of collecting information from the respondents. Therefore, rigid tools are not developed to gather information from the sample chosen. However, an outline of questions need to be asked in data collection process is developed. But it is flexible in nature. Researcher can adjust this outline on required basis while gathering information from the respondents.

6) Conduct the interview

In the sixth step of phenomenological research, researcher take interview by following the flexible interview outline. In the interview process, researcher tries to probe the hidden experiences of the respondents regarding the research topic. Research can use note, audio tape, and video recording to record all of the information from the co-researchers. But he/she must take consent from them before audio and video recording.

7) Organization and analysis of data

At the final stage of phonological research, all of the information gathered from the key informants are organized and analyzed be generating different themes. In this step, research revisit his/her field notes, audio and video recordings frequently to draw to meaning and essence from the experiences of the respondents. And then the gathered information are organized and analyzed meaningfully.

Let Us Sum Up

In chapter one, we discussed about the concept and importance of research, different operational terms such as variables in research, statement of the problem, research objectives, research questions, hypothesis, limitations and delimitations of research, and literature review in research. Furthermore, we also discussed qualitative and quantitative research including different quantitative (survey and correlational) and qualitative (case study and phenomenology) research designs. As a whole, this chapter

has tried to provide basic concept of research and its other operational terms generally applied in the field of special needs education research. All students should have good mastery on the contents incorporated within chapter one to carry out research work in the field of special needs education.

Unit-end Activities

- **Objective Questions**

Tick (✓) the best answer.

“Group-A”

1. Which of the following statement is related to research?
 - a. Selecting one set of books for the students out of many
 - b. **Systematic inquiry aims for deriving generalization**
 - c. Recording events when taking place
 - d. Rearranging facts obtaining from various sources
2. Research questions are basically drawn from
 - a. **statement of the problem**
 - b. significance of the study
 - c. hypothesis of the study
 - d. nature of the study
3. Research questions are used instead of hypothesis particularly in
 - a. quantitative study
 - b. experimental study
 - c. **qualitative study**
 - d. correlational study
4. Hypothesis is stated in
 - a. **declarative statement**
 - b. interrogative statement
 - c. experimental statement
 - d. descriptive statement
5. case study can be best used in
 - a. quantitative research
 - b. **qualitative research**
 - c. statistical research
 - d. experimental research

- **Short answer questions** **“Group-B”**
 1. Define variables and describe its major types in brief.
 2. What are the major guidelines need to be considered while stating research problem?
Discuss with examples.
 3. Select a topic of research and formulate general and specific objectives based on the chosen topic.
 4. Define hypothesis and discuss its types in short.
 5. Explain the importance of literature review in special needs education research.

- **Long answer questions** **“Group-C”**
 1. Define research and state the importance of research in special needs education.
 2. Introduce quantitative research and explain the procedures need to be followed while conducting survey research in special needs education.
 3. What do you mean by qualitative research? State two designs of qualitative research and explicate any one of them in short.

Points for Discussion

- Discuss the importance of research in special needs education.
- Explain the independent, dependent, and intervening variables in research.
- Elucidate the guidelines need to be considered while stating research problem.
- Introduce concept and types of objectives in research.
- Describe the guidelines need to be followed while stating hypothesis and research questions.
- Clarify the need and importance of literature review in special education research.
- Give brief introduction of survey and correlational research.
- Explain the procedures of conducting case study and phenomenological research.

Unit 2: Research Designs in Special Needs Education

2.1 Concept of Research Design

The research design refers to the plan and structure of the investigation used to obtain evidence to answer research questions. The design describes the procedures for conducting the study, including when, from whom, and under what conditions the data will be obtained. The purpose of a research design is to provide the most valid, accurate answers possible to research questions. Since there are many types of research questions and many types of designs, it is important to match the design with the question. Research design is a very important part of an investigation, since certain limitations and cautions in interpreting the results are related to each design, and also because the research design determines how the data should be analyzed.

Research design is a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings. In other words, research design is considered as a plan that describes how, when, and where the data are to be collected and analyzed. Researchers try to answer the research question or test the research hypothesis through research design. The function of a research design is to ensure that the evidence obtained enables us to answer the initial question as unambiguously as possible. Obtaining relevant evidence entails specifying the type of evidence needed to answer the research question, to test a theory, to evaluate a program or to accurately describe some phenomenon. Various people define research design differently. However, the essence of each is similar to one another. The definitions given below also prove so.

According to Kerlinger (1973), "Research design is a plan, structure, and strategy of investigation conceived so as to obtain answers to research questions and to control variance."

According to Young (2009), "Research design is the logical and systematic planning and directing of a piece of research."

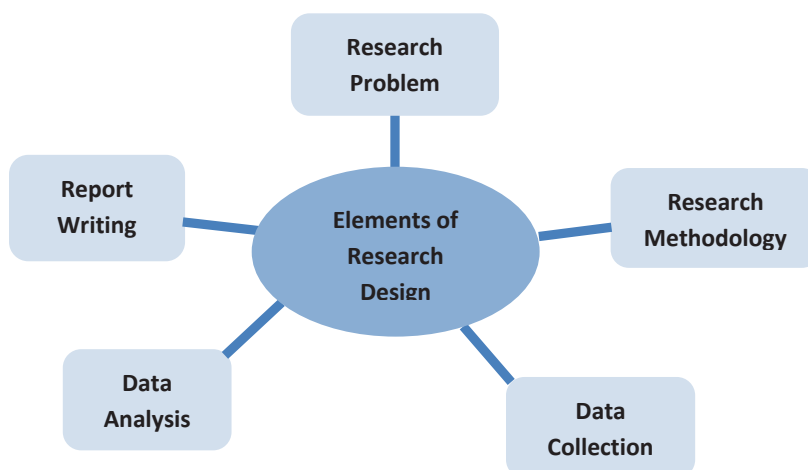
According to Kumar (2005), "A research design is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately, and economically."

According to Kothari (2004), “Research design is the conceptual structure within which research is conducted: it constitutes the blueprint for the collection, measurement, and analysis of data.”

A research design is the set of methods and procedures used in collecting and analyzing measures of the variables specified in the research problem research. The research design defines the study type (correlation, experimental, case study, single subject research design for examples), research problem, hypotheses, independent and dependent variables, data collection and analysis procedures. As a whole, research design is the framework that has been created to find answers to research questions.

2.2 Elements of Research Design

The research design is the researcher’s plan of how to proceed to gain an understanding of some group or some phenomenon in its context. The design begins with a general statement of a research problem or topic. To develop the focus of inquiry, the beginning researcher needs to think about some topic in which he or she has an interest and wants to know more about. The research question may be one that comes from the investigator’s observations and experiences with particular topics, settings, or groups. Qualitative problems examine the context of events, real-world setting, subjects’ perspectives, unfolding and uncontrolled events, reasons for the events, and phenomena needing exploration and explanation. For example, qualitative researchers may ask the following questions: How do disabled children’s parents cope with the problems that have been experiencing by them? How do chronically ill children deal with pain? The major elements of research design have been presented below with the help of a picture.



1) Research Problem

Research problem is a component of research design. A research problem can be anything that a person finds unsatisfactory that needs to be changed. Research problem is generally posed in the form of research question, which serves as the focus of the researcher's investigation. Researcher should determine feasible, clear, and significant research question. A feasible question is one that can be investigated with available resources. Most of the research that is done in schools or other educational institutions is likely to be done by outsiders. Thus, lack of feasibility often seriously limits research efforts.

2) Research Methodology

Research methodology is another component of research design. Research methodology is a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Research methods are the various procedures, schemes and algorithms used in research. All the methods used by a researcher during a research study are termed as research methods. They help us collect samples, data and find a solution to a problem.

3) Data Collection

After making decision about research methodology, researcher needs to collect data especially from primary and secondary sources. Therefore, data collection is considered as another component of research design. Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables researcher to answer stated research questions, test hypotheses, and evaluate outcomes. In other words, data collection is a process of collecting information from all relevant sources to find answers to the research problem, test the hypothesis, and evaluate the outcomes. Data collection methods can be divided into two categories: secondary methods of data collection and primary methods of data collection.

4) Data Analysis

Data Analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, and evaluate data gathered from different sources. Collected data must be organized and analyzed meaningfully to complete a research project. Therefore, data analysis is taken as another component of research design. However, the data analysis process in both quantitative and qualitative research is not identical. It means, researcher should use different statistical methods while analyzing data in quantitative research and he/she should use different direct narrations of the respondents while analyzing information in qualitative research. An essential component of ensuring data integrity is the accurate and appropriate analysis of research findings. Improper statistical analyses distort scientific findings, mislead casual readers, and may negatively influence the public perception of research.

5) Report Writing

Report writing is also considered as an important element of research design. No research work has significance without a well-organized and systematically written report. Research report is generally prepared by organizing the gathered data into different sections. The research report is usually presented in written form. In professional spheres, reports are a common and vital communication tool. Thus, report writing activity makes total research project more meaningful and useful.

2.3 Withdrawal Designs

Any experimental design in which the researcher attempts to verify the effects of the independent variable by 'reversing' responding to a level obtained in a previous condition. Especially, in withdrawal designs independent variable is withdrawn or reversed in its focus to identify the actual effect of independent variable. By withdrawal, the intervention is concluded or is stopped for some period of time before it is begun again. The premise is that if the intervention is effective, the target problem should be improved only during the course of intervention, and the target scores should worsen when the intervention is removed. If this assumption is correct, then the impact of an extraneous event (history) between the baseline and intervention phase would not explain the change. In the behavior analysis literature, the terms withdrawal and reversal are widely used to refer to various iterations of the basic A-B-A or A-B-A-B experimental design structure. Although these terms were initially used to label two distinct

but closely related experimental designs, it now appears that many researchers have come to use these terms interchangeably. In this chapter, different designs generally used in single-subject research have been discussed below:

2.3.1 Baseline Logic

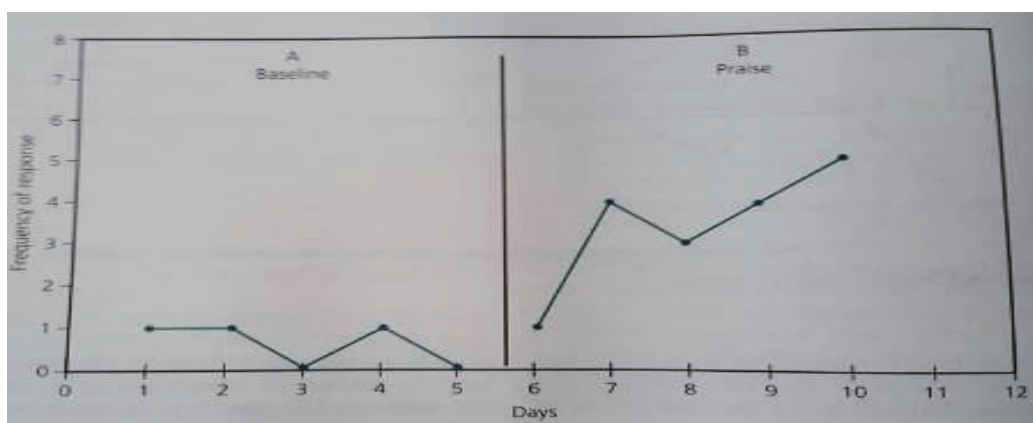
Single subject research methodology is based on baseline logic. Baseline logic refers to the repeated measurement of behavior under at least two adjacent conditions: baseline (A) and intervention (B). If there is a measurable change in behavior after the introduction of intervention, when compared with baseline measures, it is probable, but not proven, that the introduction of intervention was responsible for that change (A-B design) to verify this hypothesis, researcher can withdraw or reverse the intervention condition by returning to the previous baseline condition (A-B-A design). If the behavior returns to or approximates the level measured during the initial baseline condition there is a greater likelihood that the intervention was responsible for the behavior change. By introducing the intervention condition (A-B-A-B design) a more convincing demonstration of experimental control is possible. The more replications of effect, the greater the confidence we have that the intervention was responsible for the change in behavior. Baseline logic serves as the foundation for all single subject research paradigms. All single subject research designs are mere extensions or elaborations of the basic A-B paradigm. In this unit, different single subject designs are discussed below correspondingly:

2.3.2 A-B Design

The A-B design sometimes referred to as the 'simple time series design'. It includes a baseline phase with repeated measurements and an intervention phase continuing the same measures. In this design the target behavior is clearly specified, and repeated measurement is taken throughout the baseline (A) and treatment (B) phases of experimentation. In other words, this design requires that the dependent variable be measured repeatedly under controlled baseline (A) and intervention (B) conditions. After repeated observations under a baseline condition and after the data trend and level have stabilized, the intervention is introduced. As in all single-case experimental research, the A phase involves a series of baseline observations of the natural frequency of the target behavior(s) under study. In the B phase the treatment variable is introduced, and changes in the dependent measure are noted.

The basic approach of researchers using an A-B design is to collect data on the same subject under two conditions. The first condition is the pretreatment condition, typically called the baseline period, and identified as A. During the baseline period, the subject is assessed for several sessions until it appears that his/her typical behavior has been reliably determined. The baseline is extremely important in single-subject research since it is the best estimate of what would have occurred if the intervention were not applied. Once the baseline condition has been established, a treatment or intervention condition, identified as B, is introduced and maintained for a period of time.

For example, a researcher is interested in finding out the effects of verbal praise on a student having problem in learning mathematical contents. The researcher intended to observe the student's behavior for providing verbal praise to him for five sessions and observe his behavior immediately after the praise. Then, five measures were taken as baseline data and five more measures were taken during the intervention period as given in the following figure:



As given in the figure, intervention appears to have been effective. The amount of responsiveness after the intervention (praise) increased remarkably. However, no one can ensure that the increment occurred in successive interventions is due to the impact of intervention. In A-B design researcher does not know whether any behavior change occurred because of the treatment. There is another possibility that some other variables may cause the change. When using baseline design, researcher should:

- Behaviorally define target behavior(s).

- Select a measurement system that permits an analysis of antecedent and consequent events relative to the target behavior(s).
- Thoroughly describe baseline and intervention conditions under which the target behavior is measured.
- Collect continuous baseline data (A) over a minimum of 3 consecutive days or until stable before introducing intervention (B).
- Collect inter-observer agreement (dependent variable) and procedural (independent variable) reliability data in baseline and intervention conditions.
- Avoid inferring cause-effect conclusions.
- Replicate experimental effect with similar research participants.

❖ ***Advantages of A-B design***

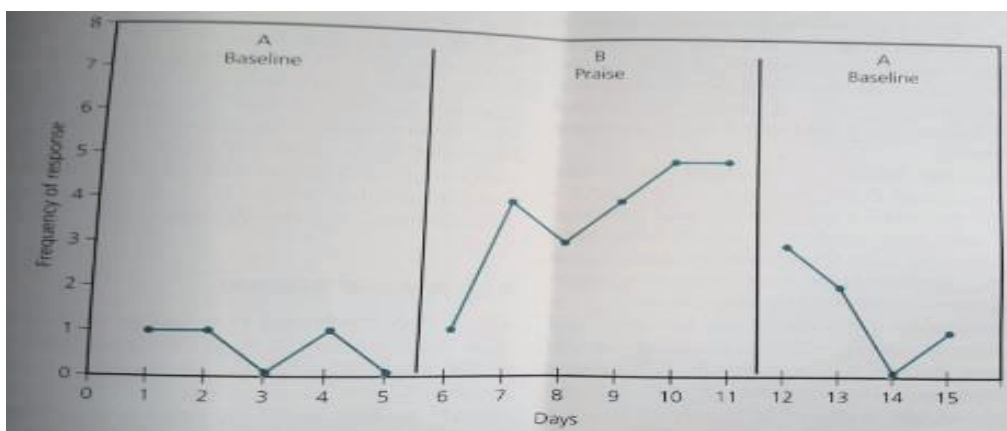
- The A-B design provides a framework within which behavior can be objectively measured under clearly described and controlled environmental conditions.
- The A-B design improves upon the 'B' design by adding repeated measurement of a target behavior under 'natural' or baseline conditions prior to introduction of the independent variable.
- Though the A-B design does not permit a functional analysis of behavior, it may provide a convincing demonstration that behavior change is not a function of the passage of time (maturation for example).
- The A-B design may be only evaluation paradigm available to teachers and clinicians for monitoring program changes in child or client behavior.

❖ ***Limitations of A-B design***

- The most notable limitation of the A-B design is the lack of information on the natural course of the target behavior in the absence of intervention.
- The A-B design fails to control for various threats to internal validity, it does not determine the effect of the independent variable on the dependent variable.
- The A-B design provides weak correlational conclusions. Due to this reason, it has also been described as quasi-experimental design.
- It is difficult ensuring internal and external validity in this design.

2.3.3 A-B-A Design

The A-B-A design builds on the A-B design by integrating a post treatment follow-up that would typically include repeated measures. This design answers the question left unanswered by the A-B design: Does the effect of the intervention persist beyond the period in which treatment is provided? Depending on the length of the follow-up period, it may also be possible to learn how long the effect of the intervention persists. The follow-up period should include multiple measures until a follow-up pattern emerges. In our previous example, the researcher, after praising the student for say, five days, could eliminate the praise and observe the student's behavior for another five days with no praise. This would reduce threats to internal validity, because it is unlikely that something would occur at the precise time the intervention is presented to cause an increase in the behavior and at the precise time the intervention is removed to cause a decrease in the behavior as given in the following figure:



The A-B-A design represents the simplest single subject research designs for demonstrating cause-effect relations. Like the A-B design, the target behavior is repeatedly measured under baseline (A1) and intervention (B) conditions. After the dependent variable has stabilized during the intervention, the researcher reintroduces baseline condition (A2) to the target behavior. While using the A-B-A design researcher should:

- Behaviorally define target behavior(s).
- Collect continuous baseline data (A), over a minimum of 3 consecutive days or until stable.
- Introduce intervention (B) only after a stable baseline trend has been established in A1.
- Collect continuous data during intervention (B) over a minimum of 3 days.

- Collect inter-observer agreement (dependent variable) and procedural (independent variable) reliability data in baseline and intervention conditions.
- Withdraw (or reverse) the intervention and return to the original baseline condition (A2) after acceptable stability in level and trend has been established in the intervention condition (B).
- Replicate the experimental effect with other participants (direct inter-subject replication).

❖ *Advantages of A-B-A design*

- The A-B-A design allows a functional analysis of behavior.
- Conclusions can be further substantiated and strengthened when the experimental effect is replicated with similar participants with the same study.
- Inter-subject replications in the design enhance the external validity of findings.
- Researcher can measure internal validity of the research by observing impact of the intervention on dependent variable.

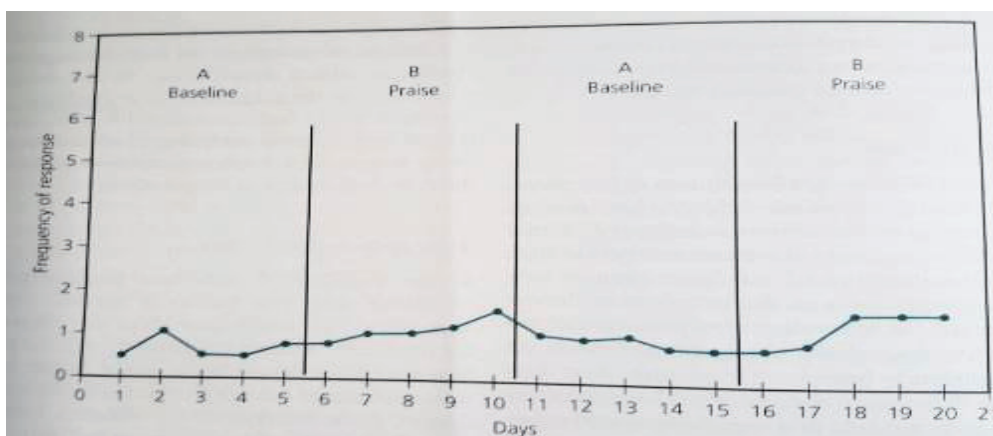
❖ *Limitations of A-B-A design*

- This design cannot ensure internal and external validity as compared to experimental design.
- The A-B-A design is not appropriate for evaluating program effectiveness with behaviors that are difficult to reverse (academic skill for example).
- There are practical and ethical problems associated with terminating a study in a baseline condition.
- This design leaves the subjects in the A condition. Therefore, many researchers would feel uncomfortable about ending this type of study without some degree of final improvement being shown.

A-B-A-B Design

The A-B-A-B design is also known as 'reversal design, withdrawal design, and equivalent time series design. The A-B-A-B design builds in a second intervention phase. The intervention in this phase is identical to the intervention used in the first B phase. The replication of the intervention in the second intervention phase makes this design useful for social work practice

research. The most important feature of the A-B-A-B design is that it evaluates a direct replication of effect. Thus, in the A-B-A-B design, two baseline periods are combined with two treatment period. This further strengthens any conclusion about the effectiveness of the treatment, because it permits the effectiveness of the treatment to be demonstrated twice. In fact, the second treatment can be extended indefinitely if a researcher so desires. In the previous example, the researcher would reinstate the experiment treatment, B (praise), for five days after the second baseline period and observe the subject's behavior. As with the A-B-A design, the researcher hopes to demonstrate that the dependent variables (responsiveness) changes whenever the independent variable (praise) is applied. If the subject's behavior change from the first baseline to the first treatment period, from the first treatment to the second baseline, and does on, the researcher has evidence that praise is indeed the cause of the change as given in the figure below:



As shown in the figure, a clear baseline is established, followed by an increase in response during treatment, followed by a decrease in response when treatment is stopped, followed by an increase in response once the treatment is instituted again. This pattern provides fairly strong evidence that it is the treatment, rather than maturation or something else that is responsible for the improvement. While using the A-B-A-B design, the researcher should:

- Behaviorally define target behavior(s).
- Identify, define, and concurrently monitor non-target behaviors of the same response class as well as behaviors that may change as a function of a change in the target behavior.

- Collect continuous baseline data (A1) over a minimum of 3 consecutive days.
- Introduce the intervention (B1) only after a stable trend has been established in the initial baseline condition (A1).
- Collect continuous data during intervention (B) over a minimum of 3 days.
- Withdraw or reverse the intervention and return to the baseline condition (A2) only after acceptable stability in both trend and level has been established in the first intervention condition (B1).
- Reintroduce intervention (B2) procedures after a stable trend has been established in the second baseline (A2).
- Attempt to replicate the experimental effect with similar participants.

❖ ***Advantages of A-B-A-B design***

- The A-B-A-B design provides a most convincing demonstration of causality available to applied researchers.
- This design controls many deficiencies associated with the A-B-A design by ending an intervention condition and providing two opportunities to replicate the positive effects of intervention (B1 to A1; B2 to A2).
- Two demonstrations of experimental effect in this design greatly enhance the internal validity of findings.
- The A-B-A-B design can be extended to a multi-treatment design (A-B-A-B-C-B-C for example).
- This design may be used to evaluate the effectiveness of assistive technology and the use of adaptive equipment.

❖ ***Limitations of A-B-A-B design***

- There is possibility of data-collector bias and an instrumentation effect can lead to changes in the condition of data collection.
- For many practitioners responsible for programming durable behavior changes, even a brief withdrawal of an effective intervention may be deemed unethical. This is particularly true when target behaviors are dangerous to the client or student or other.
- Due to ethical concerns, some applied researchers find it difficult not to continue with an effective intervention during the second baseline condition time period.

- This design is not appropriate for evaluating interventions with behaviors that are not likely to be reversed (solving mathematical problem for example).

2.4 Multiple Baseline Designs

An alternative to the A-B-A-B design is the multiple baseline design. Multiple baseline designs are typically used when it is not possible or ethical to withdraw a treatment and return to the baseline condition. When using a multiple baseline design, researchers do more than collect data on one behavior for one subject in one setting; they collect on several behaviors for one subject, obtaining a baseline for each during the same period of time. Multiple baseline design provides researchers a feasible method of controlling the effects of history. When using a multiple baseline design across behaviors, the researcher systematically applies the treatment at different times for each behavior until all of them are undergoing the treatment. If behavior changes in each case only after the treatment have been applied, the treatment is judged to be the cause of the change. It is important that the behaviors being treated, however, remain independent of each other. For example, if behavior 2 is affected by the introduction of treatment to behavior 1, then the effectiveness of the treatment cannot be determined. An example of multiple baseline design is given below:

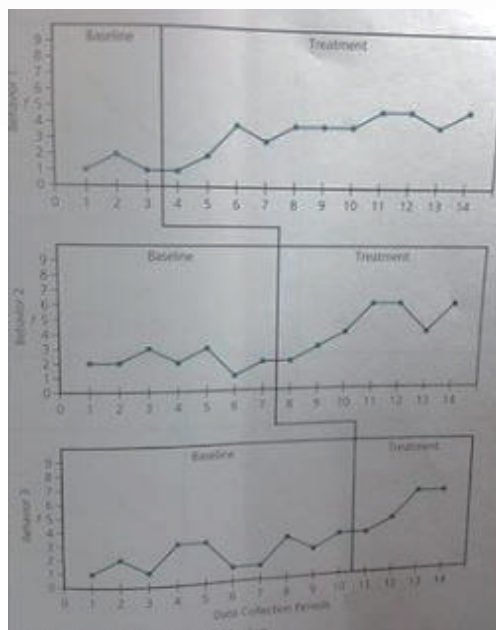
Behavior 1	0	0	0	0	X	0	X	0	X	0	X	0	X	0	X	0	X	0	X	0	X	0	X	0	
Behavior 2	0	0	0	0	0	0	0	0	0	0	X	0	X	0	X	0	X	0	X	0	X	0	X	0	
Behavior 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	X	0	X	0	X	0

In this design, treatment is applied first to change behavior 1, then behavior 2, and then behavior 3 until all three behaviors are undergoing the treatment. For example, a researcher might investigate the effects of 'time-out' (removing a student from class activities for a period of time) on decreasing various undesirable behaviors of a particular student. Suppose the behaviors are: talking out of turn, tearing up worksheets, and making derogatory remarks toward another student. The researcher begins by applying the treatment (time-out) first to behavior 1, then to behavior 2, and then to behavior 3. At that point, the treatment will have been applied to all three behaviors. The more behaviors that are eliminated or reduced, the more effective the treatment can be judged to be. How many times the researcher must apply the treatment is a matter of judgment and depends on the subjects involved, the setting, and the

behaviors the researcher wishes to decrease or eliminate or encourage. Multiple baseline designs also are sometimes used to a single behavior, or to measure a subject's behavior in two or more different settings. The figure given below illustrates the clear concept of multiple baseline design:

As discussed before, withdrawal or reversal designs may be undesirable or even inappropriate when treatment variables cannot be withdrawn or reversed due to ethical considerations, practical limitations, or problems in subject or staff cooperation. The researcher's goal of identifying which treatment components are most effective and of demonstrating the controlling influence of these components by returning undesirable behavior in their absence is often at odds with the desires of the subject. While using multiple baseline designs, the researchers should use following guidelines:

- Identify three or more tiers (behaviors, conditions, or participants) that are functionally independent but functionally similar.
- Prior to the start of the study pinpoint a criterion level for staggering the introduction of the independent variable to the next tier in the design.
- Concurrently and repeatedly monitor all tiers from the start of the study until the independent variable is introduced.
- Introduce the independent variable to one tier when acceptable level stability and trend direction are observed.
- Collect data continuously during the intervention (B) condition.
- Introduce the independent variable to subsequent tiers only when data are stable, as described in step 4, and the predetermined criterion level for staggering the introduction of the independent variable has been met.
- Collect reliability data on the dependent and independent variables in each condition.



Multiple baseline designs are those in which the treatment variable is introduced in temporal sequence to different behaviors, subjects, or settings. The power of such designs comes from

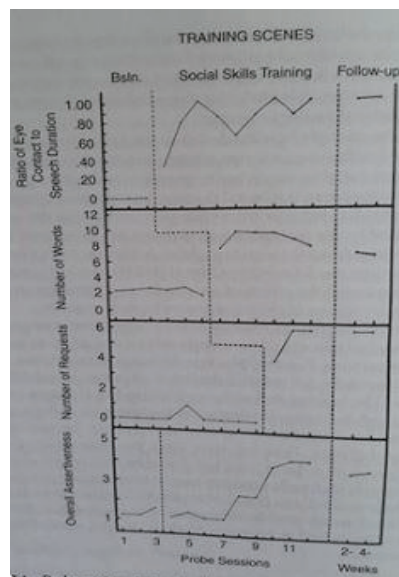
demonstrating that change occurs when the intervention is directed at the behavior, setting, or subject in question. As with reversal designs, multiple-baseline designs begin with a baseline phase that continues until behavioral stability is demonstrated, at which time the treatment variable is introduced. As mentioned above, a change in behavior that occurs only when the intervention is introduced suggests that the intervention caused the change; however, the influence of other factors must be ruled out in order to increase the validity of this claim. There are three principal types of multiple baseline designs that are given below:

- Across several different behaviors of a single individual or group;
- Across several participants (individuals or group of individuals) displaying the same behavior under same stimulus conditions;
- Across several different stimulus conditions (settings, adults, arrangements, formats, etc.) in same behavior of a single individual or group is studied.

2.4.1 Multiple Baseline Design across Behaviors

In this design, same intervention is applied to different but related problems or behaviors. The application of the intervention as it relates to the target problems or behaviors is staggered. There are many academic behaviors that are reasonably certain to be independent of one another, in that they are unlikely to be acquired without direct instruction. Thus, while using multiple baseline design across behaviors, the same treatment variable is applied sequentially to separate target behavior within a single subject. A possible variation of this strategy involves the sequential application of a treatment variable to targeted behaviors for an entire group of subjects.

Let's see an example of multiple baseline design across behaviors. A group of authors used this design to assess the effects of social skills training in the social performance of an unassertive 8-years-old third grader (Tom) whose passivity led to derision by his peers. Generally, if Tom experienced conflict with a peer, he cried or reported the incident to his teacher. Three target



behaviors were selected for modification as a result of role-played performance in baseline: ratio of eye contact to speech duration, number of words spoken, and number of requests made. In addition, independent evaluations of overall assertiveness, based on role-played performance, were obtained. As mentioned in the figure, baseline responding for targeted behaviors was low and stable. Following baseline evaluation, Tom received three weeks of social skills training consisting of three 15-30 minutes sessions per week. These were applied sequentially and cumulatively over the three-week period. Throughout training, six role-played scenes were used to evaluate the effects of treatment. In addition, three scenes on which the subject received no training were used to assess generalization from trained to untrained scenes.

In the figure, examination of the graph indicates that instruction of social skills training for ratio of eye contact to speech duration resulted in marked changes in that behavior, but rates for number of words and number of requests remained constant. When social skills training was applied to number of words itself this behavior increased, while the rate for number of requests remained the same. Finally, when social skills training was directly applied to number of requests, marked changes were noted. Thus, the finding that each behavior changed markedly when the treatment variable targeted each behavior provides evidence for the effectiveness of social skill training. Independence of the three behaviors and the absence of generalization effects from one behavior to the next facilitate interpretation of these data.

It is notable that while overall assertiveness was not treated directly, independent rating evinced gradual improvement over the three-week period, with treatment gains for all behaviors maintained in follow-up. Examination of data for the untreated generalization scenes indicates that similar results were obtained, confirming that transfer of training occurred from treated to untreated items. While using multiple baseline design across behaviors, research should follow following guidelines:

- Target a minimum of three behaviors that are functionally independent, yet similar, for each participant.
- Identify a performance criterion-level for introducing the intervention to the next behavior prior to initiating the study.
- Introduce the intervention when the data path of at least one behavior shows acceptable stability in level and trend while maintaining other behaviors in the pre-intervention condition.

- Introduce the intervention to a new behavior only after criterion-level responding is demonstrated with the preceding behavior.

❖ ***Advantages of multiple baseline design across behaviors***

- This design permits an evaluation and demonstration of intra-subject direct replication to increase internal validity of findings.
- A return to baseline condition is not required to evaluate experimental control.
- This design obviates many of the practical and ethical problems associated with A-B-A-B design.
- This design provides a practical means for evaluating programs designed to teach academic and functional skills that are nonreversible once acquired and social behaviors that are difficult to establish and would be inappropriate to reverse.
- This design provides a paradigm for repeatedly monitoring progress over time.

❖ ***Limitations of multiple baseline design across behaviors***

- All behaviors must be monitored repeatedly and concurrently, which may prove time consuming, distracting, cumbersome, or otherwise impractical.
- A prolonged baseline condition without reinforcement may induce extinction effects in which participants' attempts to respond cease all together.
- An extended pre-intervention condition may raise questions by significant others about the ethics of postponing intervention on behaviors that may require immediate attention.

2.4.2 Multiple Baseline Design across Subjects

When a multiple baseline is used across subjects, each subject receives the same intervention sequentially to address the same target problem. In this design, a particular treatment is applied in sequence across matched subjects presumably exposed to identical environmental conditions. Thus, the same treatment variable is applied to succeeding subjects, the baseline for each subject increases in length. In contrast to the multiple baseline design across behaviors, in the multiple baseline design across subjects a single targeted behavior serves as the primary focus of inquiry. Of course, there is no experimental contraindication to monitoring concurrent (untreated) behaviors as well. This design sequentially introduces the

independent variable across several individuals who exhibit behaviors that are similar and occur under similar environmental conditions.

Multiple baseline design across subjects differs from multiple baseline design across behaviors and across conditions described earlier. In the previously discussed designs the effectiveness of the independent variable is evaluated based on its impact on the same dependent measure (frequency, rate, duration for examples) across several similar, yet independent behaviors emitted by the same participant. With multiple baseline design across subjects, confidence in experimental findings rests solely on inter-subject direct replication. More specifically, independent variable effectiveness is evaluated based on its impact on the same dependent measure, across several functionally similar behaviors, emitted by several different participants. In discussing multiple baseline design across subjects, keep in mind that each tier of the design may be either one individual or a group of individuals, such as a classroom of children or particular therapy group. In such cases three or more groups of individuals are the focus of the study, rather than a series of individuals.

2.4.3 Multiple Baseline Design across Settings

Multiple baseline designs can be applied to test the effect of an intervention as it is applied to one client, dealing with one behavior but sequentially applied as the client moves to different settings. When using a multiple baseline design across settings to evaluate experimental control, researcher sequentially introduces the independent variable to the same behavior across several different stimulus conditions. Stimulus conditions can encompass the dimensions of time, instructional arrangement (individual, small group, independent), activity, setting, control agent (teacher, parent, therapist), or composition of peer group. In contrast to the multiple baseline design across behaviors, this design requires researcher to target a single behavior and a minimum of three different settings in which researcher wants the behavior is monitored continuously or intermittently and concurrently under each of three or more settings until data stability is established. Researcher then introduces the independent variable to the target behavior in on setting, while continuing to measure the same behavior in other conditions using pre-intervention procedures. When the behavior stabilizes at the predetermined criterion level in the first setting, the intervention is then introduced to the same behavior in the second setting. The systematic and sequential introduction of the independent variable across stimulus conditions continues until the criterion level is achieved under all target conditions.

For example, target conditions can range from monitoring percentage of time on-task across math, spelling, and social studies periods (across activities) to the frequency of disruptive behaviors across a classroom, lunchroom, and playground (across settings), to the number of minutes tardy across morning, lunch, and afternoon recesses (across time).

Multiple baseline design across settings requires adherence to specific constraints that may be problematic under some circumstances. First, a minimum of three environmental settings must be identified, each occasioning the same target behavior, yet each independent enough to permit the replication. Second, if the multiple baselines design across conditions, in which settings are individuals (teacher, paraprofessional, and speech pathologist for examples) and school settings (classroom, individual work station, therapy room), it may be difficult for individuals not to use an effective intervention in their setting until you direct them to do so. Third, the target behavior must be monitored repeatedly and concurrently in each condition, a task that may prove time-consuming, distracting, or otherwise burdensome to researcher as he/she tries to deliver services and collect data for his/her research project. Fourth, prolonged pre-intervention measures under conditions in which the intervention has not yet been introduced may raise questions about the ethics of postponing interventions in settings where the behavior requires immediate attention.

Let Us Sum Up

In chapter two, we discussed concept of research design with its elements. In addition, we also discussed withdrawal and multiple baseline designs. Within withdrawal designs, we studied baseline logic, A-B design, A-B-A design, and A-B-A-B design with their advantages and disadvantages. But within multiple baseline designs, we interacted about multiple baseline design across behaviors, across subjects, and across settings. This chapter primarily intends to provide superficial knowledge on different research designs used in single subject research carried out in the field of special needs education.

Unit-end Activities

- **Objective Questions**

Tick (✓) the best answer.

"Group-A"

1. Which of the following components is NOT included within research design?
 - a. Research problem
 - b. **Publication**
 - c. Data analysis and interpretation
 - d. Report writing

2. Which of the following designs is also known as 'simple time series design'?
 - a. **A-B design**
 - b. A-B-A design
 - c. A-B-A-B design
 - d. A-B-A-C design
3. The A-B-A design builds on the A-B design by integrating
 - a. findings of research
 - b. conclusion of research
 - c. **a post treatment follow-up**
 - d. generalization
4. Which of the followings is NOT related to disadvantages of A-B-A-B design?
 - a. **This design is free from the personal bias of data collector.**
 - b. Two demonstrations of experimental effect in this design greatly enhance the internal validity.
 - c. The A-B-A-B design can be extended to a multi-treatment design.
 - d. This design may be used to evaluate the effectiveness of assistive technology.
5. Which of the followings is NOT related to multiple baseline designs?
 - a. Multiple baseline design across behaviors
 - b. **Multiple baseline design across findings**
 - c. Multiple baseline design across subjects
 - d. Multiple baseline design across settings

- **Short answer questions** **"Group-B"**

1. What do you mean by research design?
2. What are the major elements of research design? Explain in brief.
3. Why does a researcher need baseline data to carry out research successfully? Discuss in brief.
4. Introduce A-B design and state its advantages in short.
5. List out the advantages and limitations of A-B-A design.

- **Long answer questions** **"Group-C"**

1. Introduce A-B-A-B design with its merits and demerits.

2. What do you mean by multiple baseline designs? Explain major types of multiple baseline designs in brief.
3. Describe multiple baseline design across behaviors. State its advantages and disadvantages in short.

Points for Discussion

- Introduce research design with its elements.
- Explain the importance of baseline data to carry out particular research.
- Clarify A-B design with its advantages and disadvantages.
- Introduce different withdrawal designs in brief.
- Elaborate different types of multiple baseline designs.
- State advantages and disadvantages of multiple baseline design across behaviors.

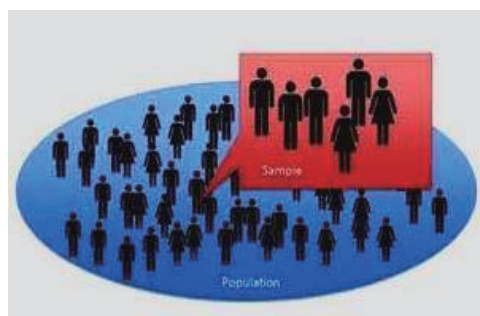
Unit 3: Population and Sampling in Behavioral Research

3.1 Population, Sample, and Sampling

Before getting entry into the discussion of sampling methods, we should be clear on population, sample, and sampling process generally used in quantitative research. Brief discussion of these terms is given below simultaneously:

❖ *Population*

A research population is generally a large collection of individuals or objects to which research is conducted and all of the findings found from the research are generalized into that population. Thus, research is conducted for the benefit of the population. However, due to the large sizes of populations, researchers often cannot test every individual in the population because it is too expensive and time-consuming. This is the reason why researchers rely on sampling techniques. The small group that is observed is called a sample, and the larger group about which the generalization is made is called a population. A population is defined as all members of any well-defined class of people, events, or objects.



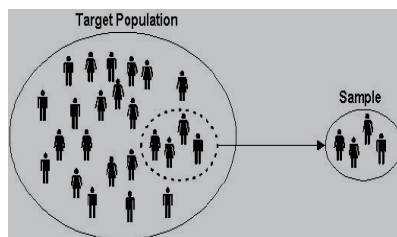
From research point of view, a population is a group of living or non-living things who/which have same characteristics. In other words, a population is a group of individual units with some commonality. For example, a researcher may want to study the problems faced by special teachers in Nepal. In this situation, all the special teachers working in different schools in Nepal are taken as the population of the study.

❖ *Sample*

A sample is a subgroup of the population that a researcher plans to study for generalizing the result about the target population. Generally speaking, the representative proportion of the

population is called sample. In an ideal situation, researcher selects a sample of individual, place, objects, etc. who/which are representative of the entire population. If all workers working in different Korean companies are taken as population then it is almost impossible to collect information from all workers. Therefore, the researcher can select a representative group of individuals from which data essential for the research is collected. Thus, the whole process that a researcher follows from defining the population to sample selection is taken as sampling. Thus, sampling is the process by which a relatively small number of individuals, objects or events is selected and analyzed in order to find out something about the entire population.

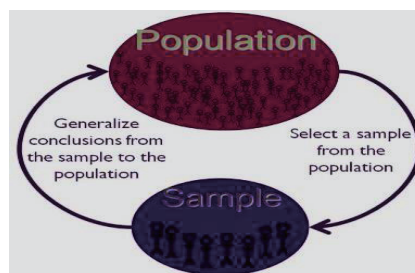
Generally, a sample is simply a subset of the population. The concept of sample arises from the inability of the researchers to test all the individuals in a given population. The sample must be representative of the population from which it was drawn and it must have good size for reliable statistical analysis. The main function of the sample is to allow the researchers to conduct the study to individuals from the population so that the results of their study can be used to derive conclusions that will apply to the entire population. It is much like a give-and-take process. The population “gives” the sample, and then it “takes” conclusions from the results obtained from the sample. Most of the cases, following steps are used in sampling process:



- Defining the population
- Listing the population
- Selecting the representing sample
- Obtaining an adequate sample

❖ *Sampling*

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. Researcher should select representative sample from the study population by using appropriate sampling procedure. Researcher can use different sampling methods to select representative sample from the total population. The purpose of drawing a sample from a



population is to obtain information concerning that population, it is extremely important that the individuals included in a sample constitute a representative across the section of individuals in the population. Samples must be representative if researchers are to be able to generalize with reasonable confidence from the sample to the population. These sampling methods are classified into probabilistic and non-probabilistic sampling methods.

Thus, the whole process that a researcher follows from defining the population to sample selection is taken as sampling. Thus, sampling is the process by which a relatively small number of individuals, objects or events is selected and analyzed in order to find out something about the entire population. Most of the cases, following steps are used in sampling process:

- Defining the population
- Listing the population
- Selecting the representing sample
- Obtaining an adequate sample

3.2 Sampling Methods

Sampling methods are classified as either probability or nonprobability. In probability samples, each member of the population has equal chance of being selected. In nonprobability sampling, members are selected from the population in some nonrandom manner. The advantage of probability sampling is that sampling error can be calculated. Sampling error is the degree to which a sample might differ from the population. In nonprobability sampling, the degree to which the sample differs from the population remains unknown.

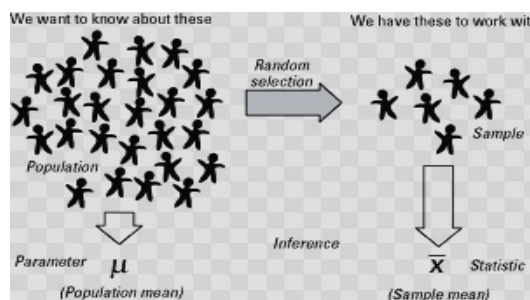
The first step in sampling is the identification of the target population, the large group to which the researcher wishes to generalize the results of the study. But researchers have only access to accessible population. Hence, accessible population refers to a population of subjects accessible to the researcher for drawing a sample. In most research, researchers deal with accessible populations. It would be expensive and time-consuming to sample from the total population of teachers teaching in special and integrated schools, but researchers could draw a sample of teachers from particular region and generalize results to total teachers teaching in these schools. After identifying the population, researchers select sample into the next step. Both probabilistic and non-probabilistic sampling methods are discussed below respectively:

3.2.1 Probabilistic Sampling Methods

In quantitative research, probability sampling involves sample selection in which the elements are drawn by chance procedures. In other words, probability sampling is defined as the kind of sampling in which every element in the population has an equal chance of being selected. The main characteristic of probability sampling is that every member or element of the population has a known probability of being chosen in the sample. Probabilistic sampling methods are especially used to minimize the effect of bias in the results of research work by using some forms of random selection. Random selection means that each person has an equal chance for being selected as a member of sample from the whole population under the study. The four types of probability sampling most frequently used in educational research are simple random sampling, stratified sampling, cluster sampling, and systematic sampling. Each of these is discussed below briefly.

❖ *Simple random sampling*

The most popular and rigorous form of probabilistic sampling method used to select representative sample from a population is known as simple random sampling method. In simple random sampling, the researcher selects each unit for the sample randomly, so that any unit of the population has equal chance of being selected from the target population. When the nature of population is homogeneous and each unit of target population has equal value for the research



then this sampling method is used. To select a representative sample by using this method, researcher should be familiar about each unit of study population and then s/he should prepare a list of all units existing within the total population under study. After preparing the list, researcher should decide about a method (out of lottery, random table, and computer software) to select the representative sample for the research. Thus, the basic characteristic of simple random sampling is that all members of the population have an equal and independent chance of being included in the random sample. The steps in simple random sampling comprise the following:

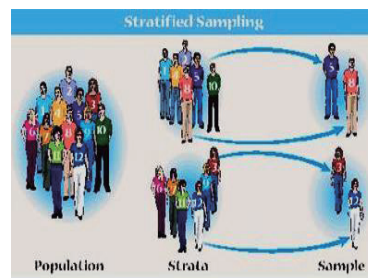
- Define the population.

- List all members of the population.
- Select the sample by employing a procedure where chance merely determines which members on the list are drawn for the sample.

The generally understood meaning of the word random is “without purpose or by accident.” However, random sampling is purposeful and systematic. It is apparent that a sample selected randomly is not subject to the biases of the researcher. Rather, researchers commit themselves to selecting a sample in such a way that their biases are not permitted to operate; chance alone determines which elements in the population will be in the sample. Unfortunately, simple random sampling requires enumeration of all individuals in a finite population before the sample can be drawn. This prerequisite makes it difficult using in social science research.

❖ *Stratified sampling*

Sometimes researcher cannot select representative sample from simple random sampling method particularly when the population of the study is heterogeneous. At that time, s/he can apply this sampling method by which representative sample is selected from different strata. In stratified sampling, researcher divides the whole population into different strata on the basis of certain characteristic then representative units are chosen from each strata by using simple random sampling method. Such activities guarantee that the sample will possess specific characteristics that the researcher wants to include in the sample of the study. The picture given in this title depicts a good example of stratified sampling method in which accessible population is divided into two strata on the basis of gender then a number of units are selected from each stratum to make the sample more representative. A sample which is chosen by using simple random sampling method from this population would likely result in the selection of more males than females or vice versa which may not be representative form gender perspective. To correct this type of error, the researcher must use stratified sampling method as an alternative.

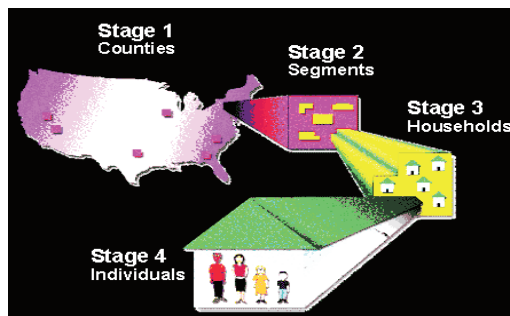


Thus, when the population consists of a number of subgroups, or strata that may differ in the characteristics being studied it is often desirable to use a form of probability sampling called stratified sampling. The basis for stratification may be geography, income, occupation, gender, age, year in college, or teaching level. An advantage of stratified sampling is that it enables the

researcher to study the differences that might exist between various subgroups of a population. In this kind of sampling, researcher may either take equal numbers from each stratum or select in proportion to the size of the stratum in the population. When the population to be sampled is not homogeneous but consists of several subgroups, stratified sampling may give a more representative sample than simple random sampling. In simple random sampling, certain strata may by chance be over- or underrepresented in the sample. The major advantage of stratified sampling is that it guarantees representation of defined groups in the population.

❖ *Cluster sampling method*

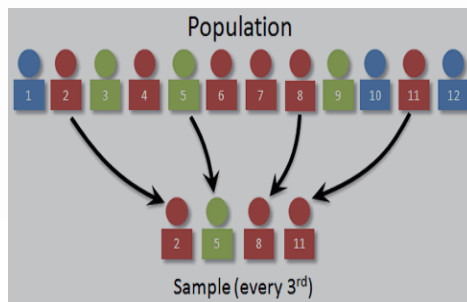
When the researcher is unable to employ other probability sampling methods due to the ambiguity of population, huge size of population or when the population is extremely scattered then s/he uses this sampling method. In simple random and stratified sampling methods, researcher must have a list or access to each unit of the whole population. But it is not possible to be familiar with each unit especially in large and extremely scattered population. At that time, s/he can use this method easily and economically. Generally, clusters are often geographic units (districts, villages, etc. for examples) or organizational units (clinics, training groups, etc. for examples). Suppose a researcher is going to conduct a study on knowledge, attitudes and practices related to family planning in rural communities. In this condition, a list of all the villages is made. Using this list, a sample of villages is chosen by using simple random sampling method and a defined number of adults in the selected villages are interviewed to glean required data.



❖ *Systematic sampling method*

Systematic sampling method can be used if all the names of the defined population are on a list which is not in systematic order. In this sampling, individuals or households are chosen at regular intervals by using a sampling frame. While selecting the sample, researcher at first randomly select a number to determine the starting point for selecting individuals from the list. This sampling method is not as precise and rigorous as simple random and stratified random sampling method but systematic sampling is usually less time-consuming and easier to perform

than simple random sampling. However, there is a risk of bias, as the sampling interval may coincide with a systematic variation in the sampling frame. For example, as given in picture, a sample is to be selected from 12 students at a school. If the intended sample size is 4, then the sampling interval is $12/4=3$. The number of the first student to be included in the sample is chosen randomly, for example, by blindly picking one out of 3 pieces of paper, numbered 1 to 3. If number 2 is picked, then sampling process will be started from second unit, until 4 units are selected. In this case, the numbers selected would be 2, 5, 8, and 11.



3.2.2 Non-probabilistic Sampling Methods

Nonprobability sampling includes methods of selection in which elements are not chosen by chance procedures. Its success depends on the knowledge expertise, and judgment of the researcher. Nonprobability sampling is used when the application of probability sampling is not feasible. Its advantages are convenience and economy. In many situations, the enumeration of the population elements (a basic requirement in probability sampling) is difficult. A school principal might not permit a researcher to draw a random sample of students with disabilities for a study but would permit use of certain disabled students. In such condition, the researcher would use nonprobability sampling, which involves nonrandom procedures for selecting the members of the sample. In nonprobability sampling, there is no assurance that every element in the population has a chance of being selected as the member of sample. Main advantages of non-probabilistic sampling methods are convenience and economy. The major forms of nonprobability sampling are purposive sampling, snowball sampling, convenience sampling, and quota sampling. Each of them is explained below respectively.

❖ *Purposive sampling*

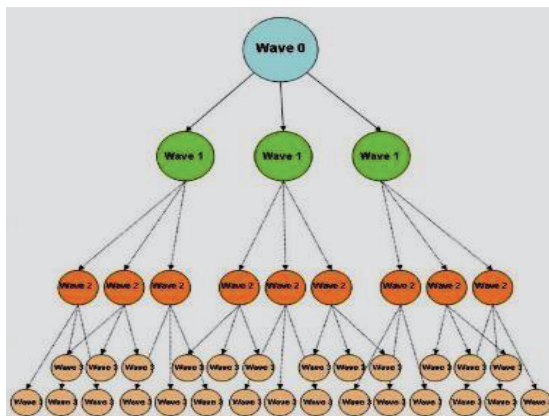
Purposive sampling is a process of selecting a group of participants according to predetermined criteria relevant to a particular research question (children with autism spectrum disorder, dyslexic children for examples). Sample sizes of the study may or may not be fixed prior to data collection in purposive sampling. Size of the study sample depends on the resources and

time available as well as the objectives of the research. Purposive sample sizes are often determined on the basis of theoretical saturation. Hence, saturation refers to a point in data collection when new data no longer bring additional insights to the research questions or objectives.

In purposive sampling is also known as judgmental sampling because sample from particular population is determined on the basis of researcher's judgment rather by chance. The assumption is that errors of judgment in the selection will counterbalance one another. The critical question in purposive sampling is the extent to which judgment can be relied on to arrive at a typical sample. There is no reason to assume that the units judged to be typical of the population will continue to be typical over a period of time. Consequently, the results of a study using purposive sampling may be misleading. Because of its low cost and convenience, purposive sampling has been useful in attitude and opinion surveys, which can also be carried out in the field of special needs education.

❖ *Snowball sampling*

Snowball sampling method is especially used to select sample from hidden population. Sometimes respondents do not like to make them public because of their profession, women involved in prostitution, patients infected by HIV AIDS for examples. While using this sampling method, researcher, at first, identify an individual or a small number of individuals who have the characteristics in which researcher is interested. These people are then used as informants to identify others informants who qualify for the research as given in the figure. Researchers who want to conduct their study in the field of special needs



education can also use this sampling method in some instances. This method is useful for sampling a population where access is difficult, maybe because it is a sensitive topic (drug abusers, people involved in human trafficking for examples). Snowball sampling is also known as chain referral sampling. Thus, snowball sampling is often used to find and recruit an unknown population that is not easily accessible to researchers through other sampling strategies.

❖ **Convenience sampling**

Convenience sampling is also known as accidental or opportunity sampling. In this sampling method, researchers generally select those individuals who are easily accessible to him/her. In other words, researcher simply chooses the sample from those to whom they have easy access. The research findings derived from the sample cannot be generalizable into another population except the group being studied. A convenience sample may be the sampling strategy selected for a case study or a series of case studies.

Convenience sampling is regarded as the weakest method of selecting sample as compared to all sampling procedures. Interviewing the first special teachers to whom researcher meets at schools, selecting parents of disabled children to whom researcher meets at first, taking volunteers to be interviewed in survey research, etc. are various examples of convenience sampling. There is no way of estimating the error introduced by the convenience sampling procedures. If any researcher uses convenience sampling, then he/she should be extremely cautious in interpreting the findings and know that he/she cannot generalize the findings into a larger population.

❖ **Quota sampling**

Quota sampling involves selecting typical cases from diverse strata of a population. The quotas are based on known characteristics of the population to which researchers wish to generalize. Sample is selected from different strata of the population, so that the resulting sample is a miniature approximation of the population with respect to the selected characteristics. But each member of the sample is selected as per the researcher's interest. Therefore, they do not have an equal chance of being selected. Generally, researchers follow the following steps while selecting a sample from the population:

- 1) **Determine a number of variables:** Numbers of variables used to determine strata are strongly related to the question under investigation. Variables such as gender, age, education, and social class are frequently used.
- 2) **Using census or other available data:** Researchers can use any available data to determine the size of each segment of the population.
- 3) **Compute quota for sample selection:** In the third step, researchers compute quotas for each segment of the population that are proportional to the size of each segment.

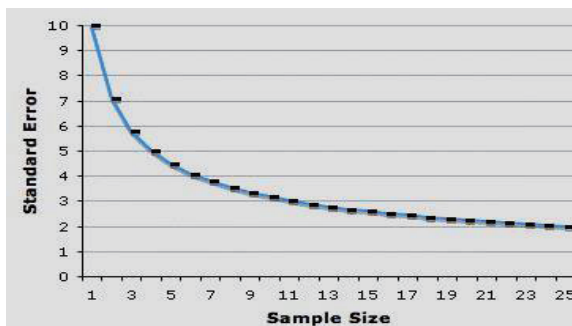
4) **Selection of sample:** At the final stage researchers select typical cases from each segment, or stratum, of the population to fill the quotas.

The major weakness of quota sampling is that researcher does not know whether the individuals chosen are representative of the given stratum. The selection of elements is likely to be based on accessibility and convenience of the researcher. In addition, there is no basis for calculating the error involved in quota sampling. Despite these shortcomings, researchers use quota sampling in many projects that might otherwise not have been possible.

3.3 Sample Size

The sample size of a survey most typically refers to the number of units that are chosen from which data is going to be gathered. However, sample size can be defined in various ways. There is the designated sample size, which is the number of sample units selected for contact or data collection. There is also the final sample size, which is the number of completed interviews or units for which data are actually collected. The final sample size may be much smaller than the designated sample size if there is considerable nonresponse.

There is no consensus among specialists about the size of sample while conducting particular research. Size of the sample is primarily determined by research type, nature of population, and so forth. Generally sample size does not matter in qualitative research but it is highly prioritized in quantitative research. Likewise, small sample size chosen from homogeneous population may represent the total population but heterogeneous population demands large sample size for representation. Other things being equal, a larger sample is more likely to be a good representative of the population than a smaller sample. Researcher can minimize his/her sampling error by selecting large sample size as given in the picture. However, the most important characteristic of a sample is its representativeness, not its size. Size alone will not guarantee accuracy. A sample may be large and still contain a bias. Therefore, the researcher must recognize that sample size will not compensate for any bias that faulty sampling techniques may introduce. Representativeness must remain the prime goal in sample selection.



There are no clear-cut criteria to select representative sample because correct sample size depends on the purpose of the study and the nature of the population under scrutiny. However, it is possible to give some advice on this matter. Generally speaking, the larger the sample the better, as this not only gives greater reliability but also enables more sophisticated statistics to be used. Thus, a sample size of thirty is held by many to be the minimum number of cases if researchers plan to use some form of statistical analysis on their data, though this is a very small number and researcher should select considerably more. The number of variables researchers set out to control in their analysis and the types of statistical tests that they wish to make must inform their decisions about sample size prior to the actual research undertaking.

3.4 Ethical Guidelines in Special Needs Education Research

As other forms of research, single-subject designs also require the informed consent of the participant. The structure of single-subject designs for research involves particularly unique conditions that must be discussed with potential participants. In the case of single subject research designs, the need for repeated baseline measurements and the possibility of premature withdrawal of treatment are particularly unique characteristics. Participants must understand that the onset of the intervention is likely to be delayed until either a baseline pattern emerges or some assigned time period elapses. Until this condition is met, a needed intervention may be withheld. Furthermore, the length of the baseline also depends on the type of design. In a multiple baseline design, the delay in the intervention may be substantial. The implications of this delay must be discussed as part of obtaining informed consent. Social workers engaged in evaluation or research should obtain voluntary and written informed consent from participants, when appropriate, without any deprivation or penalty for refusal to participate; without undue inducement to participate; and with due regard for participants' well-being, privacy, and dignity. Informed consent should include information about the nature, extent, and duration of the participation requested and disclosure of the risks and benefits of participation in research.

Protecting the welfare of research participants is an absolute priority for all social science researchers including the researchers working in the field of special needs education. Informants participated in the research should not be compelled and they should make informed choices on the basis of the risks and benefits associated with the research process. Key ethical issues related to the treatment of human subjects include protecting participants from harm, informed consent, privacy and confidentiality, deception and debriefing, and considerations related to applying and withholding treatment. These ethical guidelines have been discussed below respectively:

❖ ***Protecting participants from harm***

Research participants should have the freedom to choose whether and to what extent they will be involved in a study after being aware about the possible risks of the research. It is important for researchers to understand that harm can take many forms in special education research and that it cannot always be easily foreseen. Harm includes such obviously negative consequences as physical injury and death, but it may be more likely to take the form of embarrassment, irritation, anger, physical and emotional stress, loss of self-esteem, delay of treatment, sleep deprivation, loss of respect from others, negative labeling, invasion of privacy, damage to personal dignity, and loss of employment. Harm can also emerge as either a direct consequence or an indirect result of participation in a research study. Direct harm is often seen in medical research in the form of unintended side effects of medication or treatments. Indirect harmful consequences can also be resulted in the life of the participant.

❖ ***Informed Consent***

One of the most important issues that researchers need to consider is informed consent. Informed consent is typically achieved by providing potential participants with a description of the purposes of the investigation, a statement of potential risks and benefits, an option not to participate without consequence, and the opportunity to withdraw from the study at any time and for any reason. Consent can be ensured by asking participants (or parents of small children) to sign a form indicating that they understand their rights as human subjects and that they have agreed to participate voluntarily and without coercion. It is important to note that obtaining informed consent from participants is not necessary in all research investigations involving human subjects.

❖ ***Privacy and confidentiality***

Research participants have the right to privacy with respect to information that they provide in the study. Researchers must keep personally identifying information about particular participants in strict confidence unless participants expressly waive their rights to confidentiality. There are several ways of safeguarding participant's right to privacy as given below:

- Collecting and coding data anonymously without ever knowing the participant's name.
- Using numerical or alphabetical coding system to link data to participants' names.
- Retaining a third party who links names to data and provides the researcher with anonymous results.
- Using code number in linking personally identifying information.

- Reporting only summary or aggregate results for the entire sample or particular groups, rather than reporting information garnered from individual participants' responses.

❖ ***Deception and debriefing***

Researcher should avoid deception while conducting research in any field including the field of special needs education. Deception can include withholding specific details of a study, not informing members of a control or comparison group what intervention or stimulus other participants will be exposed to, collecting data under some auspice other than a research study, and out-and-out lying to participants. How much deception is too much from an ethical standpoint is always a matter of situational judgment. Sometimes, deception is necessary to get reliable information in the research process. Deception is allowed in the following conditions:

- The potential significance of the results is greater than the projected effects of lying.
- Deception is the only way to carry out the study.
- Appropriate debriefing, in which the researcher informs the participants of the nature of and reasons for deception after completing the study.

❖ ***Applying and withholding treatment***

Researchers are often faced with the difficult decision of choosing who will participate in an intervention and who will be excluded. In addition, the ethics of applying and/or withholding treatment are almost always complicated, and they interact with some of the foundational principles of scientific inquiry. On one hand, it would seem that any researcher would want as many people as possible to benefit from a successful intervention. On the other hand, constraints of time and money often necessitate limiting an intervention or stimulus to a specified number of participants.

Let Us Sum Up

At the beginning of this unit, we discussed concept of population, sample, and sampling in special needs education. And then we studied probabilistic and non-probabilistic sampling methods. Within probabilistic sampling method, we read simple random sampling method and stratified sampling methods. Similarly, we also discussed purposive and snowball sampling methods within non-probabilistic sampling methods. At the end of this unit, we also studied sample size and ethical guidelines need to be considered in quantitative and qualitative research. Thus, this unit intends to provide basic knowledge on different methods of selecting sample while conducting research in the field of special needs education.

Unit-end Activities

- **Objective Questions**

Tick (✓) the best answer.

“Group-A”

1. Which of the sampling methods is highly used to select sample from hidden population?
 - a. Simple random sampling
 - b. **Snowball sampling**
 - c. Stratified sampling
 - d. Purposive sampling
2. A sample which is too small can affect the
 - a. **generalizability of the study**
 - b. data gathering process
 - c. methodology of the study
 - d. findings of the study
3. Large sample size is required where the population is
 - a. educated
 - b. homogeneous
 - c. **heterogeneous**
 - d. uneducated
4. Which of the followings sampling methods should be used while selecting sample from heterogeneous population?
 - a. **Stratified sampling method**
 - b. Simple random sampling method
 - c. Purposive sampling method
 - d. Snowball sampling method
5. Each unit of the population has equal chance of being selected especially in
 - a. stratified sampling method
 - b. **simple random sampling method**
 - c. purposive sampling method
 - d. snowball sampling method

- **Short answer questions**

“Group-B”

1. What do you mean by population, sample, and sampling in research?
2. Each unit of the population has equal chance of being selected as sample in simple random sampling method. How? Justify this statement.

3. State different types of non-probabilistic sampling methods and introduce purpose sampling method.
4. Explain snowball sampling method with example.
5. Compare probabilistic and non-probabilistic sample methods with examples.

- **Long answer questions**

- **“Group-C”**

1. Stratified sampling method should be used to select sample from heterogeneous sampling method. Why? Justify with example.
2. Explain sample size in quantitative and qualitative research.
3. What are the differences between stratified sampling method and purposive sampling method? State with examples.
4. What ethical guidelines need to be considered while conducting research in the field of special needs education? Discuss.

Points for Discussion

- Introduce population, sample, and sampling in research.
- Describe simple random sampling and stratified sampling methods in brief.
- Explain different non-probabilistic sampling methods.
- Clarify sample size in quantitative and qualitative research.

Unit 4: Data Collection, Analysis, and Interpretation

4.1 Concept of Research Tools

Data collection is the systematic approach to gathering information from a variety of sources to get a complete and accurate picture of problem of being researched. Data collection enables a researcher or a group of researchers to answer relevant questions, evaluate outcomes, and make predictions about future probabilities and trends of particular phenomenon. Different tools such as questionnaire, interviews schedule, observation, focus group discussion, opinionnaire, etc. are used as primary instruments for collecting information especially from various sources. Therefore, all of the tools that are generally applied to gather information from different sources with an intention of attaining research objectives are known as research tools.

Research tools or data collection tools helps researcher gather and measure information on targeted variables in an established systematic fashion, which enables researcher to answer relevant questions aroused in the research process. Data collection is a component of research in all fields of study including special needs education. The main goal of all data collection tools is to capture quality evidence that allows analysis to lead to the formulation of convincing and credible answers to the questions posed in the beginning of research project. In this unit, we are going to discuss about different data collection tools and quantitative as well as qualitative data analysis techniques generally applied in the field of social science including special needs education.

4.1.1 Questionnaire

Questionnaire is a quite popular method of data collection especially in quantitative research. This method is particularly used to gather factual information from a large number of respondents within short period of time. Therefore, this tool is being adopted by private individuals, research workers, private and public organizations and even by governments while conducting research within their own field. While using this method, a questionnaire is sent (frequently by post and mail) to the persons concerned with a request to answer the questions

and return the questionnaire. A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms. The questionnaire is mailed to respondents who are expected to read and understand the questions and write down the reply in the space meant for the purpose in the questionnaire itself. The respondents have to answer the questions on their own. The method of collecting data by mailing the questionnaires to respondents is most extensively employed in various economic and business surveys.

Researcher should conduct 'pilot study' for ensuring whether the questionnaire is reliable or not. Pilot study is a rehearsal of the main survey, which is especially conducted to improve the errors persisting in questionnaire. Questionnaire can either be structured or unstructured. Structured questionnaires are those questionnaires in which there are definite, concrete and pre-determined questions. The questions are presented with exactly the same wording and in the same order to all respondents. The form of the question may be either closed (yes or no for example) or open (questions that offer free response for example) but should be stated in advance. Structured questionnaires may also have fixed alternative questions in which responses of the informants are limited to the stated alternatives. Thus a highly structured questionnaire is one in which all questions and answers are specified. When these characteristics are not present in a questionnaire, it can be termed as unstructured or non-structured questionnaire. Structured questionnaires are simple to administer and relatively inexpensive to analyze. The provision of alternative replies helps understand the meaning of the question clearly. Questionnaire is highly used in these because of following advantages:

- Questionnaire is more economical to collect data from large and widely spread population.
- It is free from the bias of the interviewer because answer is written by respondents themselves.
- Respondents have adequate time to give answers.
- Respondents, who are not easily accessible, can also be approached conveniently.
- Information can be collected from large samples within short period of time by using this questionnaire. Therefore, the data collated from questionnaire are more dependable and reliable.

Even having different advantages, questionnaire is not free from different limitations. Questionnaire is structured instruments for collecting information from respondents, which does

not allow sufficient flexibility to the respondent with respect to response format. Along with this, questionnaire has several demerits as given below:

- One major disadvantage of written questionnaires is the possibility of low response rates. Response rates vary widely from one questionnaire to another (10% - 90%). However, well-designed studies consistently produce high response rates.
- Another disadvantage of questionnaires is the inability to probe responses. Questionnaires are structured instruments. They allow little flexibility to the respondent with respect to response format.
- Nearly ninety percent of all communication is visual. Gestures and other visual cues are not available with written questionnaires. The lack of personal contact will have different effects depending on the type of information being requested.
- Questionnaire is not suited to illiterate people. Certain types of basic skills are needed to respond on the questionnaire.
- The control over questionnaire may be lost once it is sent.
- There is also the possibility of ambiguous replies or omission of replies altogether to certain questions; interpretation of omissions is difficult.
- It is difficult to know whether willing respondents are truly representative.

In order to make the questionnaire effective and to ensure quality to the replies received, a researcher should pay attention to the question-sequence while preparing the questionnaire. A proper sequence of questions reduces considerably the chances of individual questions being misunderstood. The question-sequence must be clear and smoothly-moving, meaning thereby that the relation of one question to another should be readily apparent to the respondent, with questions that are easiest to answer being put in the beginning. The first few questions are particularly important because they are likely to influence the attitude of the respondent and in seeking his/her desired cooperation. The opening questions should be such as to arouse human interest. The following type of questions should generally be avoided as opening questions in a questionnaire:

- Questions that put too great strain on the memory of the respondent
- Questions that offer information of personal character
- Questions related to personal wealth, etc.

Researcher should have questions that are really vital to the research problem. Ideally, the question sequence should conform to the respondent's way of thinking. Knowing what information is desired, the researcher can rearrange the order of the questions to fit the discussion in each particular case. Relatively difficult questions must be relegated at the end so that even if the respondent decides not to answer such questions, considerable information would have already been obtained. Thus, question-sequence should usually go from the general to the more specific.

Question should be impartial in order not to give a biased picture of the true state of affairs. Questions should be constructed with a view to their forming a logical part of a well thought out tabulation plan. In general, all questions should be easy to understand, simple, and concrete. Concerning the form of questions, we can talk about two principal forms such as multiple choice questions and the open-end question. In the former the respondent selects one of the possible alternative answers, whereas in the latter respondent has to supply the answer in his/her own words. Multiple choice or closed questions have the advantages of easy handling, simple to answer, quick and relatively inexpensive to analyze.

But they are not appropriate when the issue under consideration happens to be a complex one and also when the interest of the researcher is in the exploration of a process. In such situations, open-ended questions which are designed to permit a free response from the respondent rather than one limited to certain stated alternatives are considered appropriate. Such questions give the respondent considerable freedom to reply. But one should not forget that open-ended questions are more difficult to handle, raising problems of interpretation, comparability and interviewer bias.

Researcher must pay proper attention to the wordings of questions since reliable and meaningful returns depend on it to a large extent. Since words are likely to affect responses, they should be properly chosen. Simple words, which are familiar to all respondents, should be used while preparing questionnaire. Words with ambiguous meanings must be avoided. Similarly, danger words, catch-words or words with emotional connotations should be avoided. Caution must also be exercised in the use of phrases which reflect upon the prestige of the respondent.

Questionnaire should be comparatively short and simple for its effective use. Questions should proceed in logical sequence moving from easy to more difficult questions. Personal questions should not be included in the questionnaire. Technical terms and vague expressions

capable of different interpretations should be avoided in a questionnaire. Questions may be dichotomous (yes or no answers), multiple choice (alternative answers listed) or open-ended. The latter types of questions are often difficult to analyze and hence should be avoided in a questionnaire to the extent possible. There should be some control questions in the questionnaire which indicate the reliability of the respondent.

4.1.2 Interview Schedule

Interview is a conversation between two people that has a structure and a purpose. It is designed to elicit the interviewee's knowledge or perspective on a topic of being research. Individual interview is useful for exploring an individual's beliefs, values, understandings, feelings, experiences and perspectives of an issue. Individual interviews also allow the researcher to ask into a complex issue, learning more about the contextual factors that govern individual experiences.

The interview is one of the most widely used methods for obtaining qualitative data. Interviews are used to gather opinions, beliefs, and feelings of people about situations in their own words. Interviews may provide information that cannot be obtained through questionnaire and other tools of data collection. The qualitative interview is typically more probing and open ended and less structured than the interview used in quantitative research. The structure of the interview follows the extent to which the questions to be asked are developed prior to the interview. At one extreme is the unstructured interview, which is a conversational type of interview in which the questions arise from the situation.

Although the questions are structured, qualitative structured interviews differ from quantitative structured interviews. In the qualitative approach, the list of questions is generally more limited in length and most questions cannot be answered with yes or no or limited word responses. In between the unstructured and structured interview is the semi- or partially structured interview, in which the area of interest is chosen and questions are formulated but the interviewer may modify the format or questions during the interview process. One characteristic that all qualitative interview formats share is that the questions are typically open ended and the questions are designed to reveal what is important to understand about the phenomenon under study.

In a personal interview, the interviewer reads the questions to the respondent in a face-to-face setting and records the answers. One of the most important aspects of the interview is its flexibility. The interviewer has the opportunity to observe the subject and the total situation in which he/she is responding. Questions can be repeated or their meanings explained in case they are not understood by the respondents. The interviewer can also press for additional information when a response seems incomplete or not entirely relevant. A greater response rate is another obvious advantage of the personal interview. With interviews, response rates are very high perhaps 90 percent or better. Personal contact increases the likelihood that the individual will participate and will provide the desired information. With mailed questionnaires, the personal contact is missing, and people are more likely to refuse to cooperate. The low response rate typical for a mailed questionnaire (less than 30 percent is common) not only reduces the sample size but also may bias the results. For individuals who cannot read and understand a written questionnaire, interviews provide the only possible information-gathering technique.

The main disadvantage of the personal interview is that it is more expensive than other data collection techniques. The selection and training of the interviewers, their salary, and their travel to the interview site make this procedure costly. It takes a great deal of time to contact potential respondents, set up appointments, and actually conduct the interview. Another disadvantage is the possibility of interviewer bias, which occurs when the interviewer's own feelings and attitudes or the interviewer's gender, race, age, and other characteristics influence the way questions are asked or interpreted. Gender bias is another problem of interview method. Women talking to women interviewers may express different opinions than they would if the interviewer were male. Researchers should consider the interaction between the subject matter of and the demographic characteristics of the interviewers and respondents. If race, ethnicity, or some other characteristic is very relevant to the answers to be given, then the researcher should consider controlling the relationship of interviewer and respondent characteristics. Another problem is social desirability bias, in which respondents want to please the interviewer by giving socially acceptable responses that they would not necessarily give on an anonymous questionnaire. They may say what they think the interviewer wants to hear.

Whether the interview is conducted directly or by telephone, the interviewer's main job is to ask the questions in such a way as to obtain valid responses and to record the responses accurately and completely. The initial task for the interviewer is to create an atmosphere that will

put the respondent at ease. After introducing researcher himself/herself in a friendly way, briefly state the purpose of the interview but avoid giving too much information about the study, which could bias the respondent. It is well to begin the interview with fairly simple, nonthreatening questions. The interviewer also has the responsibility of keeping the respondent's attention focused on the task and for keeping the interview moving along smoothly. In a less structured interview, the same questions are asked of all respondents, but the interview is more conversational and the interviewer has more freedom to arrange the order of the questions or to rephrase the questions. If comparable data are to be obtained, however, the interviewer must standardize the procedure by using a structured interview schedule. A structured interview schedule contains specific questions in a fixed order, to be asked of all respondents.

A good interviewer needs skill in listening at times until the respondent answers. In less structured interviews, any marked deviations from the protocol should be documented so that the information can be taken into account when analyzing the interviewee's response. In using probes, take care not to suggest or give hints about possible responses. It takes less training time to teach interviewers to administer a structured interview than it does an unstructured one because everything they need to say or do is contained in the interview schedule. For this reason, the structured interview is the most widely used format for large studies with numerous interviewers. Following points should be kept in mind while conducting interview:

- Interviewer must plan in advance and should fully know the problem under consideration.
- Interviewer must choose a suitable time and place so that the interviewee may be at ease during the interview period.
- Interviewer should conduct interview in friendly and informal way.
- All possible effort should be made to establish proper rapport with the interviewee; people are motivated to communicate when the atmosphere is favorable.
- The interview questions must be well phrased in order to have full cooperation of the interviewee.
- There should be an interview guide to be observed by all so as to ensure reasonable uniformity in respect of all salient points in the study.
- Researcher should record all the information in reliable way by keeping oneself from free of bias.

4.1.3 Observation

The observation method is the most commonly used method especially in studies relating to behavioral sciences including special needs education. Observation becomes a scientific tool and the method of data collection for the researcher, when it serves a formulated research purpose, is systematically planned and recorded and is subjected to checks and controls on validity and reliability. Under the observation method, the information is sought by way of investigator's own direct observation without asking from the respondent. The distinctive feature of observation as a research process is that it offers an investigator the opportunity to gather 'live' data from naturally occurring social situations. In this way, the researcher can look directly at what is taking place in situation rather than relying on second-hand accounts. This technique is very useful to collate data that cannot be gathered from other data collection techniques because what people do may differ from what they say. Therefore, this tool has also been using in the field of social science research for long time as a vital method of data collection.

Observation is an important method for obtaining data in special needs education research especially qualitative in nature. Certain types of research questions can best be answered by observing how people act or how things look. Observational data are sensitive to contexts and demonstrate strong ecological validity. This enables researchers to understand the context of programmes, to be open-ended and inductive, to see things that might otherwise be unconsciously missed, to discover things that participants might not freely talk about in interview situations, to move beyond perception based data and to access personal knowledge. Because observed incidents are less predictable there is certain freshness to this form of data collection that is often denied in other forms of data gathering tools. For example, researcher could interview special teachers about how their students behave during class discussion of sensitive issues, but a more accurate indication of their activities would probably be obtained by actually observing such discussions while they take place. The qualitative researcher's goal is a complete description of behavior in a specific setting rather than a numeric summary of occurrence or duration of observed behaviors. Qualitative observation usually takes place over a more extended period of time than quantitative observation. Furthermore, qualitative observation is more likely to proceed without any prior hypotheses. Quantitative observations often use checklists and behavior observation tools developed prior to the observation to record or document observed

behaviors. Qualitative observations rely on narrative or words to describe the setting, the behaviors, and the interactions. The goal is to understand complex interactions in natural settings.

Observational data may be useful for recording non-verbal behavior and behavior in natural or contrived settings. More importantly, observational data should enable the researcher to enter and understand the situation that is being described. The kind of observations available to the researcher lies on a continuum from unstructured to structured nature. A highly structured observation will know in advance what it is looking for and will have its observation categories worked out in advance. A semi-structured observation will have an agenda of issues but will gather data to illuminate these issues in a far less predetermined or systematic manner. An unstructured observation will be far less clear on what it is looking for and will therefore have to go into a situation and observe what is taking place before deciding on its significance for the research. A structured observation will already have its hypotheses decided and will use the observational data to conform or refute these hypotheses. On the other hand, a semi-structured and, more particularly, an unstructured observation, will be hypothesis-generating rather than hypothesis testing. The semi-structured and unstructured observations will review observational data before suggesting an explanation for the phenomena being observed.

If the observation is characterized by a careful definition of the units to be observed, the style of recording the observed information, standardized conditions of observation and the selection of pertinent data of observation, then the observation is called as structured observation. But when observation is to take place without these characteristics to be thought of in advance, the same is termed as unstructured observation. Observation has also been classified into participant and non-participant types especially in the field of social sciences. This distinction depends upon the observer's sharing or not sharing the life of the group he/she is observing. If the observer observes by making himself/herself, more or less, a member of the group he/she is observing so that he/she can experience what the members of the group experience, the observation is called as the participant observation. But when the observer observes as a detached representative without any attempt on his/her part to experience through participation what others feel, the observation of this type is often termed as non-participant observation. There are several merits of the participant observation as given below:

- The researcher is able to record the natural behavior of the group.

- The researcher can even gather information which could not easily be obtained if he observes in a disinterested fashion.
- The researcher can even verify the truth of statements made by informants in the context of a questionnaire or a schedule.

Even having several advantages, there are also certain demerits of participant observation as given below:

- The observer may lose the objectivity to the extent he/she participates emotionally.
- The problem of observation-control is not solved.
- It may narrow-down the researcher's range of experience.
- It may be unethical to use participant observation in many circumstances.

Researcher can observe the behavior of the people sampled in the research in natural setting to gather reliable and dependable data. Naturalistic observation involves observing individuals in their natural settings. The researcher makes no efforts whatsoever to manipulate variables or to control the activities of individuals, but simply observes and records what happens as things naturally occur. The activities of students with disabilities, the interaction between students with disabilities and without disabilities, or the parents' response to the students with severe disabilities at home are probably best understood through naturalistic observation.

4.1.4 Focus Group Discussion

A focus group discussion involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It is a form of qualitative research where questions are asked about their perceptions, attitudes, beliefs, opinion or ideas. In focus group discussion, participants are free to talk with other group members; unlike other research methods it encourages discussions with other participants. It is led by a moderator (interviewer) in a loosely structured discussion of various topics of interest.

A focus group discussion is an organized discussion between 6 to 8 people who are homogeneous in nature based on particular characteristic. Focus group discussion provides participants with a space to discuss a particular topic, in a context where people are allowed to agree or disagree with each other. This method allows researcher to explore how a group thinks about an issue, the range of opinions and ideas, and the inconsistencies and variations that exist

in a particular community in terms of beliefs and their experiences and practices. Therefore, researcher should purposefully recruit participants for whom the issue is relevant. Be clear about the benefits and limitations of recruiting participants that represent either one population (girls with disabilities for example) or a mix (boys and girls with disabilities for example), and whether or not they know each other.

In focus group discussion, a small number of individuals are interviewed at the same time. An advantage of a focus group is that participants respond not only to the researcher but also to other participants. The interaction between participants usually reveals more about their ideas, feelings, and point of views. The focus group's interaction enables the researcher to see how individuals incorporate the viewpoints of the others in structuring their own understandings. Focus group is a data collection method often used in qualitative research. The researcher invites people who are interested in the same general topic for its discussion. They are assured that they will be free to express themselves in their own words and to respond not only to the researcher but also to other participants.

A focus group interview is an interview with a small group of people on a specific topic. Groups are typically six to eight people who participate in the interview for one-half to two hours. Focus group discussion is very useful method to collate qualitative data, which cannot be gathered from other data collection tools. The interviewer's main task in focus group discussion is to prevent single participants or partial groups from dominating the interview and thus the whole group with their contributions. Furthermore, the interviewer should encourage reserved members to become involved in the interview and to give their views and should try to obtain answers from the whole group in order to cover the topic as far as possible. Finally, interviewers must balance their behavior between steering the group and moderating it. Key features of focus group discussion are given below:

- Involves organized discussion with a selected group of individuals to gain information about their views and experiences of a topic.
- Particularly suited for obtaining several perspectives about the same topic.
- Helps in gaining insights into people's shared understanding of everyday life and the ways in which individuals are influenced by others in a group situation.
- The role of the moderator is very significant, as good levels of group leadership and interpersonal skill are required to moderate a group successfully.

As we discussed before, focus group discussion is an effective methods of collecting qualitative data from a different individuals at the same time. The major advantages of focus group discussion are given below:

- Free and open discussion among the respondents results in generation of new ideas that can be very useful for decision-making.
- A focus group is not static. The moderator can bring any changes in order to better facilitate the discussion during the group discussion. This dynamism allows better results in terms of information derived by a focus group.
- Expressions other than those in verbal form such as gestures and stimulated activities can provide researcher with useful insights.

Even having several advantages, focus group discussion is not free from different disadvantages. Some disadvantages related to focus group discussion are given below:

- Though moderator can control the discussion, the extent to which he/she can control the discussion depends on his/her experience. Inexperienced moderator may face problems in controlling some participants who try to dominate the group.
- Respondents may be reluctant to share some sensitive ideas and concerns publicly.
- Due to small sample size and heterogeneity of individuals, the findings may not be adequate to make projections or the composite picture of the situation.
- Focus group discussion can be a very artificial set-up that influences the respondents to express and act unnaturally. The findings may be far from the actual.

4.2 Simple Analysis and Interpretation of Data

In the research process, two types of data – quantitative and qualitative – data are collected and analyzed to attain the objectives determined in advance. Quantitative data refers to such data that is expressed in numerical terms, in which the numeric values could be large or small. Numerical values may correspond to a specific category or label. Similarly, data that is represented either in a verbal or narrative format is qualitative data. These types of data are collected through focus groups, interviews, opened ended questionnaire items, and other less structured situations. A simple way to look at qualitative data is to think of qualitative data in the form of words. Both quantitative and qualitative data analysis processes are discussed below respectively.

4.2.1 Process of Quantitative Data Analysis and Interpretation

Quantitative research typically explores specific and clearly defined questions that examine the relationship between two events, or occurrences, where the second event is a consequence of the first event. Such a question might be: what impact did the program have on disabled children's school performance? To test the causality or link between the program and children's school performance, quantitative researchers will seek to maintain a level of control of the different variables that may influence the relationship between events and recruit respondents randomly. Quantitative data is often gathered through surveys and questionnaires that are carefully developed and structured to provide you with numerical data that can be explored statistically and yield a result that can be generalized to some larger population.

Quantitative data are quantifiable, objective, and easy to interpret results. The data can typically be summarized in a way that allows for generalizations that can be applied to the greater population and the results can be reproduced. The design of most quantitative studies also helps to ensure that personal bias does not impact the data. Quantitative data can be analyzed in several ways. This module describes some of the most commonly used quantitative analysis procedures. Quantitative data analysis primarily depends on the questions and hypotheses rose in the research process. Therefore, researcher should consider research questions and hypotheses while analyzing quantitative data. At first, researcher need to organize collected data and then should analyze by considering the following points:

- Describe trends in the data to a single variable or question on your instrument. To answer this questions, researcher needs descriptive statistics that indicate general tendencies in the data (mean, mode, and median), the spread of scores (range, variance, and standard deviation), or a comparison of how one score relates to other statistical analysis.
- Compare two or more groups on the independent variable in terms of the dependent variable. Researcher can use inferential statistics to test hypothesis formulated in the beginning of the research process. Researcher evaluates whether the differences of groups (their means) or the relationship among variables is much greater or less than what he/she would expect for the total population.
- Relate two or more variables by using inferential statistics.
- Test hypotheses about the differences in the groups or the relationships of variables. To answer either of these questions, inferential statistics are also used.

4.2.2 Process of Qualitative Data Analysis and Interpretation

Qualitative data is non-numerical, covering images, videos, text, and people's written or spoken words. Qualitative data is often gathered through individual interviews and focus group discussions using semi-structured or unstructured topic guides. Qualitative data analysis is the range of processes and procedures whereby we move from the qualitative data that have been collected into some form of explanation, understanding or interpretation of the people and situations we are investigating. Qualitative data analysis is usually based on an interpretative philosophy. The idea is to examine the meaningful and symbolic content of qualitative data. There are five ways of organizing and presenting analysis of qualitative data. The first two methods are by people, and the next two methods are by issue, and the final method is by instrument. These methods are discussed below respectively:

- **Data analysis by groups:** While using this method, researcher at first analyze the data given by a group of individual at first who possess similar characteristics. The advantage of this method is that it automatically groups the data and enables themes, patterns and similar to be seen at a glance. While this is a useful method for summarizing similar responses, the collective responses of an individual participant are dispersed across many categories and groups of people, and the integrity and coherence of the individual respondent risks being lost to a collective summary.
- **Data analysis by individuals:** In this method, total responses of a single participant are analyzed, and then the analysis moves on to the next individual. This preserves the coherence and integrity of the individual's response and enables a whole picture of that person to be presented, which may be important for the researcher. This method has been used while analyzing data of case study research.
- **Data analysis by issue:** A third way of organizing data is to present all the data that are relevant to a particular issue. This method is an economical approach to handling, summarizing, and presenting data effectively.
- **Data analysis by research question:** This is a very useful way of organizing data, as it draws together all the relevant data for the exact issue of concern to the researcher, and preserves the coherence of the material. In this approach all the relevant data from various data streams (questionnaire, interview, focus group discussion for examples) are collated to provide a collective answer to a research question.

- **Data analysis by instrument:** Typically this approach is often used in conjunction with another approach, by issue or by people for example. Here the results of each instrument are presented, e.g. all the questionnaire data are presented and organized, and then all the data from interview are presented, and then focus group discussion.

Let Us Sum Up

In this chapter, we discussed different tools and techniques applied to gather data both in quantitative and qualitative research. Within the concept of research tools, we studied meaning and types of different instruments such as questionnaire, interview schedule, observation, and focus group discussion. Furthermore, we also interacted guidelines need to be followed while using these tools in research process. Finally, we also discussed about the process of quantitative and qualitative data analysis and interpretation.

Unit-end Activities

- **Objective Questions**

Tick (✓) the best answer.

“Group-A”

1. Which of the following methods is used to collect information in natural setting?
 - a. Questionnaire
 - b. **Observation**
 - c. Interview
 - d. Focus group discussion
2. Disadvantage of interview as research technique in comparison to questionnaire is
 - a. costly
 - b. time consuming
 - c. subjectivity
 - d. **all of above**
3. Questionnaire technique in research is preferred to others because
 - a. it can collect exact information
 - b. **it can cover a large number of respondents**
 - c. it is easy to manage
 - d. it can be administrated by anybody

4. Observer's bias may be reduced by
 - a. carefully structuring the interview guide
 - b. use of audio tape recording
 - c. reducing the amount of interference required by the observer**
 - d. all of them are pertinent to reduce the bias
 5. Which of the following instrument is used when factual information is desired?
 - a. Questionnaire**
 - b. Interview schedule
 - c. Focus group discussion
 - d. Observation
- **Short answer questions** **"Group-B"**
 1. What do you mean by interview? Explain its major types in brief.
 2. Describe the guidelines need to be considered while conducting Focus Group Discussion in short.
 3. Write short note on observation method.
 4. Clarify the guidelines need to be followed while using observation method of data collection.
 5. Interview schedule is more useful to gather in-depth information as compared to questionnaire. How? State your arguments.
 - **Long answer questions** **"Group-C"**
 1. What do you mean by questionnaire? State its major types. What guidelines should be considered while using questionnaire while gathering data in research? Discuss.
 2. Explain data analysis process in quantitative research with example.
 3. What do you mean by qualitative research? State the process of qualitative data analysis with brief introduction.

Points for Discussion

- Define questionnaire and state the guidelines need to be considered while constructing questionnaire.
- Introduce interview schedule with its major types.
- Explain observation method as a method of qualitative data collection.
- Define focus group discussion and describe the guidelines need to be considered while conducting focus group discussion

Unit 5: Research Proposal and Report Writing

5.1 Proposal Writing

A research proposal is nothing more than a written plan for conducting a research study. A research proposal is an overall plan, scheme, structure and strategy designed to obtain answers to the research questions or problems that constitute your research project. Writing the research proposal can be the most crucial and exciting step in the research process. At this stage, the whole project crystallizes into concrete form. The researcher's inspirations and insights are translated into step-by-step plans for discovering new knowledge. Therefore, proposal communicates a researcher's intentions, makes clear the purpose of the intended study and its justification, and provides a step-by-step plan for conducting the study. In a well-organized and well written proposal, researchers demonstrate that they know what they are seeking and that they will know how to successfully complete the planned project. The readers will evaluate the worth of the proposed study and may make suggestions for improving it. The research proposal identifies problems, states questions or hypotheses, identifies variables, and defines terms. In addition, the subjects to be included in the sample, the instruments to be used, the research design chosen, the procedures to be followed, method need to be employed while analyzing data, etc. are also encompassed with the proposal. As a whole, proposal spells out in detail what the researcher intends to do.

5.1.1 Importance of Proposal

The research proposal is a plan for carrying out the research project effectively. The proposal should include all the procedures that need to be included while carrying out the research project. Some detail of the proposed research design and methods will be included in a research proposal. A research proposal should include an outline of chapter headings such as introduction, literature review, description of research methodology, and references. A research proposal is intended to convince others that the student has a worthwhile research project and that s/he has the competence, and the work-plan to complete it. Generally, a research proposal should contain all the key elements involved in the research process. The proposal should have

sufficient information to argue that the student has an important research idea, that he/she has a good grasp of the relevant literature and the major issues, and that the methodology is sound. The research proposal provides a coherent and concise outline of the intended research. Along with these, research proposal has following importance:

- Research proposal provides the basis for evaluating the research project.
- Proposal provides guidelines to the researcher to conduct research project effectively.
- Proposal assists to accomplish the purpose of the proposed research project.
- Research proposal useful to clarify the rationale of research project.
- Research proposal helps provide clear information about research methodology to the supervisor.
- Research proposal assists to clarify the assumed time and budget.
- Research proposal help select appropriate supervisor.
- Proposal clarifies data collection and analysis process in research project.
- Proposal makes easy for researcher to understand the study for carrying out it effectively.
- Research proposal gives clear picture of activities to be carried out at every stage of the research process.

5.1.2 Elements of Proposal

There may differences between the elements of proposal prepared by different agencies. Elements of a proposal prepared by a university can be different than the proposal designed by another university. However, there may be commonness between the proposals prepared by different agencies. Whatever else, the proposal prepared from the Faculty of Education, Tribhuvan University possesses following elements:

- **Title of the research**

Title of the research is first and important component of the research proposal. The title of the research must be new, relevant, and interesting. It should not be too long and limited within twelve words.

- **Background of the study**

Another crucial part of a research proposal for research is the introduction to the proposed study. In the very first paragraph, state the research problem clearly and

unambiguously. Then link the problem to the body of information available in the field and establish the importance of and the need for carrying out the proposed research. The introduction should convince the readers that you have reviewed the related research and have a thorough understanding of the problem. The introduction provides the framework for the rest of the proposal. So prepare this section with care, caution, and the aim of promoting the reader's interest in the problem.

- **Statement of the problem**

State the problem clearly and directly very early in the introduction, ideally at the beginning of the first paragraph. The problem statement should imply a question about the relationship between specified variables. This section should also include a brief description of the background of the problem and the potential significance of the study. Researcher should state the problem in such a way that can be easily understood.

- **Research objectives**

Objective of the research is taken as an important element of research proposal because this element guides other component of the proposal. Generally, two types of objectives such as general and special are formulated in the proposal. General objectives are vague and broad. But specific objectives should be measurable, attainable, realistic, and time bound.

- **Hypothesis or research questions**

The hypothesis should state concisely the expected relationship between the variables in the study. The research hypothesis is typically determined by the implications of the related research findings so far and the deductive logic of the underlying theory. Explain the link between theory and hypothesis so that the reader will be able to understand the rationale for the hypothesis.

Research questions are another element of proposal especially in qualitative research. These questions lay out the conceptual structure of the inquiry. Qualitative research questions are typically about process or understanding—what happens, why or how something happens, how those involved understand the experience, and what it means to them. These questions will help identify what to observe or what to ask in interviews and

direct the analysis, similar to how hypotheses in quantitative research direct the methodology.

- **Significance of the study**

In this section, researcher needs to explain why the problem is an important one to study. Researcher should show how the results of his/her study will contribute to theory and knowledge in the specific area. Finally, you show how the results of the study will provide grounds for further research in the area. In addition, researcher may explain how his/her own experience and expertise, coupled with the facilities and goals of the institution where the study is being carried out. Research should convince readers on the potential application of the findings to educational practice. Researcher should tell what can be learned as a result of the study and why that is worth knowing.

- **Limitations of the study**

Researcher should clarify the limitations of his/her study within the proposal prepared for particular research project. It helps reader be clear about the boundary of research work. Researcher should mention any known limitations of the proposed research project. The limitations are any factors that may negatively impact the results of the study or the generalizability of the results. Limitations may include size of the sample, selection of the participants, the setting for the study, use of a pretest, length of the study, and so on. But researcher should be careful about pointing out too many weaknesses.

- **Literature review**

The literature review presents what is currently known about the problem under consideration and thus sets the scholarly context for the question or hypotheses of the proposed study. The review shows how the proposed research fits in with the existing body of knowledge. Even if there is no research in the field, there is usually literature of a theoretical or speculative nature that should be included as part of the background of a study. Of course, researcher should include theories and research results contrary to stated hypothesis as well as those in agreement with it. Researcher should include the findings from some of the landmark studies in the field as well as the most recent research. This will show readers that the question has been investigated by others over a period of years and is

a problem worthy of and in need of further investigation. Include not only literature dealing with research on the variables of the proposed study but also discussions of the theoretical background of the problem.

- **Research design**

Within research design, researcher clarifies how the study will be carried out to answer the research question and to test hypothesis formulated in advance. This section should also convince the reader that what researcher plan to do is the best procedure for investigating the question. Broadly researcher can use qualitative or quantitative research design and more specifically he/she can specify particular type of design either included in qualitative or quantitative (phonological research design, case study design, correlational design, and survey design for examples). Along with this, researcher should also clarify the rationales of selecting particular research design within research proposal.

- **Population and sampling**

Researcher should identify the population and sample of his/her study. In addition, researcher should describe the procedure for drawing the sample from the population. If random selection is not possible, explain why researcher has chosen a particular procedure for sample selection and how well the sample to be used will resemble the population of interest. Researcher needs to include the number of participants and a description of their relevant characteristics such as age, gender, academic level, ethnicity, and ability level. A careful description of the subjects can help the reader of the proposal to determine if, in the reader's view, the results of the study can be generalized from studied sample to the appropriate population.

- **Data collection instruments**

Different types of data collection tools should be used to collect data from different sources. If an instrument is already established, the proposal should include its name and reported evidence of its reliability and validity for the intended purpose. It is also necessary to outline the procedure to be followed while developing research instruments for collecting reliable and valid data. This outline should include the steps that will be taken to obtain valid

and reliable data by applying these instruments. Researcher can do pilot study to make data collecting instruments more reliable and valid.

- **Data collection and analysis process**

Researcher must describe the methods that will be used to collect the data to answer each research question. The quality of research is greatly improved by using multiple methods of collecting data. Typically, the qualitative researcher will collect a massive amount of data from the interviews, observations, and field notes. Researcher will need to tell how he/she will organize and analyze these data. This section should also address issues related to the study's validity and dependability and discuss the strategies that will be used to enhance credibility.

The next part of the research proposal describes the methods of handling and presenting data and outlines the statistical procedures to be used. Researcher should describe his/her plan for organizing and presenting the results of the investigation. In qualitative research, researcher should clarify the procedures that will be applied to edit, classify, categorize, and analyze the information collected from various sources. But in the case of quantitative research, researcher should clarify the statistical procedures that will use to analyze quantitative data or to test research hypothesis or to find out the answers of research questions.

- **Time schedule**

The researcher must plan with regard to the feasibility of completing the study within the time limitations. He/she needs to identify the sequence of stages necessary to complete the proposed research and to estimate the time needed to complete each stage. Be generous in allocating time for each step because unanticipated events can cause delays. Research almost always takes more time than we think. Dividing the project into manageable stages and then assigning a date to complete each stage helps systematize the project, enables researcher to estimate the effort that will be required to complete the entire project, and provides opportunities for periodically evaluating the progress of the research project.

- **References**

In this section, the researcher must list the references that were cited in the literature review as well as any other sources cited in the development of the proposal. The reference list includes the full publication information for each entry, arranged in alphabetical order according to the senior author's last name. In the field of education, the American Psychological Association (APA) format is the most popular for listing references in journals, dissertations, and other research.

5.1.3 Preparation of Proposal on Any Critical Area of Special Needs Education

Research Title: Barriers to Inclusive Education in Nepal

1) Background of the Study

Almost all nations in the world have made different attempts in order to provide equal educational opportunity to the children with special needs for few decades. The Jomtien Conference (Research Center for Educational Innovation and Development, 2004), Salamanca Conference, Convention on the Rights of Persons with Disabilities-2006 (UNESCO, 2009), etc. are some representative examples of such attempts. Nepal Government also took a part in Jomtien and Salamanca conferences and then expressed commitment among world communities to ensure educational right of all children including special needs through inclusive educational practices. In Nepalese context, the special educational provision to the children with special needs (for blind students) was begun from 1964 with an integrated educational program introduced at the Laboratory School in Kathmandu (UNICEF, 2003). Furthermore, the Special Education Council was formed under the chairmanship of Education Minister in 1973 (CERID, 2004). However, the current policy of special education is based on Special Education Policy-1996 (Nepal Law Commission, 1996) and special education has been launched up to secondary level by Inclusive Education Division which has been operating under the control of Department of Education (Department of Education, 2015). More importantly, Nepal Government has just introduced new 'Inclusive Educational Policy-2017' (Department of Education, 2017), which is intended to be launched into action soon.

In Nepal, inclusive education is defined as a process of developing educational system that ensures the opportunity for receiving education in a non-discriminatory

environment in their own community by respecting the multicultural differences (Curriculum Development Center, 2007). Considering above mentioned basic premises, Nepal Government has been making a number of attempts for last five decades (CERID, 2004), but such attempts are not enough to meet the diverse needs of children with disabilities. Nepal Government has also made a provision of inclusive education in national level policy documents (Ministry of Education, 2009) but all children are still expected to follow the same lesson, disregarding differences in their learning and needs (Human Right Watch, 2011). As a result, children with disabilities in mainstream schools repeatedly fail, which ultimately minimizes the internal efficiency of educational system.

Furthermore, the content is co-planned and often co-taught by a general and a special education teacher in inclusive classroom (Villa and Thousand, 2016) by which all students including those with special needs achieve appropriate outcomes. Similarly, teachers work as facilitators of learning rather than as transmitters of knowledge in the classroom (Kearney, 2009). Students tend to perform much better academically when they are educated alongside their peers in general education classroom. If students with special needs are removed from general educational setting then they live separate academic and social lives which may be incompatible with their normal lives (Causton and Tracy-Bronson, 2015). Individual with Disabilities Education Act (2004) has indicated that teachers have the responsibility to adapt content and instructional techniques to meet the needs of students with disabilities, and to ensure their access to general education curriculum and school activities. School teachers should therefore maintain coordination with significant others while planning and implementing curricula in inclusive settings.

In the reference to Nepal, a research (CERID, 2006) has indicated that teachers received limited knowledge and skills from training. They had no idea even of Individualized Education Plan, which has also played an impede role for implementing inclusive educational program in real classroom practices. Theoretically, Nepal Government promotes an inclusive education policy, but in practice, it supports a system of segregated resource classes designated for children with disabilities in mainstream schools and separate schools for deaf, blind and children with physical and intellectual disabilities (Human Right Watch, 2011). Thus, inclusive educational practices have not been executed in Nepalese school even having policy provision at national level. This

research therefore will be carried out to identify major challenges of inclusive education in Nepal.

2) Problem Statement

Inclusive education can be a solution to address the diversified needs of the multicultural society. It can reflect the needs of all learners irrespective their ability, ethnic and linguistic backgrounds (Miles, 2007). Inclusive education is a process for increasing participation of those who are unrepresented or underrepresented (Corp, 2012). In this regard, inclusive education works as an elevator to ensure the right to education of all children by accommodating educational program as per their needs (CDC, 2007). Considering the reality, the Constitution of Nepal has also indicated that the citizens with disabilities shall have the right to get free education up to higher level (Nepal Law Commission, 2015). However, 3.6 percent of primary school age children are still deprived from school education (Department of Education, 2015). Particularly, children with disabilities have lower enrolment and higher dropout rates as compared to normal children (Human Right Watch, 2011), and have very limited access to physical facilities at school (Regmi, 2017). Thus, children with special needs are compelled to fit into embedded educational system rather accommodating the system as per their needs. Implementing inclusive educational practices at schools can be the best solution to solve these problems.

Central Bureau of Statistics (2012) indicates that approximately 2 percent (513,321) people, out of total population, in Nepal are disabled. On the other hand, a study (New Era, 2001) has shown that 68.2% of people with disabilities do not have access to education (as cited in CERID, 2004) due to the lack of ramps and disability friendly toilets, no use of sign language in teaching, and lack of Braille teaching materials (Human Right Watch, 2011), less competent teachers (Curriculum Development Center, 2007), etc. Moreover, teachers working with disabled children do not have proper skills to accommodate normal curricula as per the learning needs of their students (Regmi, 2017); and in most of the cases, the instructional techniques used in the class are not interactive, participatory and meaningful to the learners. All these facts indicate that Nepalese classrooms are not so inclusive and interactive to the students including the learners with

disabilities. This study therefore will try to diagnose the major barriers to inclusive education in Nepal for their further improvement.

3) Research Objective

At policy level, the Nepal Government has given priority to inclusive education for ensuring access of all children with special needs to school level education. However, the formulated policies have not been implemented into action as intended manner. In this regard, the main objective of this study will be to investigate the major barriers to inclusive education in Nepal.

4) Research Questions

As discussed before, almost all classes of Nepalese schools are not accommodated as per the diversified needs, experience, ability, language, culture, etc. of the learners. Without proper accommodation, it is very hard to ensure educational right of all children or achieve EFA goal. Therefore, formulated policy of inclusive education must be implemented by identifying, assessing, and controlling barriers to inclusive education. In this regard, this study will be carried out to answer following questions:

- Do the teachers working at special and integrated schools are clear about inclusive educational policy of Nepal?
- Is there mutual collaboration between school and family for quality education?
- Do the teachers working at schools have proper knowledge about IEP, co-teaching, curriculum differentiation, multi-tiered support system, and transition planning?
- Do the physical infrastructures available at schools are sufficient for inclusive education?

5) Significance of the Study

This study will be helpful to convey message about the situation of inclusive education in Nepal to the international community including INGOs and NGOs who want to support for education to the children with special needs. This research will also be handy to find out the major gap of the program interventions and identify the core areas of improvement for quality education to the children with disabilities. Finally, all the

students, teachers, policy makers, and other related people, who are interested in getting information about the barriers to inclusive education of developing countries particularly Nepal, can be benefitted from this research.

6) Research Design

The whole research process of this study will be guided by qualitative research paradigm followed by descriptive research design. All of the data collected in the research process will be interpreted in descriptive way.

7) Population and Sample

All the head-teachers and teachers teaching to the children with special needs within Kathmandu valley, where schools representing different types of disabilities are available, will be taken as the population of the study, from which five head-teachers (two from integrated schools and three from special schools) and ten teachers ((four from integrated and six from special schools) will be selected from five schools by using purposive sampling method.

8) Data Collection Instruments

Different types of data collection instruments will be used to collect data from different sources. Semi-structured interview schedule will be used to collate in-depth information particularly related to physical infrastructures available at the schools, clarity on inclusive education policy, collaboration between school and family, teachers' knowledge on IEP, curriculum differentiation, Rtl approach, transition planning, etc. from them.

9) Data Collection and Analysis Process

In-depth information will be gathered from selected schools by clarifying the purpose of the study. Head-teachers, teachers, and students will be visited individually and in group, and then essential data will be gathered on required basis. Document related to inclusive education will also be analyzed to gather further information. All the information gathered in the research process will be analyzed in descriptive way

especially from emic perspectives. At first, collected data will be edited, classified, categorized, and then themes were generated to analyze them meaningfully. Different themes will be generated by considering research questions.

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5.2 Report Writing

A research project is of little value unless the findings can be communicated to others. The final report tells what researcher did, what he/she found, and how his/her study is related to the body of knowledge in particular area. Writing the final report is not as difficult a task as a beginning researcher might think. Much of the writing for the introduction, review of literature, and methodology has already been done in the initial proposal. Only minor revisions and a switch to the past tense should be needed on these three preliminary sections. It is important to have research reports arranged in such a way that readers know exactly where to find those specific parts they may be seeking. Research report generally has three sections namely preliminary section, main section, and reference section. Brief introduction of these sections is given below correspondingly.

5.2.1 Preliminary Section

Preliminary section is taken as a prominent section of research report within which several portions of the report such as title page, abstract, acknowledgement, list of contents, and list of figures/tables are incorporated. Brief description of these parts is given below:

- **Title page**

The title should describe, as briefly as possible, the specific nature of the study. A rule of thumb states that a title should have no more than 12 to 15 words. As per APA format, title of the report should not be more than 12 words.

- **Abstract**

Most institutions require a separate abstract of the dissertation, which should include a precise statement of the problem and concise descriptions of the research methods, results, and conclusions. The abstract must be limited in length (typically 500 words or less). The abstract follows the title page.

- **Acknowledgement**

In this part, researcher expresses thanks to all the people who directly and indirectly assist to him/her to complete the research project successfully. Generally, researcher may give thanks to report supervisor, respondents, typist, language editors, and other persons who support throughout or in any stage of research work.

- **List of contents**

Within this title, researcher states an outline of contents of the whole research report with page numbers. List of content makes readers to identify the major content included within the report. Therefore, researcher should incorporate different sections of the report with major headings within the list of contents.

- **List of tables/figures**

List of tables/figures should also be included within the preliminary section of the report. Within this part, researcher mentions title of table and figures with page numbers. This work helps reader identify the tables and figures incorporated within the report.

5.2.3 Main Section

Main section of the report is taken as the heart of human body without which body cannot work properly. In this section researcher includes introduction, literature review, research

methodology, data analysis and interpretation process, and findings and conclusions. Short description of these elements is given below respectively:

- **Introduction**

The introduction is a very important part of the report. The introduction begins with a statement of the research question (problem). In this part, researcher gives the background of the problem and state why researcher thinks his/her study will make a contribution to knowledge in the area. Furthermore, he/she states the hypothesis and the reasoning that led to researcher's expectation about the results of the study. Finally, he/she may define any terms that might be unfamiliar to readers.

- **Literature review**

This chapter contains an extensive review of the literature related to researcher's problem. In this part, researcher should not just list studies one after the other but, rather, synthesize their findings and point out agreements and disagreements among them. He/she should also show how they are related to his/her research problem.

- **Research methodology**

This chapter presents a detailed description of the research methodology. It should be clearly written and should provide enough information that another researcher could read this section and replicate the study. In a quantitative study, this chapter typically has subsections with information on the participants, the research design, the variables and treatments, instruments used to collect data, procedures, and the location of the study. In the section on participants, for example, tell the number of participants, how they were selected, and their major characteristics such as age, gender, and race/ethnicity. In this chapter, one also needs to provide information on the validity and reliability of the instruments used.

- **Data analysis and interpretation**

In this part, data gathered from multiple sources are analyzed and interpreted by consider the objectives and research questions of the study. In quantitative research, researcher uses different statistical analysis to analyze the data but in qualitative research,

the researcher analyzes and interprets information collected from various sources by triangulating them. Researcher can also use direct quotations to analyze qualitative data. Researcher can generate different themes from the data by considering the objectives and research questions and then analyzes information by organizing them within the themes generated.

- **Findings and conclusions**

In this section, researcher describes the results or findings and conclusions of the research. Results are direct observations summarized and integrated by the statistical analysis. A conclusion is an inference based on the results, expressed in terms of the study's hypothesis, such as one group's treatment being more effective than the other group's treatment. For example, a study might result in the observation that the mean spelling test scores of students taught spelling by method 'A' are significantly higher than the mean of students taught by method 'B'. The conclusion that method A is more effective than method B is not a direct result of the study but, rather, is an inference based on the results of the study.

Reference

The reference list must include all sources mentioned in the text. It is important to follow APA rules rigorously and completely. By listing each reference in the correct form as it is encountered, researcher can avoid the extra time involved in finding the references again in order to have them in complete form for the bibliography. Researcher should list them on cards or enter them in computer so researcher can file them in alphabetical order.

Appendices

The appendixes contain pertinent materials that are not important enough to include in the body of the report but may be of value to some readers. Such materials may include complete copies of locally devised tests or questionnaires together with the instructions and scoring keys for such instruments, item analysis data for measurements used, verbatim instructions to subjects, and tables that are very long or of only minor importance to the study.

Let Us Sum Up

This chapter intends to provide basic information required to prepare research proposal and research report in the field of special needs education. Hence, we mainly discussed about research proposal and report writing. Within research proposal part, we studied importance of proposal, elements of proposal, and a model of proposal. But within report writing section, we discussed different sections of the research report and other major parts included within each section.

Unit-end Activities

- **Objective Questions**

Tick (✓) the best answer.

“Group-A”

1. The overall plan designed to conduct research project effectively is known as
 - a. research work
 - b. research program
 - c. research report
 - d. **research proposal**
2. Which of the following statement is correct?
 - a. Research proposal is a plan designed to justify the rationales of study
 - b. Research proposal is a plan that directs methodology
 - c. Research proposal provides clear information about research methodology
 - d. **Research proposal is a plan that guides overall research**
3. Research proposal is generally written into
 - a. Two chapter
 - b. **Three chapter**
 - c. Four chapter
 - d. Five chapter
4. Components of research report are categorized into three sections that are
 - a. **preliminary, main, and reference section**
 - b. introduction, literature review, and methodology section
 - c. introduction, methodology, and reference section
 - d. preliminary, literature review, and reference section

5. Which of the following components is included within preliminary section?
 - a. Theoretical framework
 - b. Definition of terms
 - c. Abbreviation form**
 - d. Index

- **Short answer questions** **“Group-B”**

1. Why is a proposal required in the field of special needs education research? Give suitable reasons.
2. Select a research title of research from special needs education. Write its rationale and objectives. Estimate the sample size and state the methods of its selection.
3. Select a research topic and prepare the research two research objectives and five research questions from it.
4. List out the different components of research report and explain any three from preliminary section.
5. State different components of research proposal and explain any three of them.

- **Long answer questions** **“Group-C”**

1. Select a research topic in your subject area and develop a full proposal.
2. Develop an outline research proposal to ensure education for all the children with special needs education.
3. What are the prominent components of main section of a research report? Describe any three that are not included within research proposal.

Points for Discussion

- Explain meaning and importance of research proposal.
- Discuss different components of research proposal.
- Clarify different sections of research report.
- Describe the importance of report writing in research.

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