



Indira Gandhi National Open University
School of Education

MESP-105
Project Work

MANUAL FOR PROJECT WORK



“शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।”

— इन्दिरा गांधी

“Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances.”

— Indira Gandhi

MANUAL FOR PROJECT REPORT

(PGDHE PROGRAMME)



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Practical Manual

Introduction

You are already aware about the general format of the four courses of PGDHE. The first four courses are theory courses which you have already studied. In the course **ES-301: Higher education: its context and linkages**, you must have understood the place and aims of higher education in its socio-historical and development perspective. The dynamics involved in classroom instruction in higher education in a systems perspective alongwith various relevant instructional inputs were explained to you in the course **ES-302: Instruction in higher education**. The course **ES-303: Higher education – the social psychological context** dealt with the instructional nature of the educational, psychological, environmental and organismic components in the making of youth behaviour. In this course you were also explained the personality and attitudinal dispositions and the cognitive development of the Indian college youth. The psychological aspects of teaching and learning in higher education were also discussed in this course. The planning and management of higher education in the Indian context with focus on its structural and organisational characteristics were explained to you in the course **ES-304: Planning and management of higher education**.

While studying the contents of these four courses, you might have come across various issues related to higher education in the context of India's socio-historical, cultural and development perspective; instructional inputs and strategies, evaluation techniques, and youth in the higher education institutions; planning and management of higher education alongwith the development and transaction of curriculum, etc. These areas might be of some importance to you and you may like to undertake and execute a research project in one of these for the purpose may of the fifth course namely **ES-305, Project Work**.

In this manual we will discuss how to select a topic or a theme for the research project and conduct the study. For this you are required to develop and formulate a research proposal/synopsis. We will discuss certain guidelines for developing the research proposal and executing the project successfully.

For successfully completing the research project, you are obligated to give a completely detailed account of your experiences and thinking involved in the conduct of the research on the theme or problem right from identification and statement of the problem, formulation of hypothesis(es), collection, analysis and interpretation of data, to testing of hypothesis(es) and drawing out of conclusions. Such a complete and detailed account of research project is called **research report**. In this manual, we will discuss the procedure followed in the preparation of the research report which would also include the details about its general format, style and format of writing the report and the procedure which is followed in typing the research report.

Learning outcomes

After reading this manual, you will be able to:

- understand various types of research project;
- describe the important sources for problem identification and its selection;
- understand the criteria which are to be kept in view in formulating a research problem;
- describe various stages of a research proposal;
- understand the format of a research proposal;
- prepare a research proposal;
- execute a research project;
- understand the procedure which is followed in typing different sections of the research report.

Classification of research projects

Research projects can be classified into three groups. This classification is based mainly on the type of the research study to be undertaken and its purpose.

- i) The most common project is of the type that is prepared by those who wish to undertake research for their diploma or for their master's or doctoral degree. Submission of a research proposal is a general requirement in most of the universities in case of various diploma or degree courses. The proposal is evaluated by a committee of experts to determine the feasibility of the research project. For example, being a student of PGDHE, you are required to select a theme or a problem in an area of your choice within the framework of the contents of the four courses you have already studied and then develop a research proposal for Project Work. This exercise is meant to help you manifest and explore your specific area of interest related to higher education. As a researcher it is necessary for you to choose a broad area within which you will select a topic/problem for conducting a study. However, it may be noted that you should choose a topic for which all the needed resources are easily available to you. The main purpose of your project work is to sensitise you to the realities and practices of higher education systems, their unique problems, the demands on them and the possibilities inherent in them.
- ii) The second type of research project is one that is submitted by a researcher to a private or governmental agency for financial assistance which is given on the recommendation of expert(s) who evaluate the proposal.
- iii) Finally, in the third category is the research project that is submitted by a university or a college teacher to some research organisation such as Distance Educational Council (DEC) of Indira Gandhi National Open University (IGNOU), the Indian Council of Social Sciences Research (ICSSR), the National Council of Educational Research and Training (NCERT), National Institute of Open Schooling (NIOS), the University Grants Commission (UGC), or any other organisation. Funds are earmarked by such organisations for research, hence more teachers are taking interest to investigate problems in the areas of concern at the school, college or university levels. After successfully completing your PGDHE, you may also be interested in undertaking a research project of this nature.

Apart from the above, research can be classified from the following three perspectives:

- the application of the research study;
- the objectives in undertaking the research; and
- the type of information sought.

These classifications are not mutually exclusive and may overlap.

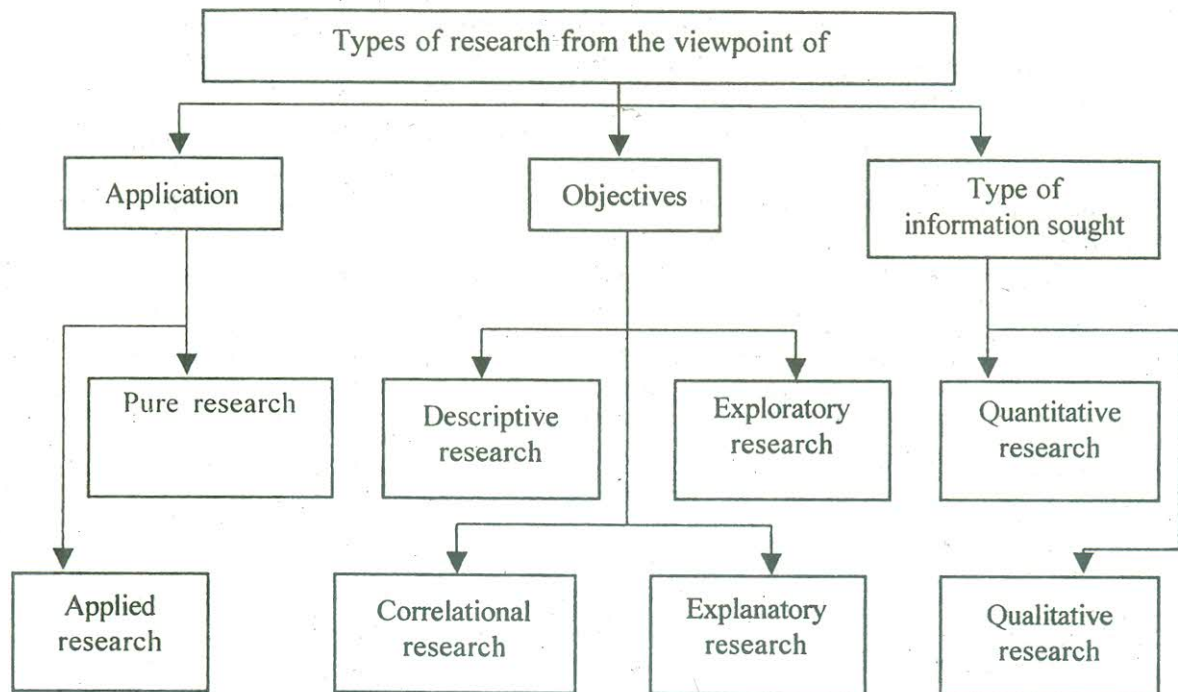


Figure 1 Types of research

Sources of problems and selecting a research problem

Before undertaking this course, it is expected that you have studied thoroughly the contents of all the four courses. These contents pinpoint certain broad areas of higher education. Some of these areas may have been of more interest to you as compared to other areas. For undertaking a research project, it is first necessary for you to choose a specific area within which you will conduct the study. The area selected should be one in which you are capable of demonstrating necessary initiative, originality, and good judgement. A thorough understanding of the known facts and developments in the area in which you are interested constitutes the first and most important step in selecting a specific problem for study. If you are familiar with your field and are aware of the studies that have already been conducted in it, you will be able to identify the problems which have, so far, remained unsolved. A survey of suggestions for further research given at the end of research reports, and reviews of research will be helpful to you in getting an idea about the gaps which exist in knowledge in a particular field or area. Periodicals and annual bibliographies are also useful in highlighting the research going in the area in which you may be interested.

It is not possible to list all the problems that need to be researched. The choice of a suitable problem is always difficult. It is a time consuming process.

Generally a researcher is unaware of the sources to which one may go for a suitable research problem. There are, however, some **important sources** which are helpful to her/him for **selecting a problem**.

Professional experience

Some of you may be teachers in universities, colleges or other institutions of higher learning. There may also be some who have a post-graduate or a professional degree in any discipline and are eligible to apply for the post of lecturer in the institutions of higher learning. In such cases, one of the most fruitful source of problems are your **own experiences** as a **professional educator** or as a curious **learner**. In a classroom there is a dynamic interaction between teacher and student; between student and student; and between student and materials. This interaction provides a rich source of problems to be solved through the conduct of various research studies. Classroom instruction, lectures and discussions suggest many stimulating problems for research. The teacher may be confronted with a number of behavioural problems of students in the classroom. She/he has to take decisions about the probable effects of classroom instruction on student behaviour so as to establish a relationship between instructional objectives, learning experiences and student changes. The behaviour of students may be analysed in terms of their achievements, interests, attitudes, motivation and other cognitive and non-cognitive factors. The teacher has to take decisions about teaching strategies, selection and use of audio-video and other electronic media, and evaluation techniques. He or she may study the effectiveness of a particular strategy or technique so as to base classroom instructions upon empirical evidence rather than upon his/her biased impressions. For instance, as a student of distance education, you may wish to study the effect of 'extended contact programme' on the motivation of a group of PGDHE students. Similarly, as a teacher you have to decide about the instructional objectives for teaching various units of a course content and then to evaluate whether the instructional objectives have been realized. In case of a discrepancy, you may wish to investigate the drawbacks in the formulation of objectives, planning and organization of learning experiences, and the process of evaluation itself.

The classroom is not the only source of problems for the teacher. The **experiences of students**, their attitudes, home environment, peer influences, motivation level, study habits, organizational and management problems of the institutions are other rich sources of problems.

The unrest among the students in the universities and colleges, the problem of recruitment of university and college teachers, the controversy of quality and quantity, development of library facilities, improvement of teaching, medium of instruction, participation of students in decision making bodies of the universities, the role of teacher's and students' unions, future enrolment policy in higher education, the problem of selective admissions, the autonomy within the university system, the examination reforms at the higher education stage, the role of higher education in the women empowerment, and issue of accountability among university and college teachers suggest worthwhile problems for research in higher education.

As a learner in the distance and open learning system, you may have felt that there is a need to identify academic, professional and vocational courses which can be initiated at the higher education level keeping in view the needs of various target groups including deprived sections of the society with help of survey studies. This can become another source of your research problem. Some of you may be interested in undertaking projects based on experimental and follow up studies for the development of course materials and their efficacy for distance learners. After going through the course material supplied to you by IGNOU and your experiences with study centres, you might even have faced problems pertaining to the structure and quality of self instructional materials, assignments, contact programmes, student support services, choice of media and communication technology, and examination. These problems need to be studied using experimental, case study approaches and action research.

Contacts and discussions with research oriented people, attending conferences, seminars and listening to learned speakers are also helpful in identifying research problems. Active membership in organizations which are concerned with the improvement of educational system usually brings one into close contact with crucial problems and issues concerning higher education.

Inferences from theory

A second important source of research problems lies in the inferences that can be drawn from various **educational** and **psychological theories** studied by you. The application of general principles involved in various theories in specific classroom settings makes an excellent starting point for research. It will help to determine whether a particular theory can be translated into actual practice. Use and application of learning theories, theories of motivation, principles and techniques of guidance and counselling and innovative evaluation techniques provide rich sources of topics for research in classroom situations within formal and non-formal settings.

Professional literature

The study of professional literature will not only expose you to pressing research problems but also suggest the ways in which research is conducted. Research reports, bibliographies of books and articles, periodicals, research abstracts, year books, dictionaries, newspapers and research guides suggest important themes which can be selected for undertaking project work. Some special sources such as the **Encyclopedia of Educational Research**, **Dissertation Abstracts International**, **The Handbook of Research and Teaching** and similar publications are good sources for locating problems. For all such documents it would be advisable for you to contact your counsellors in the study centres or the nearby libraries in higher learning institutions.

Technological and social changes

Technological and social changes demand development of new courses and curriculum for students in both formal and open systems. These developments constantly bring forth new problems for research. The use of hardware and software in teaching, the training of teachers in the methodology of teaching through simulation, team teaching, etc. give rise to various types of problems for research.

The four 'Ps'

Another interesting way to classify sources of research problem is the four 'Ps':

- People;
- Problems;
- Programmes; and
- Phenomena

The following table is illustrative of the above:

Table 1 The four 'Ps'

Aspects of a study	About	Study of
Study population	People	Individuals, organizations, groups, communities
Subject area	Problem	Issues, situations, associations, needs population, composition, profiles, etc.

	Programme	Contents, structure, outcomes, attributes, satisfaction
	Phenomenon	Cause and effect relationships, the study of a phenomenon itself, etc.

Source: Kumar, Ranjit, 1999 *Research Methodology A Step-by Step Guide for Beginners*, Sage: New Delhi

In the context of the four 'Ps', let us examine issues in higher education that could be of research interest. In education there are several such issues: student's satisfaction with a teacher, attributes of a good teacher, the impact of home environment on the educational achievement of students, and supervisory needs of post-graduate students in higher education, etc.

Evaluating the problem

Before selecting a problem which you finally select for undertaking a research project, you should ask yourself a series of questions about its feasibility and significance. These questions are helpful in the evaluation of the problem in terms of your personal suitability and social value of the problem. All these questions must be answered affirmatively before the project work is undertaken.

Is the problem researchable?

There are certain problems that may not be effectively solved through the process of research. There are certain problems which can be answered only on the basis of value judgement. The relevant data may not be available to find answers to questions involving ethical issues. The research problem must be such that can be stated in workable research questions to be answered empirically.

Is the problem a new one?

There is no purpose in studying a problem which has already been adequately investigated by others. In ignorance you might select a problem for your project work which is neither new nor original. You will spend time needlessly on a problem already investigated by some other researcher. To avoid such duplication, it is essential to examine very carefully the record of previous research projects completed in the area. However, this does not mean that a problem which has been investigated in the past is no longer worthy of study. You might want to repeat a study when you want to verify its conclusions or to extend the validity of its findings in a situation entirely different from the previous one.

Is the problem significant?

The question of significance of the problem usually relates to what you as a researcher hope to accomplish in a particular study. What is your purpose in solving the particular problem you have chosen? What new knowledge do you hope to add to the sum total of what is known? All these questions need to be addressed and unless these are answered clearly, the problem should not be selected for project work. Your project should indicate that it is likely to fill the gaps in the existing knowledge, to help in resolving some of the inconsistencies in the earlier studies, or to help in the interpretation of the known facts.

Is the problem feasible?

A problem selected for the project work may be a good one from the point of view of the three criteria mentioned above, yet it may not be feasible in view of some of the aspects discussed below:

Research competence: The problem should be in an area in which you are qualified and competent. You must be familiar with concepts involved in the area and also possess necessary skills and competencies that may be needed in the conduct of study.

Interest and enthusiasm: The problem should be one in which you are genuinely interested and about which you are truly enthusiastic. It should be meaningful and arouse your curiosity.

Financial consideration: The problem should be one which is financially feasible. You must ascertain whether you have the necessary financial resources to complete the project work on the selected theme. You must have an estimate of the expenditure involved in development of tools and data collection, printing, travel, typing, etc.

Time requirement: Project work is one of the requirements of PGDHE. You are required to complete it within a stipulated time. Thus the project selected by you should be one which can be completed in the allotted time alongwith other courses of the PGDHE. It is worthwhile to plan for the time that will be needed for the development and administration of tools, processing and analysis of data, and writing of the project report.

Preparing a research proposal

After evaluating the problem, you have to prepare and write out a proposal, synopsis, or a plan for undertaking the project work. It would include a **statement of the problem** and its **significance**, **formulation of hypothesis(es) (if any)**, **the methods** indicating the selection of sample(s) tool(s); technique to be used in the collection and analysis of data and a detailed bibliography.

A research proposal is a systematic plan, which brings to focus the preliminary planning that will be needed to achieve the objectives of the proposed project. It is just like a blue print which the architect prepares before the construction of a building. The initial draft of the proposal is subject to modifications in the light of the constructive criticism, comments and suggestions of experts in the field. The experts include your supervisor, counsellors, colleagues or research specialists in the concerned field. The research proposal always goes through the developmental phases, and therefore, deficiencies, if any, may be corrected by discussing the same with experts. You may note that an acceptable research proposal, therefore, is usually the result of several modifications. The proposal should be prepared with all care and caution.

As pointed in the figure, there are certain specifications that are essential to good research project and, therefore, all such specifications should appear in each proposal. A worthwhile research study is likely to result only from a carefully planned and well designed plan. Let us discuss one by one the categories of information which should appear in the proposal:

A research proposal must have information about

- **what** you are proposing to do;
- **how** you plan to do it;
- **why** you selected the proposed strategy

The following categories of information should be carried in the proposal:

- definitions' problems and **limitations**;
- a statement of the **objectives** of the study;
- a list of **hypotheses** (if you are **testing any**);

- the **research instrument(s)** you are planning to use;
- the information on **sample size and sampling design**;
- information on **data processing** procedures;
- an outline of the proposed **chapters** for the report; (if possible)
- a proposed time **frame**.

Figure 2 A Framework for research proposal

The title

The title of the research proposal should do no more than name the topic. It should be so worded that it suggests the theme of the study. In selecting a title, you are advised to consider two things:

- i) The title should not be burdened by pompous words and should not include terms of unscientific, rhetorical, emotional, or biased nature.
- ii) The title should not be too lengthy or too involved. It should be specific to the area of study. An adequate title for a project is one which represents a reasonable restriction and implies an objective approach. It may be noted by you that the proposed study for project work cannot be presented in the title; but it should be so worded that it would give sufficient information about the nature of the study.

For example, the title

A Study of the Effect of a Remedial Instructional Material on the Achievement of Slow Learners in Mathematics at the College Level

is simply worded and conveys specific information about the nature of the study.

The statement of the problem

Statement of the problem is not exactly the same as the title of the project. It means the definition of the problem which has a definite place in the introductory part of the proposal. The statement of the problem is primarily an expansion of the title. It provides an explanation of the title with focus on a stated goal. It must be limited enough in scope to make a definite conclusion possible. The major statement of the problem is followed by minor statements. To state a problem means to specify it in detail and with precision.

In the formal statement of the problem, you are required to describe the background of the study, its theoretical basis and stating the problem in concrete, specific and workable questions. All questions or issues raised must be related the problem. Each major issue should be separated into its subsidiary or secondary elements which need to be arranged into a logical order. These elements must clarify exactly what is to be determined or studied so as to restrict the scope of the project.

The significance of the problem

A good research proposal should specify the worth and urgency of the project. It should indicate clearly how the results of the project can influence educational processes and practices. The significance of the project undertaken for research study can be shown in several ways.

One way of establishing a need for the project work is to show the time lapse between the earlier project study and the present one; therefore the new interpretation, new knowledge, modified techniques, or conditions indicate a need to replicate the study.

A second way of justifying the need for a study is to show that there are gaps in the knowledge provided by the previous studies and to show how the present study will help to fill in these gaps and add to the quantum of existing knowledge.

A third way to justify the need for a study is to show the lack of information about a problem by presenting the supporting statements of other research studies.

Being a student of PGDHE, it is worthwhile for you to justify the need for undertaking a study for the project work by relating it to the existing social, political or economic issues at the higher education stage in the context of national educational developments.

Definitions, assumptions, limitations and delimitations

It is important to **define** all the unusual **terms** and **concepts** that could be misinterpreted. The variables involved in the problem should be defined in operational terms. These definitions help to establish the frame of reference with which the researcher approaches the problem. The technical terms or words and phrases have special meanings. We seldom come across unanimous definitions or modes of measurement for certain concepts and terms such as achievement, motivation, intelligence, etc. and in such situations, it becomes obligatory on the part of the researcher to provide an operational definition of such terms or concepts by stating how the variables will be measured and interpreted. The **Dictionary of Education**, edited by Carter V. Good; the comprehensive **Dictionary of Psychological and Psychoanalytical Terms**, edited by Horace B. English and Eva C. English and the **Dictionary of Sociology**, edited by H.P. Fairchild are some of the valuable sources for definitions of technical terms.

To illustrate this further, let us consider the title stated earlier that is, the "Effect of a remedial instructional material on achievement of slow learners in mathematics at the college level". This statement is broad and it communicates in general what you want to do. However, the problem needs to be defined with further clarity if you have to find a method to arrive at the right type of conclusions.

The first step is to specify the variables or terms involved in the problem and define them in 'operational terms'. The terms involved in the problem are **effect**, **remedial instructional material**, **achievement** and **slow learners**. It may be noted that these terms or variables are not given dictionary meanings. For example, the dictionary meaning of "effect" is "a change which is a result or consequence of an action or other cause". This meaning is not sufficient for our research purposes. It is important for you as a researcher to specify exactly what indicator of effect you will use or what you will do to measure the presence or absence of the phenomena denoted by the term "effect." Similarly, you have to define other variables also in terms of the operations or processes that will be used to measure them. To define operationally, it is always essential to indicate some kind of overt behaviour that is directly observable and measurable to represent those concepts involved in the variables.

In this study, you might choose to define **effect** as the **improvement made by the students in scores** on a criterion or mastery test in mathematics. The term **remedial instructional material** would be defined as the **self instructional material in mathematics following modular approach** based on a specified unit of mathematics course. The variable **achievement** may be defined as **scores on a mastery test** developed for the specified unit of mathematics. **Slow learners** might refer to that **group of students who are studying in the first year degree course of a particular college and are slow in learning mathematics compared**

to other students of the class. These operational definitions of the variables will help you to narrow down the scope of a general question to specific measurable and observable variables.

Assumptions are statement of ideas that are accepted as true but cannot be verified. These are written to reveal what the researcher, and others, theorize to be true in the conduct of the study. The assumptions are written to indicate those factors affecting the study but are necessarily unalterable.

Limitations are those conditions which are beyond the control of the researcher. These place restrictions on the findings of the research study and their applications to other situations. For example, due to certain administrative problems, the researcher was not able to select the random sample of students for conducting the experiment, validate the criterion test, etc.

Delimitations are the boundaries in respect of: (i) the scope of the study by specifying the areas to which the conclusions will be confined; and (ii) the procedural treatment including the sampling procedures, the techniques of data collection and analysis, the development of measuring tools and their use in the study.

The research objectives

The research objectives facilitate the execution of activities of the project in a planned manner. They are stated in achievable terms. The objectives have to be enumerated in such a sequential manner that achievement of one objective is logically connected to another activity and so on. They serve as the **functional blue print** of targets of the research project. A research activity may have **major** and **minor** objectives also. A major objective will be to achieve the global target of the research project, whereas the minor objectives focus specifically on the secondary purposes of the project. In other words, the major objective is an overall statement of the thrust of your study. It is also a statement of the main associations and relationships that you seek to discover and establish. The minor objectives are the specific aspects of the topic that you want to investigate within the main framework of your study.

Minor objectives should be numerically listed. They should be worked clearly and unambiguously. Make sure that each objective contains only one aspect of the study. Use action-oriented words on verbs when writing your objectives. The objectives should start with words such as 'to determine', 'to find out', 'to ascertain', 'to measure', 'to explore'. The following illustration gives an idea of objectives:

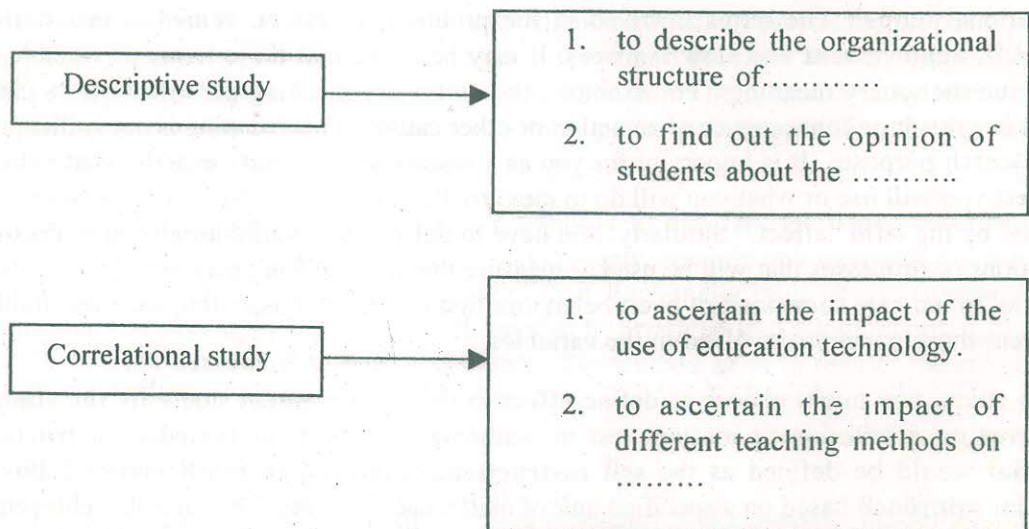


Figure 3 Research objectives

Review of related literature

Review of related literature available in research journals, books, dissertations, theses and project reports is helpful to researcher to acquaint herself/himself with current knowledge in the field or area in which the study is to be conducted. It enables the researcher to define the limits of the field and scope of the study. The review brings the researcher up-to-date on the work which others have done and thus to state the objectives clearly and concisely.

By reviewing the related studies the researcher can avoid unfruitful and useless problem areas. She/he can select only those areas in which his/her endeavours would be likely to add to the knowledge in a meaningful way. The review is helpful in avoiding unintentional duplication of well established findings and thus helps in the formulation of hypotheses.

The review of related literature gives the researcher an understanding of the research methodology which refers to the way the study is to be conducted. It helps her/him to know about the tools and techniques which have proved to be useful and promising in the previous research projects. The advantage of the review is also to provide insight into quantitative (statistical) and qualitative analysis techniques through which validity of results is to be established. The most important advantage of reviewing the related literature is to know about the recommendations of previous researchers listed in their project reports for further research.

The first step in reviewing the related literature is the identification of the material that is to be read and evaluated. This identification can be made through the use of **primary** and **secondary** sources available in the library. Though consulting primary sources is a time consuming process for a researcher, yet they provide a good source of information on the research methods used. In secondary sources, the researcher compiles and summarizes the findings of the work done by others and provides interpretations of these findings. The disadvantages of such sources is that the researcher is dependent upon some one else's judgements about the important and significant aspects of the study.

The decision concerning the use of primary and secondary sources depends largely on the nature of the project work proposed and undertaken by the researcher. If the project pertains to an area in which much research has been reported, a review of primary sources would be a logical first step. On the other hand, if the research study is in an area in which little or no research has been conducted, scrutiny of the secondary sources is more logical.

While recording and preparing the research proposal, you are advised to note (i) reports of studies closely related to projects that have been successfully completed; (ii) procedures employed and data-gathering tools and techniques used; (iii) sampling methods used in the selection of sample(s); (iv) variables that were identified and defined; (v) limitations that could have been overcome; and (vi) recommendations for further research.

In recording of the related studies, the researcher may use bibliography cards. These cards should be arranged according to the proposed outline of the project.

REMEMBER EVERYTHING THAT IS READ HAS TO BE RECORDED
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The hypothesis

Questions that the research project is designed to answer are usually framed as hypotheses at the proposal stage to be tested on the basis of evidence. This step establishes the problem and the logic underlying the study. The hypothesis gives direction to the data gathering procedure. It is in the light of the hypothesis that the relevance of data to be collected is judged.

Hypothesis is a **guess** or a **tentative generalization**, but the guess is **not** merely **accidental**. Its formulation is typically determined by the implications of related literature and deductive logic of the problem under investigation. A good hypothesis should be (i) reasonable; (ii) consistent with known facts or theories; (iii) formulated in such a way that it can be tested and found to be probably true or probably false; and (iv) stated in the simplest possible terms. Its importance is generally recognised more in the studies which aim to make predictions about some outcome. In **experimental type** of research project, a researcher is interested in making predictions about the outcome of the experiment or what the results are expected to show. Thus the role of hypothesis is considered to be of utmost important. In the problem which we stated earlier, our interest is to study the effect of remedial instructional material on the achievement of slow learners in mathematics at the college level. Since the study is experimental in nature, it is essential to formulate the hypothesis for making prediction about the outcome of the experiment. The expected outcome may be in terms of the gain in the achievement in mathematics by the group of slow learner college students.

In the **historical** or some **descriptive research**, on the other hand, the researcher may be interested in investigating the history of an educational institution, the life of a man or the happening of an event and thus may not have a basis for making a prediction of results. A hypothesis, therefore, may not be required in such fact-finding studies. It may be noted that when fact-finding alone is the aim of a research project, a hypothesis may not be required.

A hypothesis can be stated in **directional** or **non-directional** type. The hypothesis which stipulates the direction of the expected differences or relationships is termed as directional hypothesis. For example, in the problem stated earlier, you may frame the **directional** hypothesis as:

There will be a significant positive gain in the achievement of mathematics of slow learners at the college level after studying the remedial instructional material.

This statement of hypothesis stipulates the direction in terms of **significant positive gain** in the achievement of mathematics of slow learners at the college level as a result of studying the remedial instructional programme.

A research hypothesis which does not specify the direction of expected differences or relationships is a non-directional hypothesis. For example, in the above problem we may formulate the **non-directional** hypothesis as:

There will be a change in the achievement of mathematics of slow learners at the college level after studying the remedial instructional materials.

In this statement, the direction of **change** in achievement of mathematics of slow learners at the college level has not been specified and hence, the hypothesis is in the non-directional form.

Methods

This part of the research proposal comprises of three parts: **subjects**, **procedures**, and **data analysis**. The subjects section discusses the population from which researcher plans to select the sample on the basis of various attributes like chronological age, socio-economic status, locality, gender etc. The number of subjects required from the population and how they will be selected are also indicated in this section.

The section of **procedures** provides information about the research plan. It describes in detail the method of research, i.e. what will be done? How it will be done? What data will be needed? And what data gathering tools and techniques will be used?

The **data analysis** section outlines the techniques (quantitative or qualitative) which will be used in tabulating, organizing and analyzing various types of data. The information about the techniques should be specific and detailed enough to avoid any ambiguity and confusion.

Bibliography

The research proposal should include a list of books, journals and other documents that have been used in identifying and selecting the problem and which may be used during the tenure of project work.

Time schedule

For completing the project work, you should also prepare a realistic time schedule keeping in view other requirements of the PGDHE and your own personal commitments. Dividing the project work into phases and assigning dates for completion of each phase will help you to use your time systematically.

Let us now take an example and try to follow all the steps that we have discussed above:

1. The title

The relationship between academic achievement and social environment.

2. Introduction and statement of the problem

- The role of education in our society.
- Major changes in the philosophy of education over time.
- Factors affecting attitudes towards education.
- The development of education in(country).
- Trends in education participation rates in ... (country) with particular reference to the region in which the study is being carried out.
- Changing educational values.
- Trends in education in ...(country).
- etc.

3. The significance of the problem

- How do the previous researches explain the relationship between academic achievement and social environment?
- What do previous theories and research have to say regarding the components of the theoretical model and academic achievement, for example, the relationship between academic achievement and:

- the self-esteem and aspirations/motivation of a student;
- peer group influence;
- parental involvement and its relationship with their socio-economic status;
- the motivation, competence and interest in the students of teachers;
- employment prospects; etc.
- What is the difference of opinion regarding these as reflected in the literature?
- What is the relationship between educational achievement and social environment: what theoretical model will be the basis of your study?
- How will your study fill the gap?
- How will your study influence prevailing practices?

4. Definitions, limitations and delimitations

Definition of 'academic achievement', 'social environment', **limitations:** Problems in securing permission from colleges to carry out the study.

5. The objectives of the study

Main major objective:

- To examine the relationship between academic achievement and social environment.

Minor (sub) objectives:

- To find out the relationship, if any, between self-esteem and a student's academic achievement at college.
- To ascertain the association between parental involvement in a student's studies and his/her academic achievement at college.
- To examine the links between a student's peer group and academic achievement.
- To explore the relationship between academic achievement and the attitude of a student towards teachers.

6. The hypotheses to be tested

H1 = A student's self-esteem and academic achievement at college are positively correlated.

H2 = The greater the parental involvement in a student's studies, the higher the academic achievement.

H3 = A student's attitude towards teachers is positively correlated with his/her academic achievement.

Hi = etc.

7. Methodology

It is proposed that the study will be carried out in two government colleges in a metropolitan area. The principals of the colleges most accessible to the researcher will be contacted to explain the purpose of the study and the help needed from the colleges, and to seek their permission for the students to participate in the study. As the constraints of time and resources do not permit the researcher to select more than two colleges, negotiations with other colleges will cease when two colleges agree to participate in the study.

It is proposed to select B.A. 2nd year students, as the academic achievement of students in years 1 and 3 could be affected by factors unique to them. Year 1 students maybe experiencing anxiety as a result of having just made the transition to a new system.

In order to control the variance attributable to the gender of a student it is proposed to select only male students.

Once the principal of a college agrees to allow the study to be carried out, the researcher will brief the teacher in-charge about the study and its relevance, and will arrange a date and time for administering the questionnaire.

When the students are ready to participate in the study, the researcher will explain its purpose and relevance, and then distribute the questionnaire. The researcher will remain in the class to answer any questions the students might have.

i) Sampling

The selection of college will be done primarily through Quota sampling. Colleges will be selected on the basis of their geographical proximity to the researcher. The researcher will prepare a list of colleges in rank order, of accessibility.

All year B.A. 2nd year male students will constitute the study population. It is expected that the sample will not exceed 100 students.

ii) Analysis of data

Frequency distributions in terms of:

- age;
- parents' occupation;
- parents' educational levels;
- students' occupational aspirations;
- parental involvement in students' studies;
- self-esteem;
- peer group influence;
- number of hours spent on studies;
- etc.

Cross tabulations:

Academic achievement

- peer group influence;
- parental involvement in students' studies;
- self-esteem;
- occupational aspirations;
- attitude towards teachers;
- etc.

8. The structure of the report

The final report will have the following chapters:

- Chapter 1: Introduction
- Chapter 2: The study population
- Chapter 3: Occupational aspirations, self-esteem and academic achievement
- Chapter 4: The extent of parental involvement and academic achievement
- Chapter 5: Peer group influence and academic achievement
- Chapter 6: Academic achievement and student attitudes towards teachers
- Chapter 7: Summary, conclusions and recommendations

Self-assessment

1. *Why should the researcher be familiar with the field or area from which she/he intends to choose her/his problem?*
.....
.....
2. *Name some important sources which you can use for selecting a problem for the project work.*
.....
.....
3. *Select an area of your interest. Identify a problem which you may consider useful for the project work. Evaluate the problem.*
.....
.....

Executing the research project

After finalizing the research proposal, the next step is to execute the research project. The execution of research project involves various steps which include collection of data, analysis and interpretation of data, and formulation of conclusions and generalizations. Let us discuss this part in greater detail.

Collection of Data – Methods and Tools

Data collection is essentially an important part of the research process so that the inferences, hypotheses or generalizations tentatively held may be identified as valid, verified as correct, or rejected as untenable. In order to collect requisite data for any research project, the researcher has to sample the population concerned, since it is not possible to encompass the entire population; to devise appropriate tools for measuring the attributes concerned and to administer these tools on the selected sample groups. The following discussion will help you to understand the application of these concepts in undertaking the project work selected by you.

Sampling

Most of the educational phenomena consist of a large number of units. It would be impracticable to test, to interview or observe each unit of the population in order to arrive at principles having universal validity. Some populations are so large that their study would be expensive in terms of time, money, effort, and manpower.

Sampling is the process by which a relatively small member of individuals units, objects, or events is selected and analysed in order to find out something about the entire population from which it was selected. Sampling procedures provide generalizations on the basis of a relatively small proportion of the population.

A **sample** is the representative proportion of a population. To obtain a representative 'sample', it is necessary for a researcher to: (i) define the population; (ii) list the population; (iii) select a representative sample; and (iv) obtain an adequate sample.

A population refers to any collection of specified group of human beings or of non-human entities such as objects, educational institutions, geographical areas, salaries drawn by individuals, books etc. Population is also called as **universe** which can be finite or infinite. In our research projects we deal mostly with finite populations. All the 600 students studying in a college is an example of a finite population. The population should be properly defined so that there is no ambiguity as to whether a given individual or unit belongs to the population. For example, in a survey of library facilities available in the Regional Centres of IGNOU undertaken by you, it is necessary to define the population of regional centres by the geographical area or any other characteristics you consider important. Inferences concerning a population cannot be drawn until the nature of units that comprises it is clearly identified.

In order to select a sample from a given population, it is necessary to have a complete, accurate, and up-to-date list of all units in the population. This list is known as **sampling frame**. If a sampling frame is not readily available at the time of investigation, it is essential to prepare a frame before the samples can be drawn.

After defining a population and listing all the units, a researcher selects a sample of units from the sampling frame. This process is called **sampling**. A good sample must be as nearly representative of the entire population as possible and ideally it must provide whole of the information about the population from which the sample has been drawn. The logic of the theory of sampling is the logic of induction, that is, we proceed from particular (i.e. sample) to general (i.e. population).

Besides its representative characteristics, a good sample should be adequate. If the population under study is homogeneous, a small sample is sufficient. On the other hand, a much larger sample is necessary if there is greater variability in the units of the population. Increasing the size of the sample is of little value, if the units are not chosen in a way that ensures representativeness of the sample.

The methods of sampling are classified into two broad categories: (i) probability sampling and (ii) non-probability sampling. In **probability sampling**, the units of the population are not selected at the discretion or convenience of the researcher, but by means of certain procedures which ensure that every unit of a population has one fixed probability of being included in the sample. Such a method is also called **random sampling**. Different types of probability or random sampling include: (i) simple random sampling; (ii) stratified random sampling; (iii) systematic sampling; (iv) cluster sampling; and (v) PPS sampling.

In **simple random sampling**, each unit of the population is given an equal chance of being selected. A researcher may use lottery method to draw a simple random sample. Table of Random Numbers are also available for selecting a simple random sample. It may be noted that simple random sampling is neither possible nor feasible if lists of units do not exist or if such lists are incomplete. Moreover, if there is more heterogeneity among the units of a population, a simple random sample may not necessarily represent the characteristics of the total population, even if all selected units participate in the investigation.

In some research studies, a simple random sample may by chance have an undue proportion of one type of units in it and, therefore, it is necessary to make certain that the units included in the sample are selected in proportion to their occurrence in the population. When using the method of **stratified random sampling**, a researcher divides the population into different strata by some characteristics, and from each of the smaller homogeneous groups falling in each strata, he draws randomly a predetermined number of units. For example, you are interested to study the attitude of male and female teachers serving in different colleges (government and private) of a city towards privatisation of education at the higher level, imagine the total population of the college teachers is 500 with the following distribution:

	Male	Female	Total
Government Colleges	180	120	300
Private Colleges	130	70	200
Total	310	190	500

In order to ensure proportional representation of male and female college teachers from the two categories of colleges, private and government, you should select a stratified sample from population of 500 teachers. Suppose you decide to select a stratified sample of 125 teachers which represents 25 per cent of the population which is divided into four strata. To obtain a stratified sample, you are to select 25 per cent of the teachers from each of the four stratum. For this you will select randomly 45 male and 30 female teachers from government colleges, 33 male and 17 female teachers from private colleges. It may be noted that when a population is stratified, the units within each stratum are more or less homogeneous than are the units within the entire population.

When a frame of a population is available or when a population can be accurately listed and is finite, a method of systematic selection will provide a sample which approximates a random sample. In **systematic sampling**, a researcher generally starts with a list in which all the N units of the population are listed in alphabetic or some other order. To select a sample of size n,

he has to select a unit at random from the first k units of list and then every k th subsequent unit is selected. The number K is so chosen that n/k is equal to N or is just less than N . To illustrate this, suppose you are required to select a systematic sample of 7 libraries out of 100 libraries of IGNOU Regional Centres. For this you may select a regional centre at random from the first 14 regional centres of the list because $7 \times 14 = 98$ is less than 100. Let the library of the regional centre at serial number 6 be selected from the first 14 centres and then you will select every 14th regional centre library from the list to get a systematic sample of the regional centre libraries at 6, 20, 34, 48, 62, 76 and 90. This method gives a sample which is almost as good as a simple random sample and comparatively much more convenient to draw.

The **cluster sampling** is a variation of simple random sampling. It is used when the population under study is infinite, where a list of units of the population does not exist, when the geographic distribution of units is scattered, or when sampling of individual units is not convenient for several administrative reasons. For example, college student populations which are not completely listed, such as all the first year degree college students in a state, may be sampled in groups or clusters.

When the units of a population vary in size, such as colleges in respect of total enrolment, it is advisable to select such a sample that the probability of selection of a unit is proportional to its size. Therefore, a college with an enrolment of 1000 will get double the chance of being included in the sample compared to a college with an enrolment of 500. Such a sample is known as **probability proportion to size** or **PPS sample**.

In non-probability sampling, the units are selected at the discretion of the researcher. In the selection of such samples, we use human judgement in selecting units and there is no theoretical basis for estimating population characteristics. If a researcher is to select a sample of 40 social activists from a district, she may exercise her own judgement based on some information or experience for including an individual in the sample. The sample so selected is called a **judgement** or **purpose sample**. This type of sample is arbitrarily selected because there is good evidence that it is a representative of the total population. For example, in a study of eve teasing among college students, the researcher, on the basis of her/his past experience, selects certain colleges that have shown higher rate of such cases in the past.

Suppose in a study a researcher wants to know the study habits of students who attend college library regularly. She/he may fix a quota of 50 students and go on collecting from first 50 such students she/he is able to contact and get information from them. The sample of 50 students thus selected is called **quota** or **chunk sample**. If the quota is not fixed and the researcher collects information from all the students that are conveniently available and willing to co-operate for providing information, the sample is called **incidental**, **convenient**, or **volunteer sample**.

The non-probability sampling methods are very convenient in the situation when the sample to be selected is very small and the researcher wants to get some idea of population characteristics in a short time. Such samples are used in the situations where the researcher does not want a representative sample but to gain insight into the problem by selecting only informed people who can provide him the maximum degree of insight into his problem with detailed information.

In conclusion, the choice of sampling method depends upon many considerations unique to each individual project. These include the definition of the population, available information about the structure of the population, the parameters to be estimated, the nature of the research study or project, method of research, the objectives of analysis, and the financial and other resources available for the project.

Data-gathering tools

You will require many data gathering tools and techniques which may vary in their complexity, design, administration and interpretation. Each tool or technique is appropriate for the collection

of certain type of evidence or information. You have to select tools from the available tools, which will provide data you may require for the testing of the hypothesis(es). In some situations, you may find that the existing research tools do not suit your purpose and so you have to modify them or construct your own.

As a researcher, you should familiarise yourself with the nature, merits and limitations of the existing tools and should also develop skills in the construction and use of each of the research tools.

The major data-gathering tools of research may be classified broadly as: (i) psychological tests, (ii) inquiry forms, (iii) observation, (iv) interview, and (v) sociometric techniques.

Psychological tests are among the most useful tools of educational research. They have to be devised to evaluate or measure behaviour in a standardized way for the purpose of selection, classification, prediction and guidance as well as the evaluation of educational programmes. Tests are used to measure intelligence, aptitudes, creativity, achievement, personality traits, interests and values.

Questionnaires

Questionnaire is an important tool in data gathering. A well designed questionnaire is constructed after a review of the objectives of the study so that it performs its intended functions. You should ensure that as far as possible, the questions seek information/ responses covering all aspects of the study. The questionnaire should not be too demanding and time consuming on the people for whom it is intended. Questions in the questionnaire fall into two types **open** and **closed**. Closed questions offer limited number of options to the respondents. The Likert scale named after Rensis Likert who developed this format in 1932 is the most useful of such question forms. The respondent is presented with a sentence and is asked to agree or disagree on a three, five or seven point scale. The five point scale is the most practical for common purposes. In a study of adolescent attitudes towards gender equality the following item could be included. In the questionnaire, the boxes 1-5 would have the following headings: Strongly agree, Agree, Uncertain, Disagree, Strongly Disagree.

It is more important that boys rather than girls should go to University.				
1	2	3	4	5

Open questions allow the respondents to answer as she/he desires. For example, in a study of why the respondent (who has been identified as a teacher) chose teaching as a career an open question is more appropriate. Open-ended questions can also be structured to make data recording easier. For example, an open-ended questionnaire can be structured by asking the respondents to give the three main factors/ reasons. Questions have to be structured to get optimum response.

The following guiding principles (based on suggestions by Borg and Gall, 1983) have been found to help in optimizing the response from the sample:

1.	Make the questionnaire look attractive. Use good quality paper.
2.	Organise the questionnaire into a logical sequence, so that related items are grouped together. Use headings to tell the respondent what each group of questions is about, or what their purpose is.
3.	Lay out the questions so that they are as easy as possible to read and to complete.

4.	Do not hesitate to give clear instructions in BOLD type wherever it may be thought necessary so that the respondents are not left wondering what it is that they are expected to do.
5.	Use examples to demonstrate how to complete items wherever you think the respondents may have a problem. (Be careful, however, that your examples do not prompt them to provide what may be perceived to be the 'correct' answer).
6.	Begin your questionnaire with the items that are most easily answered, so as to build up the respondents' confidence.
7.	Do not leave the most important questions until the end. By this time, whatever the length of the questionnaire, the respondents will be intent on finishing it and may answer them more casually than would be wished.
8.	Precede the questions by a statement about the nature of the research; what it seeks to achieve and the benefits that will flow from its successful completion. Make it clear to the respondents that their cooperation is vital to its success, and express your gratitude for it. If it is for postal use, put the name and address of the person to whom it is to be returned. You will have included a self-addressed, stamped envelope for return. The statement should also give assurances to the respondents on the subject of anonymity. This is particularly important when they are asked to write their name on the questionnaire as may be the case in a postal survey or if the researcher intends to follow up the questionnaire by interviewing a proportion of the respondents.
9.	At the end of the questionnaire, express your thanks to the respondents for cooperating in the study by completing it.

Figure 4 Principles of a good questionnaire

Inquiry forms are a set of data gathering research tools which make use of properly designed proformas for inquiring into and securing information about certain phenomena under investigation. Tools included in this category are questionnaire, schedule, checklist, rating scale, score card and opinionnaire or attitude scale.

Observation is a technique in which one or more persons observe what is occurring in some real-life situation. It classifies and records pertinent happenings according to some planned scheme. It is used to evaluate the overt behaviour of individuals in controlled and uncontrolled situations. Observational technique has occupied an important place in descriptive studies. It needs proper planning, expert execution, and adequate recording and interpretation.

Observation may be either **participant** or **non-participant**. In participant observation, the observer (researcher) becomes more or less one of the group under observation. It may play any one of several roles in observation, with varying degrees of participation, as a visiting stranger, an attentive listener, an eager learner, or a more complete role as participant observer. In the non-participant observation, observer (researcher) takes a position where her/his presence is not disturbing to the group. She/he may follow in detail the behaviour of one individual or may describe one or two behaviour characteristics of a dozen or more individuals.

Observation may also be classified as **structured** or **unstructured**. The structured observations are much too formal and they are designed to provide systematic description for testing causal

hypotheses. They are executed in controlled conditions. Interaction analysis of the classroom verbal behaviour of a teacher is an example of structured observation. Structured observations start with relatively specific formulations. The observer sets up in advance categories of behaviour in terms of which she/he wishes to analyse the problem, and keeps in mind the time limit under which she/he has to make the observation. In unstructured observation, the observer does not categorise the behaviour in advance for observation. There is no fixed time limit.

Decide exactly what you need to know.	List all topics/aspects about which information is required.
Consider why you need this information.	Examine your list and remove any item that is not directly associated with the task.
Is observation the best way of obtaining the information you need?	Consider alternatives.
Decide which aspects you need to investigate.	Are you particularly interested in content, process, interaction, intervention – or something else?
Request permission.	Clear official channels and also discuss what is involved with individuals concerned.
Devise a suitable grid, checklist or chart.	Consult published examples and adapt where necessary.
Consider what you will do with the information.	Is it likely to produce anything of interest? Will the data be sufficiently complete to enable you to come to any conclusion?
Pilot your method and revise, if necessary.	Memorize categories. Devise your own system of shorthand (symbols, letters, etc.). Practice recording until you are confident you can cope.
Prepare carefully before the observation.	Draw a plan of the room, indicating seating arrangements and layout. Make sure you have enough copies of grids or checklists. Consult minutes of previous meetings, agenda, scheme of work, etc.
Discuss where you will sit with whoever is in charge and with people who are to be observed.	You should try to be as unobtrusive as possible. Exactly where you sit will depend on your own preferences and the views of participants.
Remember that no grid, however sophisticated, will tell the full story.	Try to place the event in its organizational context.
Analyse and interpret the data.	Factual statements about what has been observed are only part of the task. Consider what the facts indicate or imply.
Don't forget to thank the people who have allowed you to observe.	You may need their help again!

Figure 5 Observation studies checklist

Interview is a process of communication or interaction in which the subject or interviewer provides the needed information verbally in a face-to-face situation. Although the interview is generally associated with counselling or psychotherapy, it can be used effectively to collect useful information about individuals in many research situations.

Interviews are classified as **structured** and **unstructured**. A structured interview is one in which the procedure to be followed is standardized and is determined in advance of the interview. The same type of questions are presented in the same order to each subject or interviewer, and wording of the instructions to the interviewers is specified. The interviewer has no freedom to rephrase questions, add extra ones, or change the order in which the questions have been presented. On the other hand, unstructured interview provides greater flexibility. Although the series of questions to be asked and the procedure to be followed are decided upon before hand, the interviewer is largely free to arrange the form and timing of questions.

Interview technique is mostly used in descriptive and case study researches.

1. Kind and context of interview.

What is the rationale for using interviews?

What kind of interview is it?

How is the interview structured?

How much flexibility does the interviewer have?

What is the length, location and occasion of the interview?

2. Characteristics of the interview participants

a) Interviewees

Who and how many people are involved?

What is the basis for their selection and how was the selection made?

b) Interviewers

Who and how many people are involved?

What experience of interviewing do they have?

What is their relationship to the main research?

What is their status and relationship to the interviewees?

3. The purpose of the interview

What are interviewees told about the purpose of the interview?

Is this understanding shared with the interviewer?

Who will have access to the data collected and is it negotiable?

4. The method(s) of data collection

How strictly controlled is the method of asking questions?

How are responses recorded?

What other methods of data collection are being used and what is the relative weighting between the methods?

5. Analysis and reporting of data

Who analyses what?

How are the interviewers concerned with the analysis?

How many analysts are there and how are disagreements resolved?

Are full transcripts used?

What basis is used for filtering the data?

What level of uncodeable data is tolerated?

Sorting of results

How are the outcomes of the interviews being evaluated?

What access may the academic community have to raw data?

Figure 6 Guidelines for conducting an interview

Sociometric techniques attempt to describe attractions or repulsions between group members by asking them to indicate whom they would select or reject in various situations. In research, such techniques are generally used to study social adjustments, group dynamics, learning motivation, discipline, and other problem areas that involve social relations. Numerous sociometric techniques are used to measure social interaction within groups, but sociogram, sociometric matrices, guess-how technique and social distance scale are mostly used in educational research.

Selection of sampling design and data gathering tool(s) mostly depends upon the nature of the study which a researcher has chosen for research. The study may be **historical, descriptive or experimental** in nature.

Historical study aims to discover, describe and interpret what existed in the past. Suppose you have selected a problem in which your objective is to “study enrolment trends among various categories of students in PGDHE course offered by IGNOU from 1995-2000.” In this type of study, your focus is on the enrolment of various categories of students during the past years for which you would identify the documents and records for scrutiny and analysis. For collecting various data, you would use primary and secondary sources. After the data have been identified, it is important for you to learn how to analyse these data pertaining to past using rigorous evaluation, which is known as **criticism of the data**. It involves the dual processes of establishing the authenticity of the source (**external criticism**) and of establishing the validity of its content (**internal criticism**).

In *descriptive study*, the aim is to obtain pertinent and precise information concerning the current status of phenomena and, whenever possible, to draw valid general conclusions from the facts discovered. It is restricted not only to fact finding but may often result in the formulation of important principles of knowledge and solution of significant problems concerning local, state, national and international issues. Descriptive studies are more than just a collection of data; they involve measurement, classification, analysis, comparison and interpretation. These studies collect and provide three types of information: (i) of what exists with respect to variables or conditions in a situation; (ii) of what we want by identifying standards or norms with which to compare the present conditions or what experts consider to be desirable; and (iii) of how to achieve goals by exploring possible ways and means on the basis of the experience of others or the opinion of experts.

Descriptive studies are classified in various types. Some are classified on the basis of the purposes they achieve; some on the basis of geographical areas they cover; and some on the basis of the techniques they employ. These classifications mostly range from the **survey**, which describes the status quo of variables, to the **correlational** study, which investigates the relationship between variables or **developmental**, which are concerned not only with the present status and interrelationships of phenomena but also with changes that take place as a function of time. Descriptive research in education can be classified into the following categories:

- Surveys;
- Case studies;
- Development studies;
- Ethnographic studies;
- Evaluation studies, and
- Action research

Surveys are broad studies of a generalized statistical nature rather than indepth studies of individuals on their characteristics. A survey involves the clear definition of the problem, systematic

collection of data, careful analysis and interpretation and reporting of the findings. Surveys include topics such as teacher opinions/attitudes on various educational matters, pupil drop-out rates, etc. Data is collected through the use of questionnaires, interviews, standardized tests and other techniques and this method has been widely used in educational research for many years.

To illustrate, suppose you are interested in studying the attitude of university and college teachers towards distance education and open learning system and state the title of project as: "Study of Attitude of University and College Teachers Towards Distance Education and Open Learning System". In this type of study, you have to design and develop an attitude scale, identify the population of university and college teachers for selecting representative sample groups of teachers, collect and analyse data for drawing conclusions in respect of attitude of the teachers towards distance education. This is a simple survey study which you may conduct at the local or state level.

It may be noted that **case study** method of research also falls in the category of descriptive research studies. A typical case study is an intensive investigation of a social unit. The case study is essentially a research in depth rather than breadth. It is not applicable to a very large sample. However it can be employed in studying a small group of individual or a unit. The social unit may be an individual, a family, an educational institution, a group of delinquents, a slow learner, a gifted student, or any teenage group.

Development studies are not only concerned with the description of the current state of affairs and the phenomena/situation in a given point in time but in this type of study, recorded data are utilized with a view to determining what has happened in the past, what the present situation reveals, and what will be likely to happen in the future. However, as PGDHE students you are less likely to make use of this type of research since this is mostly longitudinal in nature involving longer spans of time.

Ethnographic studies have witnessed a growth in educational research because of dissatisfaction with the limitations of traditional quantitative methods. Emerging as a sub-field of anthropology and education, educational ethnography implies a methodological approach with specific procedures, techniques and methods of analysis. As a researcher, it is important to remember that the terms 'case study', 'qualitative research' and 'ethnography' are not interchangeable, Korg and Gall (1983) have defined an ethnographic study as 'an in-depth analytical description of an intact cultural scene'. The main aim of ethnographic research is to discover and describe the culture in an educational setting. The approaches, used emphasize inductive analysis, description and perception in the natural setting rather than the concerns with measurement and manipulation characterized by the experimental method. Ethnographic research involves participant observation, description concerns with process and meaning and inductive analysis. Since this type of research is inherently descriptive, everything observed is recorded, studied and analysed. As stated, ethnographers are concerned with process. How do rural students tackle problems related to urban institutional settings? What is the pattern of interaction in a meeting of teachers? Ethnographers collect their data in what are called field notes, here two types of observations are recorded – descriptive and reflective. Apart from its limitations, like demands on time and lack of generalizations, this approach has some unique benefits.

In case, you are interested in a topic related to curriculum evaluation, you could, problematize it thus, 'The effectiveness of teaching materials in achieving the desired outcomes'. The two types of *evaluation studies* are **formative** and **summative**. Formative studies gather information about programmes whilst they are in progress, summative evaluation is designed to measure the effectiveness of a programme on its completion by analyzing data collected using a variety of instruments including standardized tests.

Action research is aimed to help learners, teachers, and others to 'provide' a way of working which takes theory and practice into one whole: **ideas-in-action**. In its approach, action research shares with other approaches the need for careful systematic planning and the selection of methods, appropriate to the nature of the information required. In the field of education, action research has been employed in curriculum, professional and policy development, as well institutional improvement. It has certain essential features: testing ideas in practice as a means of increasing knowledge about curriculum, teaching and learning. The desired outcome is an improvement in the teaching/learning situation.

Experimental study aims to derive basic relationships among phenomena under controlled conditions or, more simply, to identify the conditions underlying the occurrence of a given phenomenon. It differs from descriptive research in that the researcher has some degree of control over variables involved and the conditions under which the variables are observed. The researcher deliberately manipulates some aspect of the experiment in which she/he is interested. She/he causes certain things to happen, and she/he observes how the condition is affected or changed. Although experimentation is the classical laboratory method of psychology, physics, chemistry, biology and other sciences, it has been effectively used in non-laboratory settings such as the classroom settings.

There are four essential characteristics of experimental research: (i) control; (ii) manipulation; (iii) observation; and (iv) replication.

Control is the essential ingredient of experimentation. It refers the extent to which different factors in an experiment are accounted for. Various methods which are commonly used to control inter-subject differences include: (i) random assignment of subjects to groups; (ii) matching subjects with random assignments; (iii) random assignments on the basis of homogeneous selection; (iv) analysis of co-variance; and (v) method of using subjects as their own controls. For controlling situational variables, we may: (i) hold situational variables constant; (ii) use method of randomization; or (iii) manipulate situational variables.

Manipulation refers to a deliberate operation of the conditions by the researcher. In contrast to descriptive research, in which the researcher simply observes conditions as they occur naturally, the researcher in the experimental study actually sets the stage for the occurrence of the factor whose outcome is to be studied under conditions in which all other factors which might affect the observation are controlled or eliminated. In the process of manipulation, a predetermined set of varied conditions are imposed on the subjects selected for the experiment. The set of varied conditions is referred to as the **independent variable**, the **experimental variable**, or the **treatment variable**. The independent variable may assume two or more values and the differences in the values may be of qualitative or quantitative nature. Methods of teaching, attitudes, study habits, classroom environment, etc. are some common examples of independent variables.

In the experimental research, the researcher studies the effect of the manipulation of independent variable on a dependent variable. The dependent variable, for example, may be learning some task. Since learning cannot be measured directly, the researcher can only observe it through measures as scores or marks on a test.

Despite the objectivity and caution of the researcher in controlling the extraneous variables through the method of randomization or other methods, some discrepancies invariably remain and influence the results of the experiment. The researcher can take care of such discrepancies through the replication of the study.

In an experimental study, it is necessary for the researchers to formulate the hypothesis, specify the nature of the variables in terms of independent experimental or treatment variable, dependent

variable and controlling variable(s). The details about the procedure of the experiment highlighting the type of the 'experimental design' which is to be used in the conduct of the project are to be provided. The design may be **one group pre-test post-test design, two groups randomized groups pretest posttest design, factorial design** or any other design which you think appropriate keeping in view the research objectives and hypothesis (es). As an illustration, let us consider the research problem entitled: "A study of the effect of a remedial instructional material on the achievement of slow learners in mathematics at the college stage" discussed earlier in which the main research objective is to study the impact of remedial instructional material in a specific unit of mathematics developed on mathematics achievement of a slow learner group studying in first year degree class in a college. The non-directional hypothesis formulated for achieving this objective is: "There will be a change in the achievement of mathematics of slow learner first year degree college students after studying the remedial instructional material".

In order to test the hypothesis it is necessary to provide details about the nature of variables and experimental design.

The independent or experimental variable in this study is "remedial instructional material" in mathematics and the dependent variable is 'achievement in mathematics' measured in terms of marks or scores obtained by the group of slow learners. It is also important to determine and name what variable or variables are significantly related to dependent variable (achievement in mathematics) which need to be controlled. These intervening variables are responsible for any relevant pre-existing differences between the subjects (students) selected for the experiment. In addition to inter-subject differences, there are some situational variables that might operate in the experimental situation itself. It may be noted that if the relevant and situational variables are not controlled in an experiment, we cannot be sure whether the change in the dependent variable (achievement in mathematics) is due to the effect of independent variable (remedial instructional material in mathematics) or because of the inter-subject differences or situational variables. Intelligence, motivation, study habits, family background, socio-economic status, attitude towards mathematics, etc. (intervening variables) are the variables which are significantly related to achievement in mathematics (dependent variable). In addition, venue and time for conducting the experiment, presence of the supervisor during the experiment, testing etc. are the situational variables which will also be considered for conducting the experiment.

Before the conduct of the experiment you are required to select a college for identifying a group of the students, studying in first year degree course, who are slow learners in mathematics. Suppose the number of such students is 36. You have also to select a unit, from the prescribed course in mathematics, for developing self instructional remedial material using modular approach and also a criterion/mastery achievement test.

There are various types of experimental designs which you may think of in this type of study. However, for the sake of illustration let us assume that "Randomised Groups, Pretest-Posttest design" will be used in the conduct of experiment. The group of 36 students will be assigned randomly to two groups each of 18 students. One group will be called the 'control group' and the other as 'experimental group'. Each group will be administered the criterion test in the morning hours. The experimental group will be given remedial instructional material for one month and the control group will not be provided any such material. At the end of one month, both the groups will be administered the criterion test. The difference in the means of the pretest and posttest scores will be analysed using t-test for assessing the effect of remedial instructional material on the achievement in mathematics of slow learners. It may be noted that by randomly assigning students to two groups and to two treatments, the effect of intervening and situational variables has been minimized. Randomisation is based on probability theory and is considered the best technique for attaining experimental equivalency.

In conclusion, the selection of a method and the specific research design within that method appropriate in investigating a research problem will depend upon the kind of data that the problem will require. However, the method and procedure selected should be in harmony with the scientific principles and adequate enough to lead to dependable generalisations.

Analysis and interpretation of data

Data collected from various sources or samples through the use of different tools and technique generally comprise of numerical figures, ratings, descriptive narrations, responses to open-ended questions, quotations, field notes etc. In educational studies, usually two types of data are recognised. They are **quantitative** data and **qualitative** data.

Quantitative data are obtained by using various scales or tests. The experiences of people are fit into standard responses to which numerical values are attached. These data are close ended and hardly provide any depth and detail.

Quantitative data are either parametric or nonparametric. Parametric data are measured data on interval or ratio scales of measurement. The marks scored by students in a test is an example of parametric data. Nonparametric data are obtained by applying nominal or ordinal scales of measurement. These data are either counted (enumerative) or ranked (ordinal).

Qualitative data are verbal or other symbolic materials. The detailed description of observed behaviours, people, situations and events, are examples of qualitative data. The responses to open ended questions of a questionnaire or a schedules, first hand information from people about their experiences, ideas, beliefs etc., and selected content or excerpts from documents, case histories, personal diaries and letters are other examples of qualitative data.

We make use of various types of techniques in the analysis of quantitative and qualitative data.

Statistical techniques have contributed greatly in gathering, organizing, analyzing and interpreting quantitative (numerical) data. In the analysis of quantitative data with the help of statistical techniques, the researcher is required to understand the concepts involved in use and applications of these methods. Their strengths and limitations need to be understood so that there is no ambiguity in the use of these techniques. Quantitative data analysis techniques include the use and application of various descriptive statistical measures: (i) measures of central tendency or averages; (ii) measures of dispersion or variability; (iii) measures of relative position; and (iv) measures of relationship. Inferential or sampling statistics, with the help of various parametric and non-parametric tests, enable the researcher to make generalizations or inferences about populations from the observations or measures of the characteristics of samples. Z-test, t-test, analysis of variance and co-variance, regression analysis, chi-square test, median test and Mann-Whitney U Test are examples of some parametric and nonparametric tests which are widely used in the analysis of quantitative data.

Qualitative data in form of responses and narratives are analysed to study or discover inherent facts. These data are studied from as many angles as possible to explore new facts or to reinterpret already existing facts. Content analysis, inductive analysis and logical analysis are mostly used in the analysis of qualitative material.

Once the data have been analysed, you can proceed to the stage of interpreting the results. The process of interpretation is essentially one of stating what the results show. It is not a routine and mechanical process, but calls for a careful, logical and critical examination of the results obtained after analysis, keeping in view the limitations of the sample chosen, the tools selected and used in the study. There is always an element of subjectivity which should be reduced to minimum by the researcher while interpreting the results.

Formulation of conclusions and generalisations

In the light of interpretations of the results, you as a researcher have to use all care and caution in formulating your conclusions and generalisations. This final step of the project work demands critical and logical thinking in summarizing the findings of the study and compare them with the hypothesis formulated in the beginning. You should not draw conclusions which are inconsistent among themselves or with external realities. The generalizations drawn on the basis of research findings should be in agreement with facts and should not conflict with the known laws of nature. The implications of the **conclusions** for the education processes and practices may also be indicated here. The suggestions for the applications of research findings in practical settings and suggestions for problems for further research may also be provided with conclusions and generalisations.

Self-assessment

4. *List various methods of sampling with examples.*

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5. *Give some examples of probability and non-probability samples.*

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6. *Name various data gathering tools which will be applicable to your research problem.*

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7. *Give some examples of quantitative and qualitative data with illustrations.*

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8. *What do you mean by analysis of data and interpretation of results?*

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9. Give two examples each of descriptive studies and experimental studies.

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The research report

After completing the research project as per the requirements of the research proposal, you are required to write the detailed account of the project highlighting the statement of the problem, research objectives, hypothesis(es) of the study based on the review of the related literature, method and procedures used in respect of development and use of tools, selection of sample groups, collection of data, analysis and interpretation of data, conclusions with educational implications and suggestions for further research in the area. The detailed account of all these aspects constitute a **research report**. There are certain rules and principles involved in writing a research report which we will discuss in the present section.

General format of the research report

For the purposes of presentation of a research report, several style manuals are available which provide us guidance as to the specific rules and on style and format to be followed in reporting the objectives, methods, procedures and findings of the research study. But all formats are somewhat similar to the following outline which comprises of three main sections: (i) the preliminary section; (ii) the body of the report; and (iii) the reference section. Each main section consists of several subsections.

Preliminary section

1. Title page

Several parts of preliminary material are presented prior to the body of a research report. Generally it contains the following information.

- i) Title of the project.
- ii) Name of the institution to which the report is being submitted.
- iii) Name of the candidate (if desired, previous academic degree may be listed after name).
- iv) Date of submission of the report.

2. Preface

The preface usually includes a brief statement of the purpose and scope of the report. It should also include thank for those who gave the researcher substantial guidance or help in the completion of the project work. If the researcher has little to say about the contribution of her/his research project, the preface can easily be omitted. In such situation, the page should be labeled **Acknowledgements** rather than 'preface'. Acknowledgements should be brief and simple. A long list of effusive acknowledgements full of flattery is not in good taste. The brief statement of acknowledgement should sincerely recognise the persons and institutions to whom the researcher is indebted for providing academic guidance, administrative support and facilities.

3. Table of contents

The table of contents include the major divisions of the report; the introduction, the chapters with their subsections, the bibliography and the appendix, alongwith the page numbers. The preface or acknowledgements, list of tables and list of figures are also entered in the table of contents.

Body of the report

The main body of the report contains four logical divisions:

1. The introduction

The introduction of a research report should be lucid, complete and concise. It should introduce the research problem in proper context, and arouse and stimulate the reader's interest.

In the introduction section the researcher defines, analyses, state the nature of the problem with research objectives. She/he also reviews the related studies so as to provide a rationale for the formulation of hypothesis(es). The introduction also includes the significance of the problem and the need for undertaking the research project. After reviewing the background of the problem, its scope and delimitations, the researcher presents the hypothesis (es) assumptions and operational definitions of the terms.

2. Design of the study

This section explains the design of the study in detail. It includes a detailed description about the **method** which was used in the conduct of the study, type of the data needed for the study, the tools and techniques used for their collection, and the procedure by which they have been collected. The details about the nature of the population, the size of sample(s), the method of sampling, tools, procedure of data collection, quantitative (statistical) and qualitative data analysis methods to be employed and reasons for selecting such methods, and how data will be organised and presented for analysis and interpretation, are also provided in this section.

3. Analysis and interpretation of the data

This section is the heart of the research report. The data analysis and interpretation may either be presented in separate chapters or may be integrated and presented in one chapter. The data are presented in table and figures accompanied by textual discussion. Tables which are complex and lengthy should be placed in appendix, otherwise the continuity of textual discussion gets broken. In the textual discussion the report should not repeat all the detailed information that is provided in tables and figures. It should only point out important facts and relationship to give meaning to the data and make certain generalisations about the data. Any weakness or limitations in the study pertaining to the research design, tools, or population that have come to light during the completion of the project work should be reported frankly alongwith the manner in which factors may have affected the findings of the study.

4. Summary and conclusions

This section includes a brief re-statement of the problem, a description of the procedures used, and discussion of findings and conclusions of the study. The conclusions are presented concisely and related directly to the hypotheses that were tested. As stated earlier they state whether the findings of the study, accept or reject hypothesis(es). Conclusions are answers to the questions raised and suggest modifications in the existing knowledge. In

addition, the researcher may list unanswered questions that have occurred in the process of study and which require further research beyond the scope of the problem investigated. The discussion and presentation of conclusions should leave the reader with the impression of completeness and of positive gain.

It should be noted that summary and conclusion section is the most widely used part of the research report because it reviews all the information that has been presented in its previous sections. Most readers scan this section of the report first to get an overview of the study and to determine its utility to them. If the study is of some utility to them, they go through the remaining chapters also.

5. Reference section

The reference section includes bibliography and appendix. The bibliography follows the main body of the report. It is a record of those sources and materials that have been used for the study. If the number of references is large, the researcher may divide the bibliography into various sub-sections, one for books, one for periodicals and journals etc.

An appendix follows the bibliography. All the relevant supporting unwieldy materials, that are important but not essential to the understanding of the report, are presented in the appendix. These materials include copies of the tools like tests, questionnaires, interview schedule, courses of study, raw data etc.

Style of report writing

An outstanding research study is of little value if its process and findings are not communicated effectively to others. Compbell (1969), Dugdale (1967) and Turabian (1967) have provided several style manuals. After adopting any of the style manuals, it is advisable to adhere to it throughout the report. A clear statement of research objectives and hypothesis(es), and logical and objective presentation of the procedure rather than emotionalized descriptions are required in a research report. A research report is usually read by well informed readers who always search for flaws in the process of reasoning. It is possible that the readers may check the results by repeating computations. To meet this eventuality, a research report must be presented so carefully that it can stand the test of critical scholarship of other readers.

The presentation of the report should be creative, logical and concise making use of simple common words and sentence structure whenever possible. Its language should be formal and straight forward avoiding slang, proverbial or discourteous phrases. The personal pronouns I, we, you, my, our and us should not be used. Their use should be avoided by the use of such expression as "the researcher" or "the investigator". The use of abbreviations, except some universally acceptable ones such as IQ, M.A., etc., should be avoided in the main text of the research report. In the footnotes, the tables and the bibliography, some standard abbreviations should be used to conserve space. A researcher should be familiar and should master the standard abbreviations, viz., et al, edn, eds, fig etc.

Numbers of less than three figures, round numbers and numbers that begin sentences are spelled out, except in statistical discussions in which they are used frequently. Fractions are also spelled out unless they are part of longer numbers. Figures are used for decimals and percentages, but word 'per cent' is spelled out e.g. 12 per cent.

To ensure continuity of the text, neither the standard statistical formulae nor the computations are included in the research report.

A good dictionary, a spelling guide and Roget's Thesaurus should be made use of by the researcher. The past tense should be used when referring to what the researcher or other researchers have done. The present tense should be used when the researcher is referring the

reader to the tables and charts that are presently before him and when he is presenting general truths and well established principles.

Typing the research report

A typist with proficiency should be engaged for typing the research report. It is the responsibility of the researcher to present manuscript material to the professional typist in the proper form. The manuscript should adhere strictly to the institutional requirements to which the project report is to be presented. A well and accurately typed report makes its presentation interesting and meaningful to the reader.

When the final typed copy of the report is completed, it is necessary to proof read each page carefully. The typing errors are best detected by proof reading each line from right to left. It is advisable to retype the page if there are more than one or two corrections. While retyping care should be taken to accommodate the material in such a way so that the last line on the page comes even. If no care is taken, the researcher may have to retype the rest of the chapter and renumber the remaining pages of the research report. Nowadays computers are available which have made typing convenient and accurate. Mathematical and other special symbols are also available on the computers which was not the case with ordinary type writers.

Set the deadlines.	Allocate dates for sections, sub-sections and the whole report. Keep an eye on your schedule.
Write regularly.	
Create a rhythm of work.	Don't stop to check references. Make a note of what has to be checked, but don't stop.
Write up a section as soon as it is ready.	Try particularly to produce a draft of the literature review as soon as the bulk of your reading is completed.
Stop at a point from which it is easy to resume writing.	
Leave space for revisions.	Use one side of the page only. Try to keep to one paragraph per page.
Publicize your plans.	You may need a little help from your friends to meet the deadlines.
Check that all essential sections have been covered.	Abstract, outline of the research, review of previous work, statement of the scope and aims of the investigation, description of procedures, statement of results, discussion, summary and conclusions, references.
Check length is according to institutional requirements.	You don't want to be failed on a technicality.
Don't forget the title page.	
Any acknowledgements and thanks?	

Include headings where possible.	Anything to make it easier for readers to follow the structure will help.
Number tables and figures and provide titles.	Check tables and figures for accuracy, particularly after typing.
Make sure all quotations are acknowledged.	Check that quotations are presented in a consistent format.
Provide a list of references.	Include only items to which reference is made in the report. Check that a consistent system is used and that there are no omissions.
Appendices should only include items that are required for reference purposes. Do not clutter the report with irrelevant items.	One copy of each data-collecting instrument should be included.
Remember to leave sufficient time for revision, rewriting and typing.	Check that you have written in plain English.
Try to get someone to read the report.	Fresh eyes will often see errors you have overlooked.

Figure 7 Checklist for writing the project report

Self-assessment 10. Describe briefly the general format of the research report. 11. Name some salient features of a good research report.

Summary

- Research projects can be classified into three categories. The most common type is prepared by those who wish to undertake project activity for their diploma or for their master's or doctoral degree. Being a student of PGDHE, you are also required to select a theme or a problem in an area of your choice within the framework of the courses you have already studied and develop a research proposal for undertaking a project.
- Professional experience, inferences from theory, professional literature, and technological and social changes are important sources which are helpful to a researcher in selecting a problem.

- The problem selected for undertaking a research project should be researchable, new, significant and feasible.
- A good research proposal must indicate the title of the problem; its significance; statement of the problem; research objectives; review of related literature; hypothesis(es); methods highlighting selection of sample(s) and tools, collection and analysis of data; and bibliography.
- After finalising the research proposal, the next step is the execution of the research project which involves method of research, technique of selecting sample(s), development of tools, collection of data, analysis and interpretation of data, and formulation of conclusions and generalisations.
- When the research project is successfully completed, a detailed account of the project called 'research report' is prepared. The general format of the research report comprises of three main sections: (i) preliminary section; (ii) body of the report, and (iii) reference section. The presentation of the report should be creative, logical and concise.

Suggested readings and references

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