

Unit- 2

FIVE ELEMENTS OF EFFECTIVE WRITING

1. CENTRAL IDEA

This element of good writing involves focusing on a clear, manageable idea, argument, or thesis around which to organize your material. It includes selecting subordinate ideas that support and reinforce your central idea.

2. ORGANIZATION

This element of writing has to do with coherent arrangement of material. It involves keeping the reader oriented to the central and subordinate ideas. Good organization is logical and sequential. It guides the reader between divisions of the material.

3. SUPPORTING MATERIAL

Explanations, examples, statistics, and quotations make the ideas and information presented meaningful and memorable for the reader. In exposition, the role of supporting material is to clarify; in argument, to persuade.

4. EXPRESSION, WORD CHOICE, AND POINT OF VIEW

Language is clear, specific, accurate, and appropriate to the audience, purpose, and material. Variety in sentence structure and length creates emphasis. Word choice is clear, specific, accurate, unassuming, and free of clichés and misused jargon.

5. SPELLING, GRAMMAR, AND PUNCTUATION

This element of good writing counts only when it's wrong. Fair or not, your reader will notice your spelling, grammar, or punctuation only when you make a mistake. Checkpoints:

- Spelling, including technical terms and proper names, is correct.
- Correct words are used to convey the intended meaning.
- Generally accepted rules of grammar and syntax are followed, including pronoun/noun agreement, subject/verb agreement, appropriate verb tense, pronoun case, possessive forms, parallel construction, etc.
- Punctuation, particularly comma placement, reflects standard usage.

Professional writing is a style of written communication used in a workplace environment that allows professionals (e.g. businesspeople, professors, doctors, lawyers, etc.) to make informed decisions. Professional writing typically has a formal tone and differs from written text that is considered literary or artistic, which generally seeks to entertain and/or convey a philosophical truth.

Research Paper

A research paper analyzes a perspective or argues a point. Regardless of the type of research paper the researcher is writing, the researcher should present his own thinking backed up by others' ideas and information. A research paper involves surveying a field of knowledge in order to find the best possible information in that field and that survey can be orderly and focused.

Classification of Paper into one or the other Category

Research Paper: This category covers papers which report on any type of research undertaken by the author(s). The research may involve the construction or testing of a model or framework, action research, testing of data, market research or surveys, empirical, scientific or clinical research.

Viewpoint: Any paper, that includes content that is dependent on the author's opinion and interpretation, should be included in this category; this also includes journalistic pieces.

Technical Paper: Describes and evaluates technical products, processes or services.

Conceptual Paper: These papers will not be based on empirical research but will develop hypotheses. The papers are likely to be discursive and will cover philosophical discussions and comparative studies of others' work and thinking.

Case Study: Case studies describe actual interventions or experiences within organizations. They may well be subjective and will not generally report on research. A description of a legal case or a hypothetical case study used as a teaching exercise would also fit into this category.

Literature Review: It is expected that all types of papers cite relevant literature the literature review papers annotate and/or develop critique of the literature in a particular subject area. It may be a selective bibliography providing advice on information sources or it may be comprehensive in that the paper's aim is to cover the main contributors to the development of a topic and explore their different views.

General Review: This category covers those papers which provide an overview or historical examination of some concept, technique or phenomenon. The papers are likely to be more descriptive or instructional ("how to" papers) than discursive.

Format of Research Paper (Elements of Professional Writing -Research Paper)

The most commonly used style for writing research reports is called "APA" and the rules are described in the Publication Manual of the American Psychological Association. Avoid the use of first person pronouns. Instead of saying "I will ..." or "We will ..." say something like "The researcher will ..." or "The research team will ...".

These are the major components of a research paper:

1. Title page
2. Abstract
3. Introduction
4. Body, which includes the following:

- Headings and, if necessary, subheadings to organize the content
- In-text citations of research sources

5. Discussion

6. Conclusion

7. References page

All these components must be saved in one document, not as separate documents.

Title Page

The title page of paper includes the following information:

- Title of the paper
- Author's name
- Name of the institution with which the author is affiliated
- Header at the top of the page with the paper title (in capital letters) and the page number (If the title is lengthy, you may use a shortened form of it in the header.)

Research paper titles should be descriptive and informative. Sometimes the research thesis or research question is used for a title. Avoid vague, inaccurate or amusing titles. All text on the title page is centered vertically and horizontally. The title page has no page number and it is not counted in any page numbering.

Abstract

The next page of paper provides an abstract, or brief summary of your findings. An abstract does not need to be provided in every paper, but an abstract should be used in papers that include a hypothesis. A good abstract is concise—about one hundred fifty to two hundred fifty words—and is written in an objective, impersonal style. Your writing voice will not be as apparent here as in the body of your paper. When writing the abstract, take a just-the-facts approach, and summarize your research question and your findings in a few sentences. On-line search databases

typically contain only abstracts, it is vital to write a complete but concise description of the work to entice potential readers into obtaining a copy of the full paper. Writers should follow a checklist consisting of: motivation, problem statement, approach, results, and conclusions. Following this checklist should increase the chance of people taking the time to obtain and read the complete paper.

Introduction: The introduction should appeal to a reader's interest and it should make clear what the research paper is about. Ask the research question. The question can come first, informing the reader of the purpose of the research paper; or, the question can come last, making a transition to the body of the research paper.

Body: The meat of a research paper is evidence, facts and details. The researcher can't have too much documentation, too many references. On the other hand, it is possible to have too many quotes. Discover information and analyze and evaluate it for readers. Tell readers what the data means and show them how to weigh the evidence. Present the evidence in the body of the research paper. Point out strengths and weaknesses on both sides of the issue. Making concessions establishes that the researcher have researched the issue thoroughly.

Artwork: Use appropriate drawings, pictures, diagrams, maps, tables and charts to illustrate key points. Keep artwork simple.

Conclusion: The conclusion of the research paper is the culmination of everything written in the paper before the conclusion. The research question is answered in the conclusion. The conclusion should include one to one correspondence between the objectives and their satisfaction. Discussion- The discussion portion typically centers on what the results mean and more importantly why? Remember that a strong research paper actually justifies discussion. The researcher needs to ensure that the thesis indicates the point of the discussion. The discussion should be a summary of the principal results. Look for relationships, generalizations as well as trends among the results as well as their exceptions. Talk about the most likely causes which are found underlying the patterns resulting in the predictions. There are a host of other questions which the researcher should deal with such as does it agree or perhaps contradict previous work? Talk about implications and possibilities. Remember to add evidence or even a line of reasoning

which supports each interpretation. It might be helpful to break up this particular section into different logical segments

Page Layout

Left margin: 1½" Right margin: 1" Top margin: 1" Bottom margin: 1"

Page Numbering

Pages are numbered at the top right. There should be 1" of white space from the top of the page number to the top of the paper. Numeric page numbering begins with the first page.

Spacing and Justification

All pages are single sided. Text is double-spaced or 1.5 spaced, except for long quotations and the bibliography (which are single-spaced). There is one blank line between a section heading and the text that follows it. Justify the text.

Font face and Size

Any easily readable font is acceptable. The font should be 12 points or larger. Generally, the same font must be used throughout the manuscript, except 1) tables and graphs may use a different font, and 2) titles and section headings may use a different font.

Paper Organization

The general structure of a paper comprises three major sections: introduction, body, and discussion. The progression of the thematic scope of a paper within these sections typically follows a general pattern, namely the "hourglass model" shown below in figure The introduction leads the reader from general motivation and a broad subject to a particular research question to be dealt with in the paper. The body of the paper stays within a tight thematic scope, describes the research methods and results in detail. The discussion section aims to draw general conclusions from the particular results. This is in line with Berry's claim that a research paper should be circular in argument, i.e., the conclusion should return to the opening, and examine the original purpose in the light of the research presented. However, there are additional parts of a paper with equal importance: title, abstract, and the references.

Format of the Thesis

In form, the thesis is a lengthy experimental, design, or theoretical report, with a problem-method-results-discussion structure. This recurrent hypothetico-deductive pattern of developing a thesis to solve a problem and then constructing a methodology and testing for results is common in research writing. When you begin to write the first draft of your thesis, try to salvage useful material for problem statements, methodologies, and bibliographies from your thesis proposal. Make use of your laboratory notebook for detailed accounts of your procedures.

Front Matter

The front matter frames the thesis work. It includes these elements:

- *Title page* - Your department will have a standard title page form you are required to follow. The title should be informative, contain keywords, and reveal the topic of the thesis. Include the title, author, thesis supervisor, place, and date.
- *Abstract*- Briefly state the (1) research problem, (2) methodology, (3) key results, and (4) conclusion. Generally, abstracts are between 100 and 150 words--roughly 5-10 sentences.
- *Table of contents*. List the key subject headings and subheadings of your thesis with their page numbers. Number the front-matter section in lowercase roman numerals. Be sure to list acknowledgments, appendixes, and bibliography.
- *List of figures* - Include the figure numbers, figure titles, and page numbers.
- *List of tables* - Include the table numbers, table titles, and page numbers.
- *Nomenclature (optional)* - List unfamiliar terms, symbols, acronyms and their meanings.

Body

In the thesis body, you provide the introduction, narrative, and analysis of your work. The body includes these elements:

- **Introduction.** State (1) the purpose of the investigation, (2) the problem being investigated, (3) the background (context and importance) of the problem (citing previous

work by others), (4) your thesis and general approach, and (5) the criteria for your study's success.

- Theory. Develop the theoretical basis for your design or experimental work, including any governing equations. Detailed calculations go to an appendix.
- Materials, apparatus, and procedures. List and describe key materials and apparatus. Then describe the procedure in enough detail that others can duplicate it. For design studies, this section includes component design, fabrication, assembly, and testing procedures. Use illustrations.
- Results. Present the results, usually with accompanying tables and graphs. Characterize the patterns and quality of the results and estimate their accuracy and precision. Detailed data go to an appendix. Use analytical graphics.
- Discussion. Discuss the meaning of the results, stating clearly what their significance is. Compare the results with theoretical expectations and account for anything unexpected.
- Conclusions. Review the results in relation to the original problem statement. Assess the success of the study in light of the criteria of success you gave in the introduction.
- Recommendations. If applicable, recommend directions for future work.

End Matter

The end matter is mainly referential material too detailed to fit well in the main narrative of work done. It includes these elements:

- Acknowledgments. Acknowledge assistance from advisors, sponsors, funding agencies, colleagues, technicians, and so on.
- Appendixes. Provide detailed calculations, procedures, data in separate appendixes. Give each appendix a title, a letter (Appendix A, B, C), and an introductory paragraph.
- Bibliography. List alphabetically any works referred to in your study. Follow the bibliographical and footnote formats of your department or of a prominent periodical published by a professional society in your field.

Research problem

There are two types of research problems, viz., those which relate to states of nature and those which relate to relationships between variables. At the very outset the researcher must single out the problem he wants to study, i.e., he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into. Initially the problem may be stated in a broad general way and then the ambiguities, if any, relating to the problem be resolved. Then, the feasibility of a particular solution has to be considered before a working formulation of the problem can be set up. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry. Essentially two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view. The best way of understanding the problem is to discuss it with one's own colleagues or with those having some expertise in the matter. In an academic institution the researcher can seek the help from a guide who is usually an experienced man and has several research problems in mind. Often, the guide puts forth the problem in general terms and it is up to the researcher to narrow it down and phrase the problem in operational terms. In private business units or in governmental organisations, the problem is usually earmarked by the administrative agencies with whom the researcher can discuss as to how the problem originally came about and what considerations are involved in its possible solutions. The researcher must at the same time examine all available literature to get himself acquainted with the selected problem. He may review two types of literature—the conceptual literature concerning the concepts and theories, and the empirical literature consisting of studies made earlier which are similar to the one proposed. The basic outcome of this review will be the knowledge as to what data and other materials are available for operational purposes which will enable the researcher to specify his own research problem in a meaningful context. After this the researcher rephrases the problem into analytical or operational terms i.e., to put the problem in as specific terms as possible. This task of formulating, or defining, a research problem is a step of greatest importance in the entire research process. The problem to be investigated must be defined unambiguously for that will help discriminating relevant data from irrelevant ones.

Literature Review

Once the problem is formulated, a brief summary of it should be written down. It is compulsory for a research worker writing a thesis for a Ph.D. degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval. At this juncture the researcher should undertake extensive literature survey connected with the problem. For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to. Academic journals, conference proceedings, government reports, books etc., must be tapped depending on the nature of the problem. In this process, it should be remembered that one source will lead to another. The earlier studies, if any, which are similar to the study in hand should be carefully studied. A good library will be a great help to the researcher at this stage.

HYPOTHESIS

After extensive literature survey, researcher should state in clear terms the working hypothesis or hypotheses. Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. As such the manner in which research hypotheses are developed is particularly important since they provide the focal point for research. They also affect the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis. In most types of research, the development of working hypothesis plays an important role. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested.

The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track. It sharpens his thinking and focuses attention on the more important facets of the problem. It also indicates the type of data required and the type of methods of data analysis to be used. Working hypotheses arise as a result of a-priori thinking about the subject, examination of the available data and material including related studies and the counsel of experts and interested parties. Working hypotheses are more useful when stated in precise and clearly defined terms. It may as well be remembered that occasionally we may encounter a problem where we do not need working hypotheses, especially in the case of exploratory or formulative researches which do not aim at testing the hypothesis. But as a general rule,

specification of working hypotheses in another basic step of the research process in most research problems. Hypothesis is usually considered as the principal instrument in research. Its main function is to suggest new experiments and observations. In fact, many experiments are carried out with the deliberate object of testing hypotheses.

WHAT IS A HYPOTHESIS?

Ordinarily, when one talks about hypothesis, one simply means a mere assumption or some supposition to be proved or disproved. But for a researcher hypothesis is a formal question that he intends to resolve. Thus a hypothesis may be defined as a proposition or a set of proposition set forth as an explanation for the occurrence of some specified group of phenomena either asserted merely as a provisional conjecture to guide some investigation or accepted as highly probable in the light of established facts. Quite often a research hypothesis is a predictive statement, capable of being tested by scientific methods, that relates an independent variable to some dependent variable. For example, consider statements like the following ones: “Students who receive counselling will show a greater increase in creativity than students not receiving counselling” Or “the automobile A is performing as well as automobile B.” These are hypotheses capable of being objectively verified and tested. Thus, we may conclude that a hypothesis states what we are looking for and it is a proposition which can be put to a test to determine its validity.

Characteristics of hypothesis:

Hypothesis must possess the following characteristics:

- (i) Hypothesis should be clear and precise. If the hypothesis is not clear and precise, the inferences drawn on its basis cannot be taken as reliable.
- (ii) Hypothesis should be capable of being tested. In a swamp of untestable hypotheses, many a time the research programmes have bogged down. Some prior study may be done by researcher in order to make hypothesis a testable one. A hypothesis “is testable if other deductions can be made from it which, in turn, can be confirmed or disproved by observation.”
- (iii) Hypothesis should state relationship between variables, if it happens to be a relational hypothesis.

- (iv) Hypothesis should be limited in scope and must be specific. A researcher must remember that narrower hypotheses are generally more testable and he should develop such hypotheses.
- (v) Hypothesis should be stated as far as possible in most simple terms so that the same is easily understandable by all concerned. But one must remember that simplicity of hypothesis has nothing to do with its significance.
- (vi) Hypothesis should be consistent with most known facts i.e., it must be consistent with a substantial body of established facts. In other words, it should be one which judges accept as being the most likely.
- (vii) Hypothesis should be amenable to testing within a reasonable time. One should not use even an excellent hypothesis, if the same cannot be tested in reasonable time for one cannot spend a life-time collecting data to test it.
- (viii) Hypothesis must explain the facts that gave rise to the need for explanation. This means that by using the hypothesis plus other known and accepted generalizations, one should be able to deduce the original problem condition. Thus hypothesis must actually explain what it claims to explain; it should have empirical reference.

BASIC CONCEPTS CONCERNING TESTING OF HYPOTHESES

(a) **Null hypothesis and alternative hypothesis:** In the context of statistical analysis, we often talk about null hypothesis and alternative hypothesis. If we are to compare method A with method B about its superiority and if we proceed on the assumption that both methods are equally good, then this assumption is termed as the null hypothesis. As against this, we may think that the method A is superior or the method B is inferior, we are then stating what is termed as alternative hypothesis. The null hypothesis is generally symbolized as H_0 and the alternative hypothesis as H_a . Suppose we want to test the hypothesis that the population mean μ is equal to the hypothesized mean μ_0 , $d.f. = 100$.

Alternative hypothesis is usually the one which one wishes to prove and the null hypothesis is the one which one wishes to disprove. Thus, a null hypothesis represents the hypothesis we are trying to reject, and alternative hypothesis represents all other possibilities.

FORMAT OF SYNOPSIS

Before starting to work on Dissertation/Article, the trainee has to send a Synopsis to research institute or university and get it approved.

The synopsis is a brief out line (about four A-4 size pages or 1000 words is the maximum limit) of your future work. A synopsis must have the following headings:

TITLE: Should reflect the objectives of the study. It must be written after the whole synopsis has been written so that it is a true representative of the plan (i.e. the synopsis).

INTRODUCTION: Should contain brief background of the selected topic. It must identify the importance of study, its relevance and applicability of results. It must clearly state the purpose of the study.

OBJECTIVES: An objective is an intent of what the researcher wants to do stated in clear measurable terms.”

OPERATIONAL DEFINITION: Is the definition of the exposure and outcome variables of interest in context to objective in a particular study and their means of measurement/determination.

HYPOTHESIS: A hypothesis is a statement showing expected relation b/w 2 variables. A hypothesis is needed in the following study designs:

MATERIAL AND METHODS:

STUDY DESIGN: Mention the name of the appropriate study design.

SETTING: Name and place where the research work is to be conducted.

DURATION OF STUDY: How long will the study take with dates.

SAMPLE SIZE: How many patients will be included. If there are groups how many per group?

SAMPLING TECHNIQUE: Type of sampling technique employed.

SAMPLE SELECTION: Inclusion criteria: on what bases will patients be inducted in the study. Exclusion criteria: On what bases will patients be excluded from the study.

DATA COLLECTION PROCEDURE: A detailed account of how the researcher will perform research; how s/he will measure the variable. It includes: Identification of the study variables Methods for collection of data Data collection tools (proforma/questionnaire)

DATA ANALYSIS PROCEDURE: Relevant details naming software to be used, which descriptive statistics and which test of significance if and when required, specifying variables where it will be applied.

REFERENCES: In Vancouver style (for detail refer to page 132).

DATA COLLECTION INSTRUMENT: The researcher must attach, as an annexure, the proforma or questionnaire with the help of which he/she intends to collect data. The proforma/ questionnaire must match the objectives and must not contain irrelevant sections like inclusion and exclusion criteria etc.


Research Methodology, Biostatistics & Medical Writing Workshop

Front Page example

**SYNOPSIS
MAJOR PROJECT REPORT
ON
“Automatic Number Plate Recognition”**

Submitted in Partial Fulfillment of requirements for the Award of
Degree of Bachelor of Engineering in Computer Science & Engineering


Submitted To



**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA,
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