UNIT 6 EDITING SCIENTIFIC RESEARCH WRITING

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6.1 OBJECTIVES

A study of this unit will help you to:

- Distinguish scientific research writing from other kinds of writing.
- Edit a piece of scientific research writing.

6.2 INTRODUCTION

Before we learn about editing scientific research documents, we must first understand why scientific research writing is important and the typical structure of a scientific research publication.

6.2.1 Why are Scientific Research Publications Necessary?

The scientific research process involves several distinct phases: understanding a problem, designing and performing research, gathering data, analyzing the data, and drawing conclusions. Throughout the scientific research process, the researcher gathers data, records observations and results, and generates information by analyzing the data, observations, and results.

For the findings and conclusions from scientific research to be useful, they must be communicated effectively to a wide audience – fellow researchers, students, teachers, and industry professionals. This communication is possible through scientific research documents. People require scientific research documents either to seek more information on a research topic or to examine the validity of a research outcome.
6.2.2 Scientific Research Publication Types

Scientific research documents are published in various forms – as research papers in journals, as articles in scientific magazines, and as books. Each document type serves a specific purpose. Research papers in journals are research-oriented publications that primarily target the academic world. Articles in magazines are written in a style that appeals to a more general audience. Magazine articles also focus more on practical applications of a research project. Books, by definition, are published with a direct commercial objective, and so, the content in books takes on a slightly more ‘marketing’ slant than the content in journals and scientific magazines.

6.2.3 Structure of Scientific Research Publications

Scientific research publications enable readers to find answers to, at a minimum, the following questions:

- What is the research topic?
- Why was the research undertaken?
- How was the research performed?
- What are the findings and conclusions of the research?

Scientific research documents are organized in a way that helps readers find answers to the above questions. Typically, the structure of a scientific research document reflects the elements, flow, and activities of the underlying research process. The structure includes the following sections:

\[ \text{Front matter} \quad \{ \text{Title Page, Abstract} \} \]

\[ \text{Body} \quad \{ \text{Introduction, Methods, Results, Discussion} \} \]

\[ \text{Back matter} \quad \{ \text{References, Tables and Figures, Glossary, Index, Acronyms} \} \]

The Title page consists of a title that summarizes the main topic of the research (for example, "Effect of Sustained Fertilizer Use on Top Soil Salinity"), names of the authors of the publication, and the context for the research project. The context is the name of the sponsoring institution or the name of the parent project (if the publication is for a subproject), the purpose of the project, and the date of publication.

The Abstract is a short and precise summary of the research. It describes, briefly, the purpose of the research, methods used, results obtained, and the conclusions.
The Introduction states the problem or topic being researched (the hypothesis), explains the purpose of the research, and describes how the problem or topic is similar to (or different from) previous research on related problems and topics.

The Methods section describes how the hypothesis was tested and why that particular way of verification was selected. It also describes the subjects that participated in the research, the equipment employed, explains how the tests were designed, and outlines the procedure used for performing the research.

The Results section contains the raw data collected during the research. They are often presented in the form of tables and graphs.

The Discussion section analyzes whether the results of the research support the original hypothesis or question and examines the implications of the findings.

The References section contains a list of all the information sources — books, articles, papers — that are cited in the previous sections of the document.

The Tables and Figures section contains all the tables and figures that are referenced in the other sections of the document. Figures include diagrams, photographs, and graphs.

The Glossary is a list of important terms and their definitions.

The Index serves as a mechanism for readers to search and find information quickly.

The Acronyms section contains a list of all the abbreviations and acronyms used in the document.

In addition to the sections described here, scientific research documents contain two other structural elements: footnotes and endnotes. These elements are used to provide supplementary information to the main content: footnotes at the page level, and endnotes at the document level.

Check Your Progress 1

Answer the following questions:

1. Why are scientific research documents necessary?

2. What information do readers of scientific research publications seek?

The following are five sections of a typical research document, arranged in a random order. Arrange the sections in the correct order.

<table>
<thead>
<tr>
<th>Random order</th>
<th>Correct order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion</td>
<td>Discussion</td>
</tr>
<tr>
<td>Abstract</td>
<td>Abstract</td>
</tr>
<tr>
<td>References</td>
<td>References</td>
</tr>
<tr>
<td>Results</td>
<td>Results</td>
</tr>
<tr>
<td>Methods</td>
<td>Methods</td>
</tr>
</tbody>
</table>
6.3 INTRODUCTION TO EDITING SCIENTIFIC RESEARCH PUBLICATIONS

In this chapter, we learn why scientific research publications require editing and get an overview of the types of editing.

Scientists and researchers are expected to be good at performing their core work—research. They undergo rigorous training before taking up research projects, expend a lot of effort in gathering data, conducting tests, analyzing results, and deriving meaningful conclusions. All of these activities require their undivided focus.

While a researcher works on a project, producing a good research document is the least of priorities. Often, the researcher might simply not have time to document the research work. Effective writing requires special skills that must be learned, practised, and honed. Researchers might not necessarily be good writers. Still, without a good research document, the research effort might become worthless. Editing addresses this problem.

Editing, as a distinct activity during the documentation process, serves the following purposes:

- It helps enhance the flow of content.
- It enables improvement of the clarity of content.
- It helps improve the language—grammar, punctuation, and spelling—of the research document.

6.4 EDITING SCIENTIFIC RESEARCH DOCUMENTS

This chapter explains the guidelines to be followed while editing scientific research documents. Note that the person editing a scientific research document might either be an independent editor, a peer of the researcher, or even the researcher. The guidelines described in this chapter hold good regardless of who edits a scientific research document.

6.5 FOCUS AREAS OF EDITING

What you edit and how you perform the editing depend on the purpose of the editing activity. Broadly, based on the focus of the editing activity, guidelines for editing can be grouped under the following headings.

- Structure

You check whether the research document is organized well—typically, as shown in 6.2.3 Structure of scientific research publications. You also check whether the paragraphs in the research document are arranged logically, and whether transitions between paragraphs are smooth.

- Content

In this focus area, you verify whether the research document enunciates the hypothesis clearly, examines whether the research findings support the outcome of the research. During the editing process, you also verify whether complex terms are defined and used consistently. You seek to enhance clarity by suggesting ways to rephrase sentences. The editor looks for issues such as unclear pronoun references...
(ambiguity about the subject that a pronoun represents) and poor word choice, which if undetected can affect clarity of the content.

- **Language**

This focus area of editing is sometimes called proofreading or copy editing. The focus is on detecting errors in spelling and grammar.

Language editing is very important because seemingly trivial issues in spelling and grammar can alter the entire meaning of a sentence, thus rendering an otherwise useful research project worthless. A document that is free of errors also enhances the credibility of the author because it gives an image of a person who is meticulous and quality-conscious.

- **Style**

In this focus area, you check whether the writing tone (formal versus informal, instructional versus persuasive, and so on) is appropriate, language is gender-neutral (for example, man-days versus person-days), and the text is simple and concise (for example, "due to the fact that" instead of "because")

- **References**

The process of scientific research involves intensive study of the given subject matter, often over a prolonged period. During research, scientists constantly refer to (cite) existing bodies of knowledge as they perform experiments and draw conclusions. It is mandatory that all such reference material be cited and/or paraphrased appropriately in the scientific research document. This is yet another focus area of the editor.

Each of the above focus areas of editing can (ideally, should) be addressed individually in separate editing 'passes'. In other words, you can edit content for one focus area at a time. In practice, however, in the interests of efficiency, you might have to address all of these focus areas as you read each information element (sentence, paragraph, section).

As you work on these focus areas, the content in the scientific research document is bound to undergo revisions (sometimes major). You should consciously attempt to detect error patterns. Awareness about the existence of error patterns will help you be more efficient in two ways:

- You can make global observations concerning the entire document instead of annotating every individual occurrence of a particular type of error.

- You can develop methods for detecting and fixing instances of the repeating errors.

**Check Your Progress 2**

<table>
<thead>
<tr>
<th>Editing focus area</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Content</td>
<td>a. Examine for problems in the flow of content</td>
</tr>
<tr>
<td>2. Structure</td>
<td>b. Detect and fix errors in grammar and spelling</td>
</tr>
<tr>
<td>3. Style</td>
<td>c. Check whether the information is correct and relevant</td>
</tr>
<tr>
<td>4. Language</td>
<td>d. Verify whether the tone is appropriate</td>
</tr>
</tbody>
</table>
6.6 GUIDELINES AND TECHNIQUES FOR EDITING

In the previous section, you learned about the focus areas of editing. This section provides guidelines that you can apply to perform editing in the different focus areas effectively.

6.6.1 Guidelines for Editing Structure

You can use the following techniques to detect and fix structural problems in content:

- **Create an outline**

  Often, the draft that is being edited does not contain a table of contents (ToC). Even if a ToC exists, it might not be designed well. A poorly designed ToC reflects poor document organization. You can detect this weakness by simply creating your own outline of the content, consisting of the major headings in the document. This exercise helps unmask issues such as too many heading levels (unnecessarily deep structure) and too many (or too few) sections.

- **Verify transitions**

  Yet another effective method to improve document structure is to ensure that transitional words and phrases are used between paragraphs. Transitional words and phrases create links between topics and enable readers to understand the flow of content. Sometimes, transitions can be created by simply repeating key terms and phrases in consecutive sentences and paragraphs.

  If a transitional word or phrase exists, you must verify whether the word or phrase is appropriate for the context. For example, if the context requires reinforcement of a previous statement, words and phrases such as “further”, “moreover”, and “besides” would be appropriate. If, on the other hand, the author is trying to compare ideas, words such as “similarly”, “however”, and so on must be used. Inappropriate transitions can ruin the entire logic of an otherwise well-written research document.

- **Verify parallelism**

  Parallelism in tone, grammatical construction, and sentence pattern is a key characteristic of good scientific documentation. It strengthens the document structure, and reinforces the tone. Look for violations of this important principle of effective writing.

Consider the following text, which is intended to explain the research methodology used in a particular study:

The experiment was conducted as follows:

1. First, we created a demographic profile of each participating town.

2. After that, we should create population segments in each town based on geographical location.

3. We pick a random sample of participants from each locality.

4. Finally, we have performed a door-to-door survey.
The four sentences in the list are intended to represent a sequence of activities, but that fact is somewhat obscured because the verbs in the sentences are in different tenses.

Now, examine the following revised version of the same text:

1. First, we created a demographic profile of each participating town.

2. After that, we created population segments in each town based on geographical location.

3. We then picked a random sample of participants from each locality.

4. Finally, we performed a door-to-door survey.

Look at the highlighted verbs in the revised text. Compare them with the verbs in the original text. All of verbs in the revised text are in the past tense. The revised text exhibits parallelism, and makes for better readability and easier comprehension.

Check Your Progress 3

Answer the following questions:

1. Give two examples of structural issues that you can detect by examining the content outline.

2. Why is parallelism important in scientific writing?

6.6.2 Guidelines for editing content

The following are guidelines for editing the content in individual sections or elements of a standard scientific research document.

- **Introduction** section
  - Verify whether the purpose of the research and the hypothesis (the subject of the research) are stated clearly.

The hypothesis explains the “what” of the research, whereas the purpose addresses the “why”. For example, a research project in the field of economics might seek to establish the correlation between poverty and population growth (hypothesis) with the objective of helping the government find ways to address both problems (purpose). Researchers are, most of the time, clear in their minds about the purpose and hypothesis of the research, but their writing does not always reflect this distinction.

- Verify whether the hypothesis is stated clearly and completely. Look at the following examples of poor and well-written hypotheses.

Not a good hypothesis: “Generally, population growth is closely related to poverty”.

Good hypothesis: “The rate of population growth is directly proportional to the rate of growth in income levels”.

- Examine whether the justifications to believe that the hypothesis might be proven are stated clearly in the introduction. The reasons could include facts, specific instances of observed behavior, earlier research, or simply logic.
- Verify whether the content in the introduction is organized logically: First the purpose, followed by the justifications, and finally the hypothesis. Here’s an example of a well-written introduction:

*Economists have, for long, viewed population growth and economic well-being as twin phenomena that cannot be studied in isolation (purpose). This viewpoint stems from the fact that, historically, nations have witnessed periods of rapid population growth at precisely the same time as economic prosperity (justification). It is hypothesized that population growth is directly proportional to economic growth (hypothesis).*

- **Methods section**

This section must describe, in detail, the test procedure, the equipment used for the test, and the rationale for picking that particular procedure. Why is this section important? The information in this section ensures that the experiment or study is reproducible. It also enhances the credibility of the research findings.

- Verify whether the content describes the method in a generic sense and does not include actual test values and results.
- Make sure that the details provided are precise, adequate, and relevant.

For example, if the testing process in an experiment involves recording the temperature at specific intervals, the Methods section must include information about the intervals at which the temperature is to be recorded.

- Check whether the purpose of (rationale behind) each test step is explained.

For example, in a test that involves measuring the temperature of the subject a predetermined number of times, the Methods section must describe the reason for deciding on that particular number of readings.

- Verify whether the control of the experiment is identified clearly.

The control is typically a test subject, which unlike the other test subjects does not undergo the steps of the test. While the test is being conducted on the other subjects, the control subject is left as is, so that its state and identity becomes a point of reference to measure the results of the test.

For example, in a test to measure the effects of a protein-heavy diet on school-going children, a few of the children who are selected as subjects of the test would continue on a normal diet. This ensures that the test reveals the ‘differential’ impact of a protein-heavy diet.

- Examine whether information is organized in the Method section such that it presents a coherent picture of the entire experiment. Verify whether the sequence of steps is clear. This section must describe the experiment that was performed in the past. So make sure that the steps are written in the simple past tense (did this, did that), and not in the imperative tone (do this, do that).
- Verify that the voice used to describe the steps in the experiment adheres to the house style guideline. If no guideline exists, verify whether the voice is consistently active or consistently passive.

Note that, in the past, scientific research content, especially the content in the Methods section, was usually written in passive voice (*task x was done*). In recent times, however, active voice (*we performed task x*) is coming into vogue.
Results section

While the Methods section describes how you achieved the results and the Discussion section analyzes the implications of the results, the Results section contains the data that forms the foundation of the research. Of all the sections in the scientific research document, the Results section is the most objective, and probably for that reason, the easiest to write.

- Look carefully for information that is speculative or predictive in nature. Such information has no place in this section, which must include only facts derived directly from the experiment.

- Verify that the Results section does not include analyses and conclusions.

- Look for opportunities to improve the effectiveness of the data in this section, by using tables, charts, figures, and pictures.

- If tables and figures are used, make sure that they are numbered sequentially and uniquely, and referenced in the related text.

- When tables and figures are used to present data, make sure that the same data is not presented in text as well.

- Though this section must contain an objective representation of bare facts, it can include information about trends and patterns that are evident from the data without the need for additional predictive calculations and assumptions.

For example, while presenting data about temperatures recorded over a period, it is okay to draw readers’ attention to the highest and lowest temperature readings.

- Like in the Methods section, the language in this section too must be in the simple past tense.

For example, temperature increased from x to y rather than temperature increases .... This might seem to be a trivial distinction, but remember that, the present tense might indicate, wrongly, that the data being presented is a universal truth rather than the result of a single controlled test.

Tables section

- Check whether tables are used appropriately. Tables lend themselves best to data that is voluminous, objective, and shows significant variation. Make sure that tables are not used for data that can be presented just as well in short sentences.

Consider the following table:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Active</td>
</tr>
<tr>
<td>B</td>
<td>Idle</td>
</tr>
</tbody>
</table>

The same data could have been presented more effectively as a simple sentence: Subject A was active, whereas B was idle.

- When the objective is to highlight trends or patterns, organize the data vertically rather than horizontally.
Consider the following example:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Status1</th>
<th>Status2</th>
<th>Status3</th>
<th>Status4</th>
<th>Status5</th>
<th>Status6</th>
<th>Status7</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Idle</td>
<td>Idle</td>
<td>Idle</td>
</tr>
<tr>
<td>B</td>
<td>Idle</td>
<td>Idle</td>
<td>Idle</td>
<td>Idle</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
</tr>
</tbody>
</table>

Now, look at the same data presented vertically.

<table>
<thead>
<tr>
<th>Status</th>
<th>Subject A</th>
<th>Subject B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Active</td>
<td>Idle</td>
</tr>
<tr>
<td>2</td>
<td>Active</td>
<td>Idle</td>
</tr>
<tr>
<td>3</td>
<td>Active</td>
<td>Idle</td>
</tr>
<tr>
<td>4</td>
<td>Active</td>
<td>Idle</td>
</tr>
<tr>
<td>5</td>
<td>Idle</td>
<td>Active</td>
</tr>
<tr>
<td>6</td>
<td>Idle</td>
<td>Active</td>
</tr>
<tr>
<td>7</td>
<td>Idle</td>
<td>Active</td>
</tr>
</tbody>
</table>

Clearly, the vertically organized table communicates the pattern and contrasts evident in the results more effectively than the horizontally arranged table.

- Ensure that all the tables are numbered uniquely and are assigned meaningful titles.
- In tables showing measurements, verify that the unit of measurement is stated clearly.
- In columns that contain numerical values, make sure that the numbers are centered on the decimal point and show a consistent number of decimal places. See the examples below.

Incorrect alignment

<table>
<thead>
<tr>
<th>Subject</th>
<th>Temperature (degrees F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11.02</td>
</tr>
<tr>
<td>B</td>
<td>9.3</td>
</tr>
<tr>
<td>C</td>
<td>12.35</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>09.25</td>
</tr>
</tbody>
</table>

Correct alignment

<table>
<thead>
<tr>
<th>Subject</th>
<th>Temperature (degrees F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11.02</td>
</tr>
<tr>
<td>B</td>
<td>9.30</td>
</tr>
<tr>
<td>C</td>
<td>12.35</td>
</tr>
<tr>
<td>D</td>
<td>6.00</td>
</tr>
<tr>
<td>E</td>
<td>9.25</td>
</tr>
</tbody>
</table>

- Figures section

Figures include photographs, line drawings, flow charts, graphs (also known as charts). Like tables, figures should be used judiciously. Graphs, for example, are ideal for illustrating important trends in the data.

- Verify whether the figure is free of visual clutter. In a line graph, for example, the reader should be able to spot the most important line quickly. The font size used for texts in labels and callouts must not be visually distracting.
- Ensure that color is used sparingly, and only to depict contrasts and highlight data.
- Check whether the figure has visual and functional balance.

Visual balance can be achieved by optimum use of white space in and around the figure.

Functional balance reflects the extent to which the figure depicts data in an unbiased manner while at the same time bringing out the salient facts. Consider the following graph showing temperature readings over a period.

Now, contrast the above graph with the following modified version of the same graph.

The second graph is more balanced functionally. It uses a Y-axis scale that is more relevant to the range of temperatures that are being plotted. Therefore, it indicates the rapid drop in temperature more clearly than the first graph.

If multiple graphs are used to compare and contrast data, make sure that all of them use the same scale.
- Verify that the graphics are numbered uniquely and assigned meaningful titles.
- Discussion and Analysis section

This section informs readers about the implications of the results of the experiment or test. In general, this section must first describe the implications of the results in the context of the specific experiment or test, before moving on to implications that are more far-reaching and predictive in nature.

- Verify whether the result of the experiment (does the data derived from the experiment support the hypothesis?) is stated clearly.

- Make sure that the words used to qualify the result reflect the appropriate degree of confidence.

Experiments, typically, involve a small sample of all the possible test subjects. Except in very rare cases, the result of an experiment does not become universal truth automatically. So phrases such as “the results suggest” or the “the results indicate” are often more appropriate than “the results prove”.

- Examine whether the train of logic used to move from results to conclusions is described clearly every step of the way. If, at some point, any assumptions were made or data from other sources were used, verify whether the assumptions and extraneous data sources are cited. Likewise, if any of the data derived from the experiment is not considered in the analysis, make sure that such exclusions are rationalized.

When in any doubt about the content, check or ask! If some part of the content seems erroneous, but you are not able to pinpoint the specific issue, do not ignore it. Examine the area more closely. If that does not help, move on and return later to the issue. If you are still unable to identify the specific issue or solve it, flag the area (mark it up) with a question to the author.

Check Your Progress 4

The following text is from the Introduction section of a scientific research report. Read the text, and then identify the hypothesis, justification, and purpose of the research project.

Traditionally, the health and longevity of human beings has been associated with diet and the level of physical activity. Still, no two experts agree on the exact nature of the correlation between diet, physical activity, and health. This lack of consensus has led to a lot of confusion in the minds of common people, and even fitness experts, on approaches to becoming healthier and living longer. It is hypothesized that the level of physical activity has a more direct bearing on longevity than does diet.

Hypothesis:

- The level of physical activity has a more direct bearing on longevity than does diet.

Purpose:

- To investigate the impact of physical activity on health and longevity.

Check Your Progress 5

Which of the following is/are NOT part of the *Methods* section of scientific research documents?

- Description of the test procedure
- Rationale for choosing the test procedure
- Measurements taken during the test
- List of material and equipment required for the experiment
- Interpretation of the results of the test
- Information about the control subject of the test

6.6.3 Guidelines for editing language

Reviewing content for errors in spelling and grammar is usually the last step in the editing flow. By performing this activity last, editors can ensure that content changes that are introduced to address issues in the other editing focus areas (structure, style, and so on) do not escape proofreading.

- If the draft to be edited is submitted electronically (for example, as an MS Word document), use the spelling and grammar checking tools of the word processing program, but do not rely on them.

Automated spelling and grammar checkers are not foolproof. For instance, they do not detect spelling errors when the misspelled word happens to be a dictionary word ("there" instead of "their", "hole" instead of "whole" and so on). Note that standard spelling checkers might not recognize domain-specific scientific terms.

- To the extent possible, focus on one error at a time: grammar or spelling. This task separation is especially crucial for detecting grammatical errors.

- While editing language read aloud and slowly. This technique ensures that you do not inadvertently skip errors or unconsciously correct them.

- Since the purpose of proofreading is not necessarily to catch content issues, treat each sentence as a distinct unit. Make sure that each sentence, in isolation, is error-free, before moving on to the next sentence.

- Checking punctuation errors is tricky, because, while it is hard to "notice" each punctuation mark, it is harder still to spot the missing punctuation marks. One technique that you can use on hard-copy drafts is to circle all the punctuation marks and examine them individually.

- Read the document backwards! At the word level, this technique helps you detect spelling errors. At the sentence level, it helps you check grammar. When you read each word separately, starting from the last word, content, grammar,
and punctuation become irrelevant; so you can focus on spelling. Similarly, when you read each sentence separately starting from the last sentence, content will not make any sense. Therefore, your undivided focus is on grammar.

- Keep dictionaries and grammar references handy. They will help you produce a well-edited document. Besides, they will help you learn as you edit.

Check Your Progress 6

| Read the following statement. State whether you agree or disagree. Explain your reasons: |
| "Modern word processing tools contain reliable spelling and grammar checker utilities. So, editors need not proofread scientific research writing for spelling and grammar errors". |
| Answer the following questions: |
| What is the "backward reading" technique? |
| How is the backward reading technique advantageous when compared with forward reading? |

6.6.4 Guidelines for editing style

When you edit a document for style issues, you seek to make the content concise and clear.

Eliminate wordiness

- Look carefully for fillers and qualifiers such as "actually", "in reality", "hopefully", and so on. These words make the content unnecessarily wordy.

- Ensure that the content is free of clichés. Clichés should be replaced with descriptions that are more precise. For example, "at the end of the day" could be changed to "finally".

- Examine the sentences for excessive use of prepositions – a sure sign of wordiness.

Consider the following sentence; pay attention to the highlighted prepositions.

The key factor that contributed to the success of the experiment was the support provided by the professors in letting us conduct the tests without worrying about the costs of the equipment required for the experiment.

Here is a modified version of the sentence, with fewer prepositions:

The experiment was successful because the professors let us conduct tests without worrying about equipment costs.

- Look for stock phrases that can be replaced with fewer words. The following are some examples:
<table>
<thead>
<tr>
<th>Stock phrase</th>
<th>Replace with...</th>
</tr>
</thead>
<tbody>
<tr>
<td>due to the fact that</td>
<td>because</td>
</tr>
<tr>
<td>despite the fact that</td>
<td>although</td>
</tr>
<tr>
<td>in the event that</td>
<td>if</td>
</tr>
<tr>
<td>in a situation in which</td>
<td>when</td>
</tr>
<tr>
<td>with regard to</td>
<td>about</td>
</tr>
<tr>
<td>it is necessary that</td>
<td>must</td>
</tr>
<tr>
<td>is in a position to</td>
<td>can</td>
</tr>
<tr>
<td>it is possible that</td>
<td>might</td>
</tr>
<tr>
<td>prior to</td>
<td>before</td>
</tr>
<tr>
<td>not the same</td>
<td>different</td>
</tr>
</tbody>
</table>

- Look for nominalization, the process by which verbs and adjectives are converted to nouns. This type of writing makes the content wordy.

Consider the phrase “We performed the test on the samples”. The word “test” here acts as a noun, but could be rewritten as a verb: “We tested the samples”. Similarly, “has knowledge of” could be rewritten as “knows”, and “take into consideration” as “consider”.

- Check for phrases such as “It is” and “There are”. These phrases contribute to wordiness.

  Wordy: There are six steps in the experiment.

  Concise: The experiment has six steps.

- Look for vague “crutch” words such as “aspect” and “area”. They do not add value.

  Wordy: Scientific research is flourishing in the area of brain mapping.

  Concise: Scientific research on brain mapping is flourishing.

- Check for phrases such as “It is” and “There are”. These phrases contribute to wordiness.

**Improve clarity**

- Make sure that the main subject and main verb of each sentence are clearly and positioned close to each other so that readers can understand the meaning easily.

- Check the text for noun strings: a series of nouns without any intervening conjunctions or prepositions.

Consider the following sentence:

The liquid container temperature gauge level indicated that the test was aborted.

Each of the underlined words is a noun that serves as an adjective (descriptor) for the subsequent noun. Here is how the reader must understand the meaning:
The level of the temperature gauge of the liquid container indicated that ...  

The missing prepositions in the original sentence make it harder to understand.

- Make sure that the sentences are in active voice, except when (a) the emphasis is on the action rather than the actor, (b) the actor is not known, or (c) the actor should not be disclosed.

- Look for errors in word choice. The following are some examples:
  
  - *effect* (the result) versus *affect* (the action)
  - *less* (for nouns that cannot be counted) versus *fewer* (for countable nouns)

- Ensure that simple words are used as far as possible. The following are some examples:
  
  - *use* instead of *utilize*
  - *show* instead of *demonstrate*
  - *end* instead of *terminate*

- Ensure that sentences are not too long. There is no golden rule for the number of words in a sentence; but any sentence with more than 30–35 words would be hard to follow in one reading.

**Check Your Progress 7**

Each of the following sentences contains one or more “style” errors. Rewrite the sentences to correct the error/s.

- In reality, the Amazonian rain forests are, in fact, being destroyed at the same rate as they were a decade ago.

- While carbon-dioxide emissions are increasing by the minute, developed nations are sitting by waiting to see who will bell the cat.

- The reason for the repeated failures of manned missions to the moon is that instead of planning for successful missions to the moon, the missions have become opportunities for competition between nations in the race to the moon.

- Due to the fact that the mice exhibited a higher degree of activity when the noise level was increased, it is necessary that the relationship between activity and noise levels be recorded.

- The experiment demonstrates the efficacy of chlorine in treating contaminated water. Chlorine has an adverse effect on bacteria and other microbial organisms that thrive in water.

**6.6.5 Techniques for effective editing**

In this section, you learn certain techniques to help you edit scientific research documents more efficiently and effectively.

- Just as writers find it difficult to spot errors in their own text, editors too can get ‘used’ to the text after spending some time with it. When this happens, errors go
unnoticed. You can overcome this problem (also known as "confirmation bias") by taking breaks between the editing cycle. For example, after completing a structural edit on a document, put the document aside for a while (take a break or work on another assignment), before picking it up again for the next editing cycle – say, language editing.

If there is absolutely no way that you can plan for such breaks, try changing the look-and-feel of the document (font, color, line spacing, and so on) for each editing cycle, so that your mind is tricked into believing that it is a new document.

- Pick the medium (paper or online) in which you are most comfortable editing. Marking up content on hard copy has certain disadvantages when compared with editing online – such as the inability to “delete” edits; but despite the rapid growth in the use of computers, many of us still prefer reading from paper.

- Before editing a document, understand the big picture – the hypothesis and purpose of the research project, the research methodology, and the overall conclusions. Do this not by reading the draft of the research document but by interviewing the researchers.

- If your work environment permits it, read aloud as you edit. This technique helps you spot issues such as comma splices – independent clauses that could have been written as separate sentences or joined by a conjunction, but instead, are joined with a comma.)

- To make sure that you focus on one line of text at a time, place a blank sheet of paper over the lines below the one you are reading. Move this paper down, one line at a time, as you read each line.

6.7 ADDITIONAL RESOURCES

Ethics: http://www.tandf.co.uk/journals/pdf/announcements/imph_guidelines06.pdf

References: http://www.sciedocs.com/science_medical_library.htm

Style Sheets for Citing Resources: http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Style.html

APA: http://www.uwsp.edu/psych/apa4b.htm


