**AN AUTHORITATIVE GUIDE TO TECHNICAL REPORT WRITING FOR STUDENTS OF UNIVERSITIES OF SCIENCE, TECHNOLOGY AND AGRICULTURE**

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 **ABSTRACT**

A report is a spoken or written account of what one has observed, heard, or diligently investigated. It is an account of body of facts on a situation that occurred in the past. It aims to give a straightforward account of an issue, answer a question, offer solutions to a problem or recommend an action; it can be formal or informal. A formal report is written after studying or investigating a specific issue or phenomenon. In this category includes progress report, feasibility studies, field trips, recommendation studies and laboratory reports termed as technical report. Technical report is written by science and technology students in Universities of Technology and Agriculture during their period of studentship in the form of seminars, long projects, dissertations or theses. Through these, student give firsthand report of experimental works, observations from field work, feasibility studies, review activities already carried out and discuss possible solutions to them. The importance of these reports notwithstanding, experience has shown that students still encounter the problem of differentiating between writing technical report and other kinds of reports, particularly with respect to use of language, organization and format of the report. The present article therefore, presents an authoritative step-by-step guide to technical report writing for students of Universities of Science, Technology and Agriculture in Nigeria. The article examined in greater depth the grammatical features such as the use of specialized vocabulary, their organizational features such as topical arrangement and uniqueness of style and made practical suggestions on how teachers of English as a second language and students ‘Supervisors can tackle the problem of poor report writing headlong by highlighting potential problem areas to focus on during remedial instruction.

Key Words: Technical report, topical arrangement, register, expository modes, complex noun cluster, nominalization.

**Introduction**

A report is a document that presents information in an organized format for a specific [audience](https://www.thoughtco.com/audience-rhetoric-and-composition-1689147) and [purpose](https://www.thoughtco.com/purpose-rhetoric-and-composition-1691706). Although [summaries](https://www.thoughtco.com/summary-composition-1692160) of reports may be delivered orally, complete reports are almost always in the form of written documents. Sharma and Mohan define a technical reportas "a written statement of the facts of a situation, project, process or test; how these facts were ascertained; their significance; the conclusions that have been drawn from them; and (in some cases) the recommendations that are being made" (Business Correspondence and Report Writing, 2002). Reports written in a university context tend to be structured, formal, objective, impersonal, complex and contain technical language. Reports are mainly of two kinds according to the purpose they serve and their content. Therefore, scholars talk of formal and informal reports. The formal report is usually written on goals and objectives of an organization, an institution, a company or ministry. It can be a report that is written after studying or investigating a specific issue or phenomenon. The writer of a formal report writes it in his official capacity and such writing is essentially on an important matter that needs careful compilation, analysis, interpretation and documentation. Examples of formal reports are progress reports, feasibility studies, field trips, recommendation reports and laboratory reports. On the other hand, an informal report is meant for future guidance. It provides information on related issues that may occur in the future. It is the type written on activities of social clubs, family affairs, of even religious activities. This article focuses on formal reports.

Technical report is a type of formal report and includes any written information that is based on an account of what has been learned by experience, observation or investigation. It is information that reports and interprets what has been observed. It does this responsibly from a technical viewpoint based on facts that are verifiable. Technical report writing conveys formally specific information about a technical subject to a specific audience for a specific purpose (Daniel and Steven, 2002). Markel (2012) defines technical writing as a process of gathering information from experts and presenting it to an audience in a clear and easily understandable form. It is a type of writing where the author writes about a particular subject that requires direction, instruction, or explanation. It is a field that involves creating documents to convey complex information from developers to customers. Traditionally, it involves creating documents especially for professional audiences such as research paper, programming guidelines, and repair manuals. This type of report is characteristic of science, technology, business and various other professions. A technical report is expected to contain data that can be verified. Such data will not change unless new findings emerge after the report has been written. The information provided is complex, specialized, organized and presented in a certain format. The writing is concise, clear, and accurate and conveys the exact meaning intended. It also takes into account the audience’s needs, biases and prior understanding. The writing presents information to help readers solve a problem or gain a better understanding of a situation. The graphics of technical writing is meant to be practical, that is, to communicate a body of factual information that will help an audience to better understand a subject or carry out a task.

Effective reporting of technical information involves three major steps, which are:

1. Focusing on a problem or subject matter that is not popular knowledge, but rather specialized in that it belongs to arts, science, medicine, engineering or other related fields.

2. Taking systematic steps to study, observe, analyse, experiment and measure, obtain accurate and precise information about the problem or subject matter.

3. Organising information in a meaningful way and presenting it in such a way that it will be clear and meaningful to the person for whom it is intended.

**Features of Technical Report**

According to Daniel and Steven (2002), technical reports:

* **Are audience-centred:** This means that the writing aims to help its readers. The writer of technical reports should therefore ensure that the writing is clear, concise and easy to rasp.
* **Deal with specific situations:** technical writing engages a specific audience that has specific needs. The writer’s goal is to satisfy the audience’s need.
* **Enable readers to act:** According to Killingsworth and Gilbertson (1992) cited in Daniel and Steven (2002) it is helpful to view technical writing as a tool to empower readers by preparing them and for moving them toward effective action. An effective action means readers act in a way that satisfies their need.
* **Occur within a community:** Killingsworth and Gilbertson (1992) further assert thatall action occurs within acommunity, a loosely or closely connected group of people with a common interest. The key point for a writer to remember is that belonging to a community affects the way a person acts and expects other members to act. This feature requires writers to write in certain ways to satisfy the readers’ expectations.
* **Are interactive**: the interactive sense of writing and reading means the document is a blueprint from which the reader recreates the message. The reader relates to certain words and presentation techniques from a framework of expectations and experiences and makes a new message.
* **Have a definite purpose:** technical writers enable the readers to act in three ways: by informing, instructing and persuading them (Killingsworth and Gilbertson, 1992). Most writers use technical report writing to inform; to carry out job responsibilities, people must supply or receive information constantly. Writers instruct when they give readers directions for using equipment and for performing duties. For instance, writing tells medical personnel exactly what to do if a patient as fever. Finally, writers persuade readers with cogent reasons to follow a particular course of action or accept a particular solution to a problem.
* **Are presentational:** This refers to the format of technical report writing, which progresses through topical arrangement. The information is presented in topics and sub topics to allow easy reading and comprehension of each segment of the material. Daniel and Steven opine that although presentation has many strategies, the key ones are: Use of top-down method; use of headings; chunks; visual aids establishment of consistent visual logic;

**Top-down** means putting the main idea first in order to establish the context and the outline of the discussion. A good technical report writer always puts the audience first and always presents the material in a dramatic way.

**Headings or heads** are words or phrases that name the contents of the preceding section. Heads are top- down devices that tell the readers what will be treated in the next section of the material. They also indicate where the units begin and end. As a result, the reader always has a map of the message.

**Use of chunks**: a chunk is any block of text. The basic idea is to use a series of sort blocks rather than one long block. Readers find sorter chunks easier to rasp than long ones.

**Visual aids** such as graphs, tables, maps, and drawings appear regularly in technical report writing. Writers use visual aids to present collections of numerical data (tables), trends in data (graphs), and examples of actions (how to insert a disc into a computer). Documents that explain experiments or projects almost always include tables or graphs; manuals and sets of instruction use drawings and photographs while feasibility reports often include maps of sites. These visual aids help to reinforce the message in the text

As well as simplify examples that would have been impossibly long and ineffective to give in writing. Technical writers use visual aids for four purposes: they are to summarise data; give readers an opportunity to explore data; provide a different entry point into the discussion; and engage reader expectations, that is, to cause readers to develop questions about the topic.

The followings are some of the visual aids used in technical report writing.

**Tables, Figures and Graphs**

Ku Leuven (2018) recommends that writers should use tables, figures and graphs to **display main and significant results**. Tables are used to present exact values or information. To understand patterns and relationships between multiple sets of data, a graph is usually better suited. Effective use of this feature also means that the writer should:

* **Present information only when it is of value to the reader**. Each table, figure or graph should convey interesting new information and add value to the text.
* **Number**every table, figure and graph in the sequence in which they will be referred to.
* Tables should be numbered and captioned above the table.
* Labels, figures and graphs below with their number and descriptive title.
* **Refer**to every table, figure and graph included in the text **by using the present tense.**
* Ensure that each reference to tables, figures and graphs cites the corresponding number. The text should highlight and interpret only two or three key results shown.
* Cite references if applicable.

#####  **Tables**

In the case of tables, writers are expected to:

* Be consistent in font type and size.
* Make sure columns and/or row labels are clearly separated from the data, for instance, by placing them in another font type (e.g. Bold). Also include units of measurement.
* Decimal numbers should be aligned on the decimal point. The tables should be kept simple. **Too much unnecessary elements and decoration**, such as horizontal and vertical rules or borders between rows and columns, should be omitted.

#####  On Graphs,Ku Leuven (2018) advises as follows:

* **Axes should be properly labeled**.
* Show **parameters and units**and describe the **scale**of every graph.
* Make sure the centre point of the graph is located at the zero point on the horizontal (x) axis and the zero point on the vertical (y) axis. If the y-axis is not starting at the zero point, your graph can easily mislead the reader.
* Make sure that both the x- and the y-axis are divided into equally spaced intervals.
* Add a**legend**or **explanatory caption**. A legend should be carefully placed. In some cases, removing the legend and labeling the lines in a graph directly should be possible.
* Ensure graphs are **sufficiently large and readable**. Guide the reader in interpreting the information.
* Keep the simple by omitting unnecessary **ornamentation**, such as gridlines, tick marks and crosses. Avoid three-dimensional graphs as well, as they are rarely clear and easy to interpret.
* Provide comparable graphs with the same format, size and lay-out. Include all information needed to compare in one graph as far as possible.

**Symbols, Formulas and Equations**

* Standard symbols and notations should be used consistently throughout the text. Symbols should be written in italics*.*
* Define symbols on first use in the text and add units and parameters. Be consistent in using symbols throughout the text.
* Keep records of the symbols being used in a (numbered) list, in order to avoid double use of symbols. Do not mix capital and small letters.
* Formulas and equations are cited in the text by means of an equation editor such as Math Type (i.e. the equation editor of MS Word).
* Insert short formulas and equations in the text, long formulas and equations are placed on a separate line in the text.

**Establishment of a consistent visual logic**: a consistent visual logic means that each element of the format is presented in the same way as other similar elements.

**Technical report writing uses plain and objective language**

Technical writers use plain, objective language and terminology that the audience understands because their purpose is to inform, instruct, or persuade the readers about a specific practical matter. They use words or sentence structures that focus on the reader’s attention on the relevant facts. The words used should not prompt the readers to make emotional, unusual, or unnecessary interpretations about the subject.

**Technical report writing is responsible**

Since the reader count on the writer to be their guide, the writer should do his best to fulfill their trust by telling them what and all they need to know. In other words, technical report writing is an ethical endeavor (Grifflin 1980 in Daniel and Steven, 2022). The key point is to take responsibility for the writing (Mathes, 1981 in Daniel and Steven, 2022). Ethnically is the technical writer’s responsibility to ensure that the facts of the matter are truly represented by the choice of words. In the text of your documents, the writer must tell the truth and do all the necessary things that can be done to ensure that the audience understands the message. To achieve both, language and format should be used honestly; visuals should be used with precision; use simple, direct expression of ideas; and credit the ideas or work of others. Knowing the characteristics of technical writing is very important as it enables effective report writing.

**Skills in Writing Technical Report**

Nordquist (2017) opines that a well-written technical report requires four types of writing skills. These are exposition, narration, description and argumentation. Of all these skills, the expository writing skill is the most employed in writing technical reports. Expository writing is a type of writing used to explain, describe, or give information. The text is organised around one topic and developed according to a pattern or combination of patterns. As it is used in technical research reports, a number of strategies are employed to expose a material. These are: topical arrangement, exemplification, definition, classification, analysis, comparison and contrast.

**Topical Arrangement**

An ordinary arrangement of information is an important requirement that makes for easy reading and comprehension of any piece of writing. A good method of achieving an orderly presentation of information is choice of a topic which can be sub-divided into sub topics. We can see from these explanations that any form of arrangement of information in a technical writing material is referred to as topical arrangement. Laboratory report writing can be cited as an example of a technical writing that has a good form of topical arrangement. It has a topic, that is, a title upon which other sub-topics within this report are based. The topical arrangement of a typical laboratory written experiment may look like this:

* Title
* Abstract
* Aims/objectives
* Introduction/theoretical Background
* Equipment and Materials (Apparatus)
* Procedure
* Results
* Discussion of results
* Conclusion

###### **Exemplification**

This is a mode of symbolization that is characterized by the relation between a sample and what it refers to. An element of expository writing is to start with generalizations which are then supported by concrete examples. It uses specific, vivid examples for the purpose of adding more information. For example, a question like, *I achieved success,* requires exemplification.

###### **Definition**

For further clarification and proper understanding of any message being communicated in technical writing, we may use some technical words that have to be defined. These technical terms may be concepts, idea or words that readers (specialists and non-specialist) may not be found in non-technical dictionaries. Definition makes something clear or distinct. It sets boundaries or specifications with the intention of making the defined item stand out. For example, what is language?

###### **Classification**

Another form of exposition found in technical writing is the presentation of information in a clear and logical manner known as classification. It is used essentially to make a description of similar or related objects, concepts, substances and ideas. How we classify objects or ideas depends on the importance we attach to common characteristics that each of these objects or concepts possesses. For instance, *Discuss the advantages and disadvantages of educating the girl child in Nigeria.*

######  **Comparison and Contrast**

This is a strategy or method in which you examine the similarities and / or differences between two related things, Ideas etc. An example is, *compare and contrast water flowing through a pipe to* electricity *flowing through a wire.*

**Language and Style of Technical Report**

According to Ku Leuven (2018) a well written technical report requires mastering a certain style of writing. This style of writing has a very specific purpose and different characteristics. This means acquiring the ability to write using grammatical features that distinguish it from other types of writing. Each form of writing has its style reflected in the structure, organization and language peculiarities/ requirements. The followings capture some of these peculiarities.

###### **The Use of Complex Noun Clusters**

Technical writing is characterized by the use of complex phrases. These are made up of three to four words. One other feature of technical writing is the tendency to modify noun by means of other nouns. Typical examples are:

1. to prevent poor thermostat operating the machine
2. the dangers of nationwide population explosion are imminent
3. an informal modification system was used.
4. a highly accelerated air-conditioned tinted glass car may not be good for Nigerian roads.

e. population-based control study;

f. the experimentally determined structural parameters employed in the plot; and

g. cool-start solenoid system.

These complex phrases crop up everywhere in technical report writing though sometimes make reading difficult. Daniel and Stevens (2002) therefore advise that writers should break them up to simplify the reading process by the audience.

**The Use of Nominalisation**

Nominalization means the tendency to turn verbs into nouns. In its use, actions, procedures and objects are often used as subjects of sentences. It is the expression of actions as noun phrases instead of verbs. The language of reports should also be objective and complex. Objectivity and complexity can be achieved through the use of structures such as nominalisation and extended noun phrases. This allows the text to focus on objects or concepts rather than actions, so it sounds more abstract and objective. This language structure also allows more information to be packed into less space and increases the complexity of the writing. [Extended nominal groups](https://unilearning.uow.edu.au/academic/3c.html) increase the amount of information provided about the people, places or concepts described in the report. E.g. Measurement of internal diameter was performed by the probe, conclusion of an observation. However, Daniel and Steven (2002) advise that technical report writers should avoid too many nominalisations as they weaken sentences by presenting the action as a static noun rater tan as an active verb, thus making the idea harder for the reader to grasp. The true action in the sentences should be expressed with strong verbs.

###### **Use of Passive**

Passives occur frequently in scientific/technical writing. It is frequently used in writing the procedure section of experiments and describing the methodology of a typical research study.

Examples:

a. The water was steadily heated.

b. The boiling point of water was obtained.

c. The sample was tested.

d. The graph was plotted.

e. The temperature was taken.

f. Some water was added to the distilling flask.

Also, passive is used to convey impersonal information in technical writing.

E.g. the rational for the studies was discussed. This means, there is more emphasis on the action than on the doer of the action.

###### **The Use of Impersonal Forms**

###### In technical texts, there is the tendency to avoid impersonal tone which implies that the writer is not important or the situation is neutral. In order to make the tone impersonal the following should be considered:

a. do not use names, especially first names;

b. do not use personal pronouns such as: I, you and we;

c. use the passive voice;

d. use longer sentences; and

e. use the third person singular ‘it’.

###### For instance:

###### It has been shown that…..

###### From the preliminary studies, it was found that…………

###### The result of the study shows that………………….

###### A decision to implement a circles proposal has been made.

###### This project should increase bot employee morale and the profits of the company.

**Use *there* sparingly**

Daniel and Steven (2002) observes that the over use of the indefinite article ‘there are’ and its many related forms (there is, there will be, and so on) weakens sentences by ‘burying’ the subject in the middle of the sentence. Most sentences are more effective if the subject is placed first. For instance, *there is change in efficiency policy that could increase our profits* is not as effective as, *our profits will increase if we change our efficiency policy.* There however some few instances were there forms are more effective. For instance, it is weak to write, *three standard policies exist* but better to write, *there are three standard policies.*

**Avoid choppy sentences**

A string of short sentences results in choppiness. This is because as each idea appears as an independent sentence, the effect of such a string is to de-emphasise all the ideas because they are treated equally. To guide against tis, subordinate ideas should combined so that only the important ones are expressed as the main clauses.

**Avoid wordiness**

Ideas are generally effective when they are expressed concisely. Excess wording should be pruned by eliminating redundancy and all unnecessary intensifiers, e. very, repetition, subordinate clauses, and prepositional phrases.

**Avoid redundant phrases**

There are many redundant phrases being used in speaking and in writing which should be avoided. Examples of such phrases and the preferred equivalents are as follow.

Redundant Phrase More concise form

Due to the fact that because

Employed the use of used

Basic fundamentals fundamentals

Completely eliminate eliminate

Actual experience experience

Connected together connected

Final result result

In as few words as possible concisely

Alternative choices alternatives

**Use Jargon Appropriately**
Jargon refers to word use that is specialised or appropriate to a particular group. Jargon is a hallmark of technical writing, and its use is desirable in that it facilitates communication between members of a group. The use of discipline specific terminology in a report will add to its technicality and formality. [Discipline specific terminology](https://unilearning.uow.edu.au/academic/2ci.html) consists of words or phrases particular to a discipline which experienced writers within the field use to convey meaning in a certain way. Writers must be certain, however, that readers are familiar with any specialised terms used in a document. Documents that contain ‘jargon’ may seem obscure or pretentious to readers outside the field. If you are writing for a broad audience, define new terms or, if possible, substitute more general terms (ACS, 2011).

**Use Gender Neutral Language**
The days when writers used ‘he’ to refer to people in ‘masculine’ occupations and ‘she’ to ‘feminine’ occupations are long gone. When you refer to a person’s job title, don’t make a gender judgement, use neutral terms. Your nurseryman could well be a woman, and your nursing sister, a man (ACS,2011). Examples of gender neutral language include:
• Actor instead of actress
• Firefighter instead of fireman
• Salesperson or sales representative instead of salesgirl, saleswoman or salesman
• Flight attendant instead of air hostess or steward
• Police officer instead of policeman or policewoman
• Spokesperson instead of spokesman
• Synthetic or artificial instead of manmade
• Worker instead of workman.

**Use Simple Sentences**
The more complex a sentence, the more difficult it is to understand, especially for readers unfamiliar with the topic. Some novice writers, especially those trained in academic writing will try to impress readers with long, complicated sentences. If you find yourself falling into this trap, double check your sentences to see if there is a more direct way to write the same thing. Imagine how someone would actually say the sentence in conversation (Daniel and Steven, 2002). For example, while a typical report might state “It was known by his supervisor that the equipment was faulty”, few people would say that it like that. Most would simply say “His supervisor knew the equipment was faulty”. Writing a sentence in this way provides a clearer and more direct message for readers.

**Use Active or Passive Voice**Active voice is one of the cornerstones of clear writing. In technical writing it is nearly always preferred to passive voice. Using an active voice gives your writing authority and verve. It speaks directly to readers, leaving them in no doubt who or what carried out the action (Ku Leuven, 2018).

Voice, in writing terms, refers to whether the subject of the sentence acts or receives the action.
In active voice, the subject does the action; for example: ‘The manager recommended an investigation’.
In passive voice, the subject receives the action; for example: ‘An investigation was recommended by the manager’. By comparison, passive voice lacks clarity and emphasis, although there may be occasions where you will use it, particularly in cases where the subject is unknown or less important than the action. For example, ‘The connector cord is constructed from a flexible, heat-resistant material. In addition, the use of the [passive voice](https://unilearning.uow.edu.au/academic/3a.html) allows a writer to foreground what was done, rather than who did it, thus making the writing less personal. A more objective, impersonal tone is achieved through the use of [formal](https://unilearning.uow.edu.au/academic/2b.html) and [impersonal](https://unilearning.uow.edu.au/academic/2d.html) language. Some examples of expressions that may be used in a report include:

 This report aims to investigate...

 This report was commissioned to review...

 This research indicates...

 The results suggest...

 It can be concluded that...

 Conclusions that can be drawn are...

 It recommends that...

 The following recommendations are made...

**Avoid Unnecessary Words**Use simple, straightforward words and expressions. For example:

* Use instead of utilise
* Begin instead of initiate
* Person instead of individual
* Now instead of at this point in time
* Because instead of due to the fact that
* Consider instead of give consideration to
* Investigated instead of conducted an investigation
* Apply instead of make an application

Avoid unnecessary repetition of words (redundancies). For example: end results or final results, red in colour, in order to, refer back, all of, join together, etc.

**Use Imperatives**

Imperatives are instructions or directives. They tell the reader what or how to do something.

The difference between imperatives and active voice is that active voice makes a statement but gives no directive to the reader. For example, ‘The instructions describe how to assemble the machine.’ Imperatives should be used when writing instructions, procedures and operating manuals. In these documents, the reader needs clear and unambiguous instructions (ACS, 2011).

**Use Correct Spelling, Grammar and Punctuation**

Correct spelling is essential in all types of technical documents. Misspelt words are distracting, unprofessional and potentially misleading. Use a dictionary if you are unsure of a word, and take especial care with unfamiliar technical terms and people’s names. Use a style sheet to ensure consistent spelling throughout the document.

Grammar is the set of rules that is generally agreed on in any language. A good writer will:
• Keep sentences short and clear.
• Vary the length of sentences.
• Use the correct syntax

Punctuation marks are designed to aid the reader’s understanding of the text. Poor punctuation obscures the meaning and destroys the reader’s train of thought. All writers must know the correct use of punctuation marks. As a starting point, make sure you know exactly how to use the common punctuation marks: commas, full stops, semicolons, colons, apostrophes, brackets, hyphens, question marks, and quotation marks.

**Top of Form**

##### **Writing style in Writing Technical Report**

According to Ku Leuven (2018), the writing style of technical report requires that the writer should avoid the followings

* Avoid colloquial or informal language. Eliminate all 'fillers' and needless words. Biased language is not acceptable in academic writing.
* Avoid personal or familiar language. Do not directly address the reader and do not ask rhetorical questions. The use of personal pronouns does not fit into an objective, scientific paper.
* Avoid ambiguous, imprecise or vague words such as ‘various', 'some', 'particular', 'numerous'. Also avoid impersonal expressions. Be **clear, concrete, specific, precise and direct**. If possible, choose **specific wordings**which will lead to more concise writing.
* Do not use 'wordy' expressions. For instance. 'Since' or 'because' are easier to read than 'for the reason that' or 'owing to the fact that'.
* **Limit the use of abbreviations**in academic writing. Explain the abbreviations you are using.
* **Avoid contractions**such as 'doesn't', 'haven't'. Always write full forms.

##### **Reporting numbers**

* Write out numbers at the beginning of a sentence.
* Spell out cardinal numbers from one to nine and ordinal numbers from first to ninth. Numbers below 10 are usually written as words. Also write out hundred, thousand and million in words. Please consider the following exceptions:
* Write the number in numerals if numbers have been measured or calculated, followed by a unit of measurement. Usually, a space is inserted between the number and the unit.
* Round numbers to, for instance, two decimal places unless stated otherwise.
* Percentages require numerals, except when beginning a sentence.

##### **Punctuation**

* Writing correctly **punctuated sentences**is essential to enhance readability:
* Do not forget punctuation.
* Make sure you are using punctuation marks correctly. Do not use commas instead of full stops. To separate items in a list, use a colon.
* Commas are used between each item (use a semicolon if you are including the items on a separate line in the text) and end the last item in the list with a full stop.
* Do not use excessive punctuation.

**The Structure of technical report**

A scientific or technical report or text should have a logical structure and organization. Typically, an academic text comprises of different chapters and sections of about equal length flowing smoothly into each other. The sections consist of associated paragraphs that are carefully formatted in a consistent page lay-out as seen below.

##### **Writing Paragraphs:** in writing paragraphs, the followings should be taken into consideration:

* Organize the text in paragraphs and ensure that paragraphs are more or less **evenly distributed;**
* Structure paragraphs along a **topic sentence**. The topic sentence should adequately describe the main idea of that paragraph. The remaining part of the paragraph should then develop that idea more fully;
* Develop a paragraph **in a systematic way**, for instance working from general to specific or from theory to practice.
* Be consistent in the use of **tense t**hroughout paragraphs;
* Pay attention to **transitions between and within paragraphs;**
* Include transition markers between paragraphs to maintain coherence. Also, link sentences within paragraphs using signal phrases, connecting phrases as well as reference words. Paragraphs should be coherent and presented as a whole. Some of the possible**transition words and phrases**are the following:
	+ - Indicating a purpose: in order to, so, so that………..
		- Indicating a reason or cause: since, because of, due to, for...
		- Indicating a result or an effect: consequently, therefore, thus, hence...
		- Indicating more information: in addition, furthermore, besides, moreover...
		- To compare or contrast: although, however, on the other hand, in contrast, contrarily, in comparison...
		- To summarize or conclude: in short, in sum, in conclusion...

##### **Sentence structures:** on appropriate sentence structures, the following guidelines should be considered

##### **Use Simple Sentences**The more complex a sentence, the more difficult it is to understand, especially for readers who are unfamiliar with the topic, the writer should therefore consider the followings:

##### Avoid complex sentence structures that would make report difficult to understand;

##### Use correct, simple and **compound sentences;** Long sentences should be broken up into multiple sentences in order to improve readability; and

* Focus on **one idea per sentence**and emphasize the most important element. The most important agents should be used as a subject. Avoid using first person pronouns ('I', 'we') as well as personal experience in academic writing. There are however exceptions to this, Udu (2021) states that, deciding whether to write in the first, second or third person depends on how formal you want the document to be as can be seen below.

First person writing, using ‘I’ or ‘we’, means the writer has a central role in the document; therefore the writing cannot be objective. According to him, first person is used in writing reports, memos, business letters, and some types of academic writing, to show where the writer wants to establish his or her credentials or opinions. Writing in the second person means you address your reader directly. It gives the document a casual, friendly tone, which helps the reader to focus on the content. It is appropriate for writing instructions, memos and how-to manuals. However, this style is not appropriate for other, more formal, types of technical writing.

Ku Leuven (2018) opines that academic writing, scientific reports, business reports and some types of reference books usually require a more detached, measured tone. One does not need to create a personal bond with the reader in these types of writing; certainly the reader will not want to be overly aware of your presence. Second or first person writing would most likely sound presumptuous, awkward and unprofessional but writing in the third person creates an appropriate sense of distance or formality between the reader and the writer. The writer should also eliminate redundancies and avoid unnecessary repetition of words. Sentences should also not begin with conjunctions such as 'for', 'and', 'or', 'but'.

##### **Tenses and structures**

##### Give preference to**active verb forms**and impersonal constructions in the **simple present:**

* The abstract, as well as a method and results section are generally written in the simple past. They refer to what has been done;
* The introduction as well as  discussion and concluding sections are typically written in the simple present to refer to existing research, the **present perfect**is common;
* Reduce the number of nouns and, if appropriate, **replace them with their verb forms**. Too many nominalizations may produce a text which is difficult to read. Consider the following examples:

It is wrong to write; “In *this chapter****it is described****how the 2D system is extended to a 3D system*“. The correct sentence should be, “*This chapter****contains the extension****from a “2D system to a 3D system.”*

It is wrong to write, “*The following results****are obtained****in this experiment, but correct to write,* “*The experiment****yields****following results."*

##### **Word choice:** on word choice, the register or jargons applicable to the field under consideration should be frequently used but, novel or specific characters (concepts, symbols) should be described on their first use in the study. Writers must be certain, however, that readers are familiar with any specialised terms used in a document. Documents that contain ‘jargon’ may seem obscure or pretentious to readers outside the field. If you are writing for a broad audience, define new terms or, if possible, substitute more general terms. Also, choose the most **specific term**and always use names consistently throughout the report. In a technical or scientific paper clarity and unambiguity are of utmost importance.

#####  **Avoid Sexist Words**

Language is considered sexist when the word choice request only one sex even though both sexes are intended. Careful writers rewrite sentences to avoid usages that are insensitive and in most cases, inaccurate. Several strategies can help to write smooth and nonsexist sentences such as avoiding clumsy phrases as he/she and s/he, too many of them make a passage difficult to read. Example: it is sexist to write, the cleaner must make sure he punches in; it is better to write, the clerk must sure to punch in or the plural form, the clerks must make sure that they punch in.

**Avoid Unnecessary Words**

The formal and impersonal nature of reports can be achieved by avoiding [certain types of language](https://unilearning.uow.edu.au/academic/2e.html) such as slang terms and contractions (didn't, won't etc.) as well as [strong expressions of opinion and attitude](https://unilearning.uow.edu.au/academic/4a.html). Use simple, straightforward words and expressions. For example:

* Use instead of utilise
* Begin instead of initiate
* Person instead of individual
* Now instead of at this point in time
* Because instead of due to the fact that
* Consider instead of give consideration to
* Investigated instead of conducted an investigation
* Apply instead of make an application

Avoid unnecessary repetition of words (redundancies). For example: end results or final results, red in colour, in order to, refer back, all of, join together.

  **Language Items Used in Writing Some Sections of Laboratory Report**

**The Title-** Words often used include: Study: this relates to careful observation of a phenomenon e.g. “Studying the mass of an object using the principle of moment of reflection of light rays from a plane mirror.”

Investigation: concerned with a careful study by means of observations, tests and deductions from these. Examples of titles in this area are-

Measurement or determination: relates to finding the value of property by comparison with a standard E.g. “Measuring current by means of standard input”.

“Determining the boiling point of water at saturated vapour pressure”

Verification: involves carrying out an experiment to show that a scientific law is true or false. This means observations made by previous researchers are true e.g.

Verifying Hooks Law by determination of elastic Constance of spring or

Verifying the law of conservation of matter

1. **Aims/Learning Outcome**

This could either stand as a separate section or form part of the introduction. For example: it is usually derived from the title of the experiments and is in phrases.

to verify that at a point in a stationary liquid, pressure acts equally in all directions;

to determine the boiling point of water at saturated vapour pressure;

to determine the height of ceiling by simple pendulum; and

to study the reflection of light rays at place surface.

1. **Procedure**

In writing the procedure section, certain “verbs of process” are used. Below is a list

of frequently used ones:

determined as in “was determined” conducted as in was conducted”

noted as in “was noted”

Tested as in “was tested” observed as in “was observed” Followed as in “was followed” Plotted as in “was plotted”

Set as in “was set”

Recorded as in “was recorded”

1. **Results and Discussion of Results**

The results section presents data in the form of a table comparing experimental results with published or standard values which are very important. There are particular ways of expressing comparison of results. For example, if the results are in good agreement with published values, then the expressions like the following can be used:

|  |  |  |  |
| --- | --- | --- | --- |
| Subject | VerbResult(s) | Is/are consistent with | Published values |
| The | Finding(s) | Agrees/agree with | The standard value |

However, if the results obtained are not in good agreement with the published values, then we use language expressions like the following.

|  |  |  |  |
| --- | --- | --- | --- |
| The | Result(s) Figure(s) FindingsValue(s) | is/are significantly different from or do not agree with | The published value |

Explanation of error- this forms part of discussion of results. Whenever a result is different from what you expected, you must give one or more reasons. Language expressions such as the following could be used in explaining the error.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Error/discrepancy |  | Due to the | Human error |
| The | Difference | May be | Result of | Incorrect calibration |

**Tips for Mastering Technical Writing Skills**

* 1. Reading before writing. The first major requirement for mastering technical writing is by engaging in academic reading for purpose of acquiring useful vocabulary, getting familiar with how punctuation signs and other conventions of writing are used practically, and generating ideas useful to the subject in question. Reading serves as an armour to a writer to know what already exists in the literature, the gaps in knowledge that needs to be filled and the possible course(s) of action. Furthermore, research has proved that the reading skills prove useful to writing (Chappell, 2011). When a student reads effectively, he/she gets get useful information that helps him/her to create a personal understanding based on what they read, and then they tend to put down their understanding in written form (Udu, 2021).
	2. Engaging in regular practice. It is essential for young writers to practice the art of writing on a regular basis. Most successful writers did not become what they are in a single day. Since writing is a painstaking effort involving strict adherence to the conventions of writing, grammatical rules and effective paragraphing, writers should take all necessary steps to write, give to others to read and make their observations and suggestions for improvement. This can only be achieved through regular practice.
	3. Encouraging Meaningful feedback on written drafts. Whoever wants to succeed in writing should develop the habit of sharing his/her write-up with his peers and teachers for feedback with a view to improve. Objective feedback will definitely enable young writers to know their strengths and weaknesses.

 **Conclusion**

Ability to communicate intelligently either orally or in writing is a basic requirement in the world of work and social contexts. Effective communication has a direct impact on one’s career aspirations and progression within and outside of the organization. Unfortunately, poor technical writing skills are a common challenge among even undergraduate students in Science, Technological and Universities of Agriculture in Nigeria. The paper has presented several guidelines for producing an effective and confident technical report by students these institutions of higher learning considering the peculiarities in terms of format, style and use of language in writing seminars, laboratory reports and theses. Some of these guidelines have to do with topical arrangement, paragraphing, sentence structure, appropriate use of tenses and punctuation, word choice, use of visual materials, among others. All these have shown that technical report writing stems from tree basic concepts- technical writing is audience-centred, it is presentational and responsible; and like any other academic writing, it is a process, involving pre writing, writing and post writing stages. It is therefore of great importance that students of technical- related institutions of learning such as universities of science, technology and agriculture key into these peculiarities of writing technical reports such as to be in tune with the dynamism of 21st century information dissemination .

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