

# Simple report layout with TCD blue section colour (report with cover page option also available)

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June 4, 2024

## Abstract

Input abstract here. The abstract should be short, and contain a summary of what is to be expected in the report. Some key findings is recommended to be highlighted in the abstract.

## 1 Introduction

An introduction is important to ensure the background of the report is sufficiently explored, and to give the readers up-to-date information before jumping into the content of the report. The main parts of an introduction should be a background of the content that will be covered in the report, the motivation of the project or purpose of the report, and finally the outline of the report. The outline of the report is important to let readers know what to expect by reading the report, what sections will be covered and a brief outlook on what it entails.

The page margins can be set under the package *geometry*. It is advisable to look up the margin requirements of your department.

If you are not familiar with concepts like styles, captioning, cross-referencing, and how to generate tables of contents, figures etc. in LaTeX, the Overleaf guides are a useful start at: [https://www.overleaf.com/learn/latex/Learn\\_LaTeX\\_in\\_30\\_minutes](https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes).

Otherwise, a lot of help can be obtained through Stack Exchange, where it is a forum that people get help from others regarding  $\LaTeX$  writing.

Other useful tools are

- Detexify, which can convert your drawings to  $\LaTeX$  commands,
- Mathpix tools, which you can use to screenshot an equation and it will convert into  $\LaTeX$  equation form to be copied into your .tex document,
- Grammarly is a great help for grammar assistance on overleaf.

### 1.1 Sectioning

This is a subsection. You can also use sub-subsections, although it isn't recommended.

#### 1.1.1 Subsubsection

Example of a sub-subsection. It isn't recommended to nest one more layer. However, if needed, the command is `\paragraph{insert section name}`. It should not be numbered.

Finally, make sure to outline the report at the end of the introduction section.

## 2 Background

This section should highlight the basis of the report, containing specific concepts used for the contents of the report. An alternative section title would be "**Theory**". This should include any background understanding required for the content of the report, any literature review done and so on. Sometimes, this can be combined with the introduction, however, generally, it will look neater to have a section dedicated to the theory or background of the research or experimental analysis done.

This is different from the methodology which outlines the steps done to do the experimental work. Consider this to be an outline of the theoretical work done for the experimental (or simulation) work which will be outlined in the methodology section.

## 2.1 Writing tips

Generally, a scientific report should have justified text, as it looks neater, the right side of the report is not looking jagged. The font size should be 11pt to 13pt, but generally should be kept at 12pt. The recommended font type is either Arial or Calibri. Times New Roman is still accepted and generally the preferred font type, although recent talks about how it is less reader-friendly make it less appealing.

Given that Ireland uses UK English, please make sure any spellings should follow UK English spelling. If any information can be presented through paragraphing, it is recommended to do so. It is not recommended to use bullet or numbered points. It should be used sparingly, even though it might be easier to read.

Please also bear in mind that the main text should be within the margins. Any figures, equations and tables should still be within the margins. The following subsections will consider the specific points that should be taken note of.

## 2.2 Typography

Be mindful that the capitalisation of the first letter is only for given names. For example, although LED is a generally understood term, and the abbreviations are in capital letters, it should be written as light-emitting diode instead of capitalising the first letters. Any abbreviation should use uppercase letters (e.g. greenhouse gas (GHG)). If a few letters are used to represent an abbreviated word, lowercase letters can be used, such as Abbrev. for abbreviation or Pop. for population.

Typos could be mitigated with proofreading (especially on  $\LaTeX$  where the code editor and the PDF presented might have different outcomes). The use of Grammarly will help in checking grammatical and spelling errors if needed, especially for  $\LaTeX$ .

### 2.2.1 Scientific Writing Conventions

The **bold** style is not recommended to be used for emphasis. Excessive (or any) use of **bold** in text is frowned upon. Emphasis is usually done using *italics*. But again, please use it sparingly.

Italics in mathematical equations are also very particular. By convention, *italics* should only be used for mathematical terms (e.g.  $l$  for length,  $m$  for mass), while units should be in normal style (e.g. m for metre, and kg for kilogram). On  $\LaTeX$ , the default style in mathematical equations are *italics*, so if any units were to be introduced in the equation, please remember to remove the *italics*.

On that note as well, superscripts and subscripts should not be overlooked. Writing  $m^2$  is different from  $m^2$ , as well as  $V_{oc}$  from  $V_{OC}$ . When writing symbols, it is generally recommended to keep one symbol to represent one quantity, while using subscripts to specify the specific quantity it represents. For example, for the population of Dublin, *PopulationOfDublin*, *PopulationDublin* or *PopDublin* are not recommended. Instead, it is recommended to use  $P_{Dublin}$  or even  $N_D$ . Given that unknowns or quantities can be represented by a single symbol or letter, *Pop* could be an abbreviation for 'population' or three unknowns under implicit multiplications. This will be further discussed in subsection 2.3.

## 2.3 Equations and Numbers

Whenever an equation is introduced into the report, it must be useful to understand the mathematical work done in the report. Any mathematical equations used during the process of the research are recommended to be included in the report (although simple equations that are generally well-understood can be omitted).

A good practice is not to write the full name of the quantity in the equation but to introduce a term to represent it in the equation. This can be seen for example using Einstein's mass-energy equation in (1) and (2):

$$Energy = mass \times (SpeedofLight)^2, \quad (1)$$

$$E = mc^2, \quad (2)$$

where  $E$  is energy,  $m$  is mass and  $c$  represents the speed of light.

Once terms are introduced as seen in (2), the equation is easier to read. Note also that any terms that have been introduced are fully described, and in a paragraph instead of bullet points. The equations are also treated as part of the sentence instead of a separate entity like figures or tables. That is why a punctuation mark was used at the end of each equation.

The equations should also be labelled so that it is easily referred to when it is used. Thus, instead of inputting values in the equations, it is recommended to leave them out and conclude the calculations in text. For example, the gradient of a linear function,  $m$  can be written as

$$m = \frac{y - c}{x}, \quad (3)$$

where  $x$  and  $y$  are independent variables with a linear correlation and  $c$  is the  $y$ -axis intercept. For a directly proportional relationship (i.e.  $c = 0$ ), and a coordinate of  $(2.0, 7.0)$  was found, by using (3),  $m$  is calculated to be 3.5.

Although it is fine to include the units in the equation, it is generally better to put it in the description of the terms. For example, energy,  $E$  in Wh can be calculated as

$$E = P \times t, \quad (4)$$

where  $P$  is the power in watts (W) and  $t$  is the time taken in hours (h). Bonkers.ie stated that the average household energy usage in a year is 4200kWh a year, while 50% of the households use between 3150–5250kWh a year [1]. Note that even if a range is written, the units should only be at the end, and the dash should be an en dash.

Generally, it is recommended to use indices when writing values. It is easier to understand  $3.1 \times 10^{-3}$  compared to 0.0031. Likewise, since the purpose is for ease of reading and interpreting, if any indices are used, the indices should be consistent throughout the variable for easy comparison.

## 2.4 Citations and Reference

When citing a document, the reference should contain as much information as possible. The reference should be consistent as well, with the order of information and style of writing. Some report has an inconsistent style of writing the authors. If initials are used for first names, all the authors should only have initials for first names. Most article database (or even journal websites) will have the option to download the citation as BibTeX, which then can be copied into the bibliography .bib file. The reference should be at the end of the document, before the appendix.

When citing in the main text, the common two ways of doing it is by numbers (generally Vancouver style [2]) or by author-year (generally Harvard style [3]). When mentioning the name of the author during the citation, *et al.* should be used and in italics. If using numbered styles, the number can appear after the name of the author or at the end of the sentence.

One source that is frowned upon as a reference is Wikipedia. Given the nature of Wikipedia being open for editing by the public, the generally quick-changing nature of the Wikipedia page makes it not a suitable source of reference. However, Wikipedia is still useful to obtain resources from their citation list. Although Wikipedia should not be referenced, Wikimedia figures can be referenced, although not recommended as well.

### 2.4.1 Plagiarism

Changing a few words in a sentence from a resource is insufficient for paraphrasing. Paraphrasing requires a rewrite of the content in your own words, not a slight modification of a given work. Take note as well, although ChatGPT can be a good tool to help paraphrase a sentence, make sure that the content has not changed and produce a conceptually false sentence. **Please look up your department policies regarding the use of AI writing tools in your report writing.**

At the same time, picking up a full sentence (or a huge part of a sentence) from your sources are also considered plagiarism, even though the sentence is short and not the full content of the report. Although not recommended, quoting should be used if a full quote is picked up to be used in the report. A general guide is that a single quotation mark is for a direct quote from the source, while 'double quotation marks are usually used for quoting direct speech' [2, p. 6]. Also, take note of the punctuation used as the open quotation mark is a different symbol to the close quotation mark in L<sup>A</sup>T<sub>E</sub>X.

If paraphrasing can be done, that would be much more recommended than a direct quote. However, if the message cannot be transmitted through paraphrasing, a limited amount of direct quoting can be done.

Finally, no matter where you have obtained your data, please cite it. Even if the source is the lecture content, please cite the source. As long as it is not from you, you have to cite it. If you looked up more information to analyse your data, *cite where you obtained the information that led you to the conclusion you have made*. In this lab report, the most number of reference per report is one, which highly unlikely that all the information in the report is your own output without any external support or reference.

One final note, that **self-plagiarism is still plagiarism**, and you should never submit any work that you have submitted before. If it showed to be useful for the current report, it has to be cited and paraphrased as much as possible.

## 3 Methodology

Elaborate in detail the methods you used to collect the data. This should also include any potential uncertainty and errors. Any relevant equations should be explained either here or in the background section.

Typically, scientific writing should be in the passive voice. The use of active voice has been more and more accepted in scientific writing, however, it is generally better to be in a passive voice. A passive voice removes the author from the work, which makes the work done feel more generalised, and should be replicable by anybody. Since scientific work should be factual by nature, the results should be the same regardless of the individual doing the experiment. Although this is not always true, especially considering bias, it is generally recommended to leave the subject out of the report.

## 4 Results

Highlight any relevant data collected that will be used for the analysis of your work. Depending on the requirements, sometimes just a summary of the data is required, but sometimes the full elaborate data is required. The main thing is to make sure that the data is presented in a clear and easy-to-understand way, usually through figures and tables. Any data that was introduced *must* be discussed and interpreted.

### 4.1 Figures and Tables

Whenever a figure or table is introduced into the report, the first thing to make sure of is that the table or figure can provide additional support to the report. If the information can be included as text in the main text of the report while the figure will not provide extra visual aid, the figure is considered pointless and should be omitted from the report.

Figures and tables should be treated as an additional attachment to the report. The main text should specify where it is referring to the figure (even if the figure is right next to where it is used in the text). Figure 1 shows the Trinity College Dublin logo [4].



Figure 1: The logo of Trinity College Dublin. Image taken from the Trinity College Dublin website [4].

Note that the figure citation and in-text citation were both done, as they are treated as independent of each other. The main text should be written such that the figures and tables are supporting materials for the report. Thus, it should be clear where the figures are utilised in the report. At the same time, the figures should have a descriptive caption. The caption should state what the figure represents, and if applicable, highlight some main things to observe through the figures. The purpose of the caption is to describe the figure used, and act as a description in case the figure was not produced properly.

Crucially, any figures and tables that are introduced into the report must be referred to in text, to show where the figures are being used in the report. The use of directional reference should be avoided (especially on  $\LaTeX$ ) given that your figure might not be in the direction that you specified in the text, as the figure might have been relocated while the compiling of the document is being made. 'This can be seen in Figure 3.' is a good enough reference to the figure in the text. Additional discussion in figures and tables will be in subsection 4.1.

When including a figure or a table (and even an equation), please make sure that they are within the bounds of the margins. Use a new line if that is required.

The comments on figures apply as well on tables too. Generally, figures will have captions underneath the figure but tables will have their captions above the graph, although this is not widely enforced. However, similarly, if the content of the table can be easily written in the main text, in a paragraph or bullet points (not recommended), a table should not be used. Table 1 is an example of a table.

Please also ensure that the tables and figures are capable of supporting the report. Do not include any figures for aesthetic purposes, nor include any figures that do not provide any additional information that can be outlined in the main text. Furthermore, generally, a figure or graph will provide more information than a table, and the data can be easily extracted and analysed. So, do consider the best method to display your data, observation and analysis.

Manipulating var. / unit	Responding var. 1 / unit	Responding var. 2 / unit
Option 1	Outcome 1-1	Outcome 2-1
Option 2	Outcome 2-1	Outcome 2-2

Table 1: Each row should be a different manipulated variable while each column is the corresponding results obtained.

## 5 Data interpretation and analysis

Interpret the data you have collected, and analyse it to come up with an inference about your data.

Note that sometimes, it is preferable to combine this section with the results section to form the “**Results and analysis**” section, since it is easier to understand what data the analysis is taken from.

Possible additional section depending on the report submitted, is “**Future work**”, discussing what will be done for the future, either by you or by someone else after you.

## 6 Conclusion

A clear and concise conclusion, containing key takeaways of the article or report. It is useful to give the readers a huge summary of what they just read, highlighting the main takeaway from the report. It should provide the key information that the author wishes the reader to remember most when reading the report. Although this sounds very similar to the abstract, this is generally true, but make sure the content of both the abstract and the conclusion do not overlap. Basically, the main body should have an elaborate discussion while summarised in the conclusion.

## Acknowledgements

*Place acknowledgement here.*

## References

- [1] Daragh Cassidy. What is the national average energy consumption?, n.d. URL <https://www.bonkers.ie/guides/gas-electricity/national-average-energy-consumption/>. [Accessed 19 November 2023].
- [2] Library Services: Imperial College London. Citing and Referencing: Vancouver Style, n.d.. URL <https://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/library/public/IMPP10650-College-Vancouver-Guide-230822-WEB.pdf>. [Accessed 19 November 2023].
- [3] Library Services: Imperial College London. Citing and Referencing: Harvard Style, n.d.. URL <https://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/library/public/IMPP10649-Harvard-Guide-230822-WEB.pdf>. [Accessed 19 November 2023].
- [4] Trinity College Dublin. Logo downloads, n.d. URL <https://www.tcd.ie/identity/logo-downloads/>. [Accessed 19 November 2023].

## Declaration

I hereby declare that this dissertation is entirely my own work and that it has not been submitted as an exercise for a degree at this or any other university.

I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at <http://www.tcd.ie/calendar>.

I have completed the Online Tutorial on avoiding plagiarism 'Ready Steady Write', located at <http://tcd-ie.libguides.com/plagiarism/ready-steady-write>.

I consent / do not consent to the examiner retaining a copy of the thesis beyond the examining period, should they so wish (EU GDPR May 2018).

I agree that this thesis will not be publicly available, but will be available to TCD staff and students in the University's open access institutional repository on the Trinity domain only, subject to Irish Copyright Legislation and Trinity College Library conditions of use and acknowledgement. **Please consult with your supervisor on this last item before agreeing, and delete if you do not consent**

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## A First Appendix

This is the first appendix. For more appendices, add `\section{appendix title}` for another appendix.