Lucy Cavendish College
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Writing Centre

Guidelines for Scientific and Technical Writing

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1. Technical writing differs from other styles of writing in that clarity, conciseness and accuracy take precedent over eloquence or the use of rhetorical devices (although they are by no means mutually exclusive).
   - Scientific statements need to be objective and unambiguous and leave no room for subjective interpretations.

     Example: "The agreement between the theory and the experimental observations was very good."

     Without further clarification, this statement is not scientifically acceptable. What may be a good/excellent/acceptable agreement for one person, might not necessarily be so for someone else. Instead, one could write: "The ratios of the experimental measurements to the theoretically predicted values displayed an average of 1.05, with a standard deviation of 0.07. Given the simplifying assumptions inherent in the model, this agreement can be considered satisfactory."
   - The right technical terms should be used. In cases where synonymous terms exist (e.g. 'centre of mass' and 'gravitational centroid') only one term should be used consistently throughout the document (even if this causes slightly annoying repetition), as 'mixing' these terms might lead to confusion.
2. A more formal writing style is usually maintained in scientific reporting.
   - Colloquial language should be avoided. Contractions (e.g. isn't, didn't,…) should not be used.

     Example: "We couldn't do the measuring because the sensor was broken." could be replaced by "Measurements could not be conducted because of a faulty sensor."
   - The passive tense is typically used to describe the various steps and actions taken during research.

     Example: "I mixed the solutions and then I measured the pH value." could be replaced by "After mixing both solutions, the pH value was measured."
3. The majority of scientific literature, whether it be a laboratory report, a research report, a conference paper, a journal article or even a PhD dissertation, tends to have a similar structure (although their length and scope obviously differ). It typically includes:
   - An abstract: This provides a short summary of the research, including its aims and the main outcomes. It is recommended that the abstract be written last, when one has a better overview of the whole report. The abstract should be written for the benefit of a potential reader who needs to decide whether reading the whole report is worthwhile for his/her purposes.
   - An introduction: This section provides a context to the research. One should start from a wide view of the research field and its applications, and situate the new research within this field. The introduction should ideally answer the following questions: 'Why is the new research relevant ?' (i.e. 'Why do we need to know this ?'), 'What is the novelty of the research in the context of what we already know ?' (i.e. 'Which research gap does it fill ?'), and 'How is the new research connected to previous knowledge

?' An answer to the latter question typically involves a literature review and a discussion of previous key achievements in the field.

- A description of the methodology: The consecutive steps followed to arrive at the research results should be described in detail. The 'golden rule' in science is that sufficient information needs to be provided for someone else to independently repeat the experiment and verify the outcomes. Any report which fails this test will not stand up to scientific scrutiny. All relevant test specimen characteristics and key parameters which have an influence on the results need to be reported.
- The research results: Test results should be presented in an effective format (e.g. figures or tables), which allows an immediate overview and easy interpretation of the results.
  - Figures should be accompanied by a caption (*below* the figure) indicating what information the figure is conveying (even if this is already mentioned in the main text). All figures should be numbered.
  - When using x-y graphs, axes should be clearly labelled, including units. Gridlines may be used to facilitate reading results off the graph (although they are considered by some to be 'distracting'). The number of labelled divisions on the axes should be kept below 6-7 to avoid 'crowding'. Axes should preferably start at zero to avoid distortion of trends. Only in very specific cases (e.g. very slight trends around an elevated value) is a deviation from this rule justified. The maximum values on the axes should be chosen such that the space in the graph is completely 'filled' with results.
  - Tables should also be captioned (*above* the table), indicating what information is being conveyed. Tables should be numbered, keeping a separate count from figures.
  - Acceptable examples of a figure and a table are shown below:

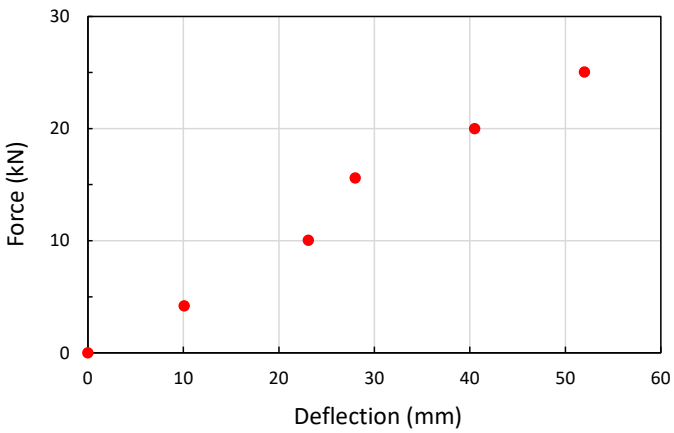

Figure 1. Force – deflection diagram of a simply supported beam under a point load.

Table 1. Deflection *d* caused by a force *F* in a simply supported beam.

d (mm)	*F* (kN)
0.0	0.00
10.1	4.20
23.1	10.05
28.0	15.60
40.5	20.00
52.0	25.05

- A discussion of the results: This section may either be combined with the previous section, or a separate 'discussion' section may be provided. Rather than just reporting observations and trends, the reasons behind them should be explored. Particular attention should be paid to seemingly anomalous results. In some cases, it might not be possible to explain these, but they should nevertheless be reported. Omitting data simply because they do not fit the model is a cardinal sin in science (almost as severe as fabricating data). Similarly, errors made during the experiment or observed flaws in the set-up should be reported. Very rarely will an extensive series of experiments go entirely as planned.

- Conclusions: Conclusions should be concise and to-the-point. The concluding remarks may contain a very short summary of the research. However, the emphasis should be on any new findings. One should be careful not to draw overly general conclusions, but instead report specific findings accompanied by a clear description of the limitations/boundaries within which these conclusions are believed to be valid. Recommendations for further research generally have no place in the conclusions, but may be provided as a separate section.

4. Referencing: To avoid issues of plagiarism, all material obtained from external sources should be properly referenced. This also includes graphical material (e.g. figures) and information obtained from websites. Two referencing systems are particularly common in the sciences:

   - The Harvard convention: In this system the name of the author(s) and the year of publication are stated in the main text. The abbreviation 'et al.' (= et alumni) is used when there are more than three authors. The reference list is compiled in alphabetical order.

     Example: "The value of *a* typically ranges between 1.12 and 1.59 (Huang and Zheng, 2011), although Allwood et al. (2015) reported a slightly higher value of 1.70."

     - Allwood, J., Johnson, L.M, and Poincaré, J. (2015). "A Koiter approach to plate instabilities." *Journal of Interesting Science*, 108(5), pp. 125-134.
     - Huang, S., and Zheng, H. (2011). *Structural stability for the practicing engineer*, Cambridge University Press, UK.

   - The IEEE convention: References are indicated with numbers in square brackets. The references are listed in the order they appear in in the main text.

     Example: "The value of *a* typically ranges between 1.12 and 1.59 [1], although Allwood et al. [2] reported a slightly higher value of 1.70."

     - [1] S. Huang, H. Zheng. *Structural stability for the practicing engineer*, Cambridge University Press, UK, 2011.
     - [2] J. Allwood, L.M. Johnson, J. Poincaré. "A Koiter approach to plate instabilities." *Journal of Interesting Science*, 108(5), 2015.

   - Software should also be referenced.

     Example: Mathworks Inc. (2011), Matlab R2011a, Natick, MA, USA.

   - More information on referencing can be found on the University of Cambridge library website:

     https://www.plagiarism.admin.cam.ac.uk/resources-and-support/referencing/referencing-conventions

5. Equations: All equations should be numbered, and exclusively referred to using their number to avoid ambiguity.

   Example: 'Substituting Eq. (6) into Eq. (5) yields the following expression:' is much preferable over: 'Substituting the above equation into the first equation yields:'

   All symbols indicating variables should be printed in italic for distinction and clarity, both when appearing in the main text and the equations. The font type of symbols should be consistent between their appearances in the equations and in the main text.

   Example: 'The temperature T exceeded the threshold T_{lim}.'

6. Some minor points:

- Integers below 10 should we written out in full. For other numbers, their numerical representation is used.

  Example: “The experimental programme comprised of 32 samples, of which eight were benchmark specimens.”

- Avoid starting a sentence with a symbol or a numerical character.

  Example: “16 measurements resulted in an average ν value of 2.345. ε was thus 2.51.” could be replaced by “A total of 16 measurements resulted in an average ν value of 2.345. The variable ε was thus 2.51.”