

Writing Scientific Research Articles

Using suggested material and methods from Cargill & O'Connor (2009)

Task 1: Article headings and sub-headings

Find the headings of the sections of the Provided Example Articles (PEAs)

- How is each article organised?
- What are the main headings and subheadings?

| Kaiser et al (2003) | Britton-Simmons & Abbott |
|---|---|
| Summary | Summary |
| Key words | Keywords |
| Introduction | Introduction |
| Results | Methods |
| Cloning of GmDmt;1 | Study system |
| Gene expression | The invader |
| Protein localisation | Field experiment |
| Functional analysis in yeast | Statistical analysis |
| Discussion | Model |
| GmDmt;1 can transport ferrous iron | Results |
| Specificity of GmDmt;1 | Discussion |
| Localisation and function of GmDmt;1 | Simulated urchin/mollusc disturbances |
| Regulation of GmDmt;1 expression | Propagule pressure and invasion success |
| Conclusion | Conclusions |
| Experimental procedures | Acknowledgements |
| Plant growth | References |
| Isolation of GmDmt;1 | Supplementary material |
| Northern analysis | |
| Antibody generation and Western immunoblot analysis | |
| Symbiosome isolation and nodule membrane purification | |
| Functional expression in yeast | |
| Acknowledgements | |
| References | |

Conventional article structure

AIMRaD:

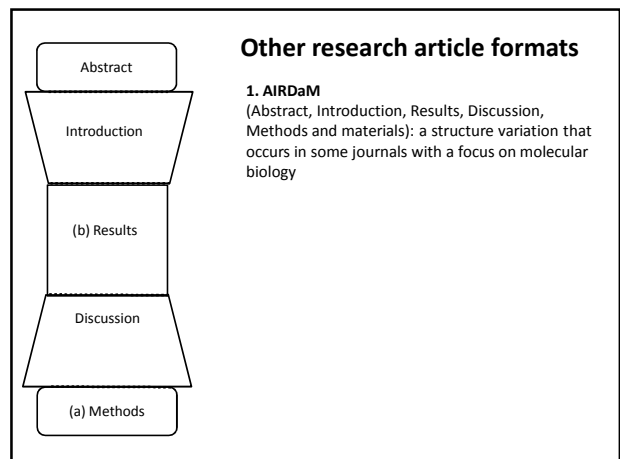
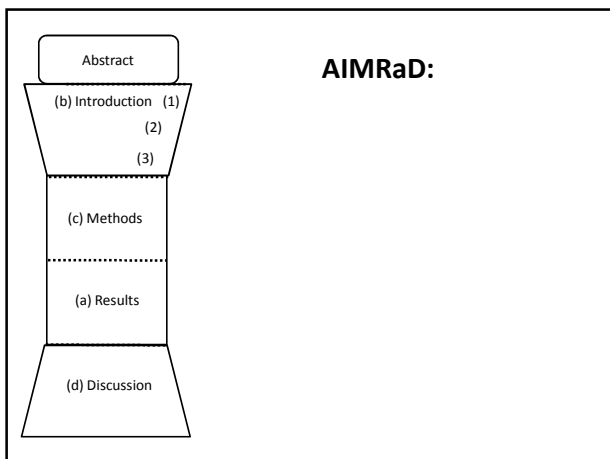
Abstract

Introduction

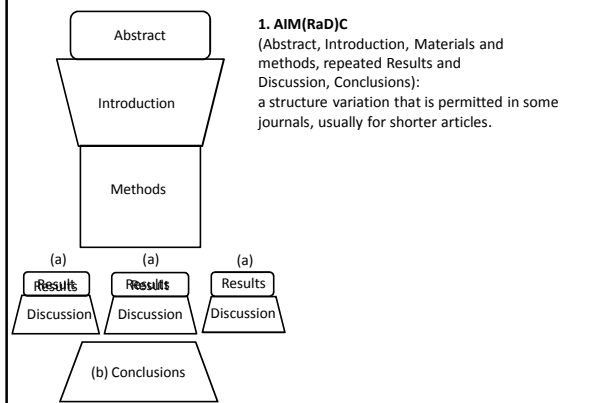
Materials and methods

Results

Discussion



Other research article formats



Task 3: Structure of the PEAs

Which of the three structures presented so far matches most closely the structure of the given articles?

Kaiser et al. (2003) most closely resembles the AIRDaM diagram. Britton- Simmons and Abbott (2008) most closely resembles the AIMRaD diagram, with a separate Conclusion section added at the end.

The language used

Have a look at the task sheet and see if you can identify which section of the article the sentences may have come from.

There is often more than one possible answer

Results as a “story”: The key driver of an article

- Results govern the content and structure of the whole article
- Identify from your results a clearly connected story which leads to one or more take-home messages
 - what readers remember after putting down the paper
 - what they talk to their colleagues about after reading it
- For story, focus on your tables and figures first
- Decide what to include and what not to include

Creating the clear story: Focus on tables and figures

- For each write one or two bullet points highlighting the main message(s) of the data presented.
- Sort the figures and tables into the best order to connect the pieces of the story together.
- Draft some bullet points into a list to form a take-home message.
- Then sit down and discuss the story of the paper you will write with your supervisor

Task 1: Questions to focus the drafting process

Answer the four questions below, in English even if it is not your first language, for the results you want to turn into a paper.

1. What do my results say?
2. What do these results mean in their context?
3. Who needs to know about these results?
4. Why do they need to know?

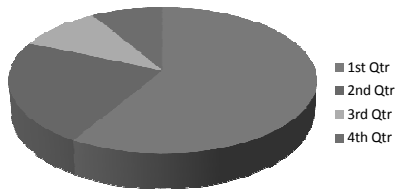
Overarching guideline:

Tables and figures should “stand alone”: the reader should not need to consult the text of the article to understand the data presented in the table or figure

- all necessary information should appear in the table/figure, in the title/legend, or in keys or footnotes

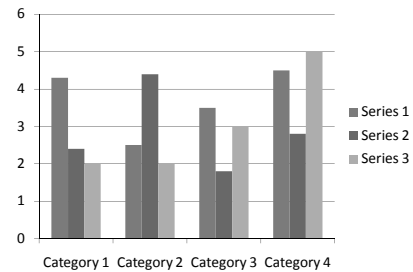
Different figure types

Pie charts: Effective at highlighting proportions of a total or whole



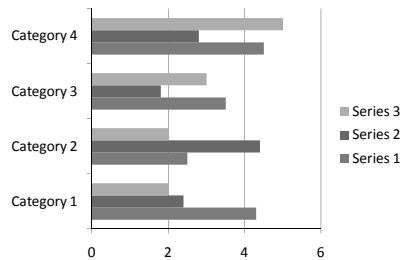
Different figure types

Column and bar charts: Effective for comparing the values of different categories when they are independent of each other (eg. apples & oranges)



Different figure types

Column and bar charts: Effective for comparing the values of different categories when they are independent of each other (eg. apples & oranges)



Different figure types

Line charts: Allow the display of a sequence of variables over time or space or the display of other dependent relationships (e.g. change over time)

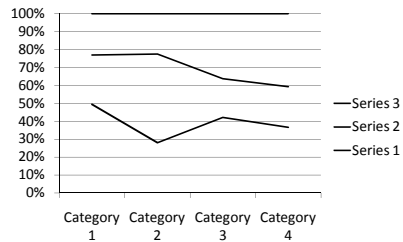


Figure legends and table title: What's in them?

Figure legends generally have five main parts

1. A title which summarises what the figure is about.
2. Details of results or models shown in the figure or supplementary to the figure.
3. Additional explanation of the components of the figure, methods used, or essential details of the figure's contribution to the results story.
4. Description of the units or statistical notation included.
5. Explanation of any other symbols or notation used.

Table titles

Can include all of the above elements but tend to have only brief Parts 2 and 3 and not to have a Part 5

Have a look at Fig 5 p129 (Kaiser) and Fig1 p138 (Britton-Simmons) and match the above section

Five parts of a figure legend:

1. A title which summarises what the figure is about.
2. Details of results or models shown in the figure or supplementary to the figure.
3. Additional explanation of the components of the figure, methods used, or essential details of the figure's contribution to the results story.
4. Description of the units or statistical notation included.
5. Explanation of any other symbols or notation used.

Number of *Sargassum muticum* (a) recruits and (b) adults in field experiment plots (900cm²). Propagule pressure is grams of reproductive tissue suspended over experimental plots at beginning of experiment. The average mass of an adult *S. muticum* (174g) is indicated by an arrow. Data are means \pm 1 SE ($n = 3$).

1. A title which summarises what the figure is about.
2. Details of results or models shown in the figure or supplementary to the figure.
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4. Description of the units or statistical notation included.
5. Explanation of any other symbols or notation used.

Uptake of FE(II) by GmDmt in yeast. **1**

(a) Influx of $^{55}\text{Fe}^{2+}$ into yeast cells transformed with GmDmt1;1, *fet3fet4* cells were transformed with GmDmt; 1-pFL61 or pFL61 and then incubated with $1\mu\text{M}^{55}\text{FeCl}_3$ (pH 5.5) for 5- and 10-min periods. Data presented are means \pm SE of ^{55}Fe uptake between 5 and 10 min from three separate experiments (each performed in triplicate). **1 4**

(b) Concentration dependence of ^{55}Fe influx into *fet3fet4* cells transformed with GmDmt1;1-pFL61 or pFL61. Data presented are means \pm SE of ^{55}Fe uptake over 5 min ($n = 3$). The curve was obtained by direct fit to the Michaelis-Menten equation. Estimated K_M and V_{MAX} for GmDmt1;1 were $6.4 \pm 1.1\mu\text{M Fe(III)}$ and $0.72 \pm 0.08\text{nM Fe(III) min}^{-1}$ protein, respectively. **2**

(c) Effect of other divalent cations on uptake of $^{55}\text{Fe}^{2+}$ into *fet3fet4* cells transformed with 1 pFL61-GmDMT1:1. Data presented are means \pm SE of ^{55}Fe ($10\mu\text{M}$) uptake over 10 min in the presence and absence of $100\mu\text{M}$ unlabelled Fe^{2+} , Cu^{2+} , Zn^{2+} and Mn^{2+} . **3 & 4**

Writing about results: Journal articles

- **Results**
 - confine any comments in the Results section to saying what the numbers show, without comparing them with other research, or suggesting explanations
- **Results and discussion**

BUT authors do sometimes include comparisons with previous work in the Results section where the point being made relates to a component of the results that will not be discussed in detail in the Discussion. For example, see Kaiser et al. (2003), p. 126, column 2, line 4 and following.

6.1 Functions of results sentences

The text of a Results section typically

- **highlights** the important findings;
- **locates** the figure(s) or table(s) where the results can be found
- comments on (but does not discuss) the results

Elements that highlight and locate are sometimes combined in the same sentence, and sometimes appear in separate sentences.

Measurements of root length density (Figure 3) ^{Past tense} revealed that the majority of roots of both cultivars were found in the upper substrate layers. **Combined**

Figure 7 ^{Present tense} shows the average number of visits per bird. **Separate**

Task 6.2 Verb usage in Results section

1. Read the extract from the Kaiser study results section below (p126 Protein Localisation) and identify which verb tenses/verb forms are used and why

Antibodies were raised in rabbits against the N-terminal amino acids of GmDmt1;1 (Figure 1c). This antiserum was used in Western blot analysis of 4-week-old total soluble nodule proteins, nodule microsomes, PBS proteins and PBM, isolated from purified symbiosomes. The antiGmDMT1 antiserum identified a 67-kDa protein on the PBM-enriched nodule protein fraction (Figure 3a), but did not cross-react with soluble nodule proteins, PBS proteins or nodule serum (Figure 3a). Replicate Western blots incubated with pre-immune serum (Figure 3b) did not cross-react with the soybean nodule tissue examined. The protein identified on the PBM-enriched protein fraction is approximately 10kDa larger than that predicted by the amino acid sequences of GmDmt1. The increase in size may be related to extensive post-translational modification (e.g. glycosylation) of GmDmt1 as it occurs in other systems.

(Kaiser et al. 2003)