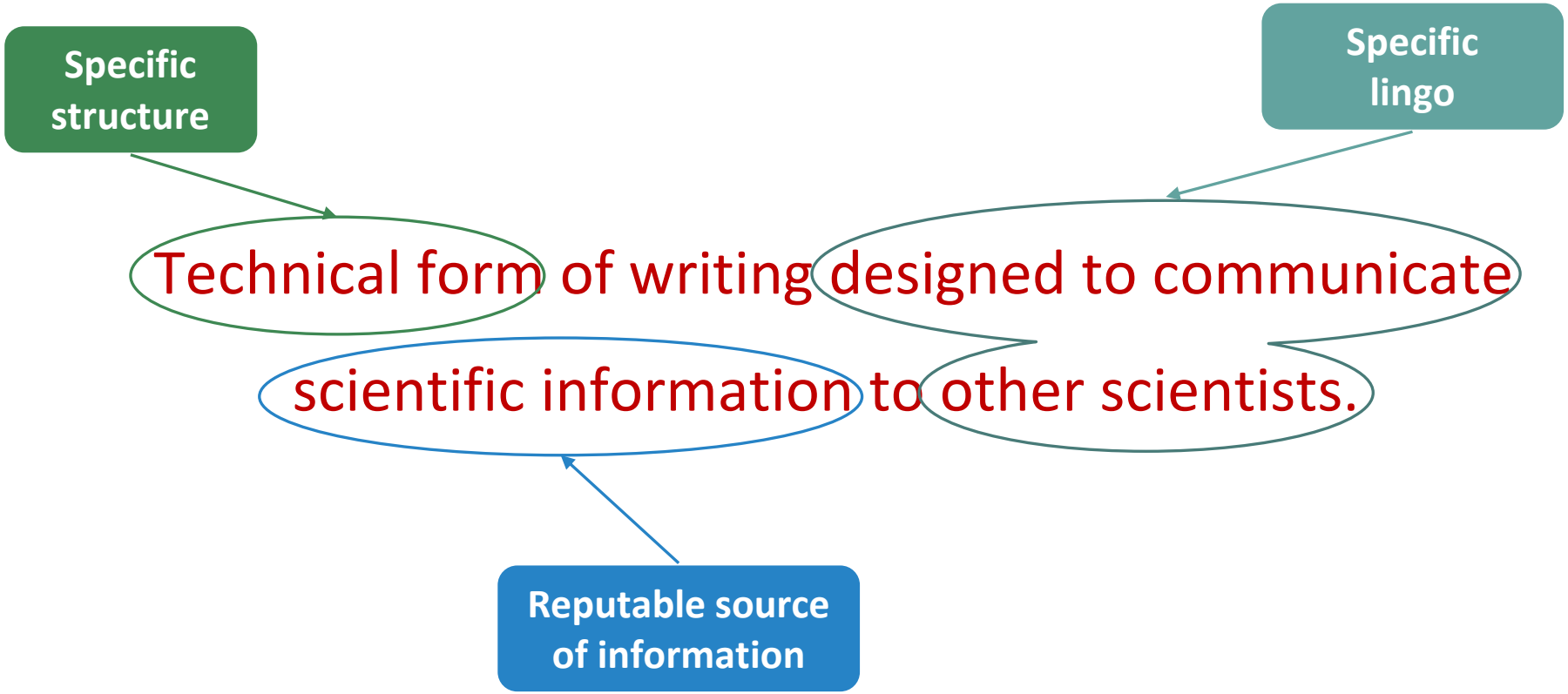
3rd URS Workshop

Scientific writing

„HOW DO YOU GO ABOUT THE WRITING TASK?“

What is scientific writing?

"Scientific writing is as much about science as it is about writing…"



Step 0: the before step – the purpose

Genre	Primary purpose
Journal article	To share new findings from your research or new insights into other people's work
Poster	To share the scope of a research project in an especially concise and easy-to-read format
Research proposal	To persuade a funding agency that they have need of your research and that it is important
Lab notebook	To organize thoughts, keep track of procedures, and protect intellectual property during research
Lab report	To reinforce new techniques learned in lab
Thesis paper	To present in detail the scope of an individual research project

Write with an audience and purpose in mind!

The purpose: share original finding and explain the significance of it.

- Why am I writing? What am I trying to achieve?
- Different purpose will require different writing.

Task: write different headlines for an article about global warming hitting its peak in March to achieve the following purposes:

a) To teach – "Global CO_2 Levels Surpass 400 ppm in March"

b) To impress - "CO_2 Reaches Highest Level on Earth in 3 Million Years"

c) To persuade – "Toxic CO_2 Milestone Warrants Action by Lawmakers"

d) To spark interest – "March Made Climate History, and not in a Good Way"

Step 0: the before step – the purpose

Google Scholar

Web of Science

arXiv

ResearchGate

Wolfram Alpha

Write with an audience and purpose in mind!

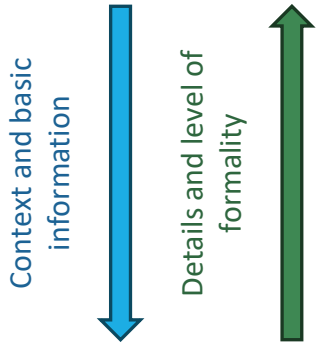
The purpose: share original finding and explain the significance of it.

- Research how your work fits into existing literature: What do we know about the topic? What open questions and knowledge do we not know yet? Why is my information important?
  - Perform literature search on a credible search engine! Google Scholar, Web of Science, Internal University Libraries (Pre-prints!)
  - Will give you critical insights into the structure and style of other similar articles.
  - Will set you up to a good storyboard for your own article.

Step 0: the before step – the audience

Write with an audience and purpose in mind!

The audience: people most likely to read a particular piece of your writing



- Experts: highly familiar with the specific area/topic you discuss
- Scientist: may be part of any scientific field, therefore has a basic understanding but not all the details that you discuss
- Students: will read with limited prior knowledge but are hoping to learn more
- General public: have little to no prior knowledge but may be interested in the subject

The audience determines how much context and background information you need to provide:

- Journal article: how you conducted your experiment/set up your model, the results, and the implications of your work
- Research grant: why your research is important and worthwhile with lots of background information and data

Step 0: the before step – the audience

Task: Which audience (expert, scientist or student) do each of the following statements seem to be addressing?

1. Extracellular polymeric substances, widely produced by microbes for attachment and protection, are important in facilitating sediment trapping in cave and soil environments (adapted from Riding 2000).
   (Scientist)

2. Sandstone composition is influenced by source rock composition, climate, relief, slope, vegetation, and characteristics of the depositional environment (adapted from Johnsson, Stallard, and Meade 1988).
   (Student)

3. Sands were cemented with epoxy, and standard thin sections were stained for both potassium feldspar and plagioclase (adapted from Johnsson, Stallard, and Meade 1988).
   (Scientist)

4. Grain surfaces of first-cycle sands from the lowland shield are typically densely covered with dissolution etch pits and are frequently deeply embayed, features that are rare on the surfaces of first-cycle sands from the elevated shield (adapted from Johnsson, Stallard, and Meade 1988)
   (Expert)

Step 0: the before step – formality

Adjust the tone of your writing to your audience for most effective communication!

In scientific writing, your tone will almost always be formal □ obtain objectivity.

Informal	Formal
Personal pronouns (e.g., "We analyzed")	Passive voice (e.g., "It was analyzed")
Contractions (e.g., "can't," "won't")	Full words (e.g., "cannot," "will not")
Colloquial expressions • a lot • totally • at the same time • interesting • look into	Academic expressions • many • completely • simultaneously • compelling • investigate
Wordiness	Conciseness

Your writing	Audience	Acceptable aspects of informality
Poster at a student symposium	Scientists	Personal pronouns and contractions maybe okay
Poster at a national conference	Experts	None
Journal article for publication	Experts or scientists	None
Research proposal	Experts	None
Textbook	Students	Contractions and colloquial expressions
Class handout	Students	Personal pronouns, contractions, and colloquialisms

Step 0: the before step – formality

Task: re-write the sentences below to a formal tone.

1. When I first mixed the dried cell extract into the solution, it didn't dissolve. After I stirred it for a while, it finally did.
2. The oscilloscope said that the frequency wasn't above 25 Hz.
3. DNA, or deoxyribonucleic acid, packs a lot of genetic information into a relatively tiny molecule.
4. When the sediment collected downstream after the storm event from the week previous to the week that this study happened, buildup caused troubles for the water to flow from the stream into the main lake.

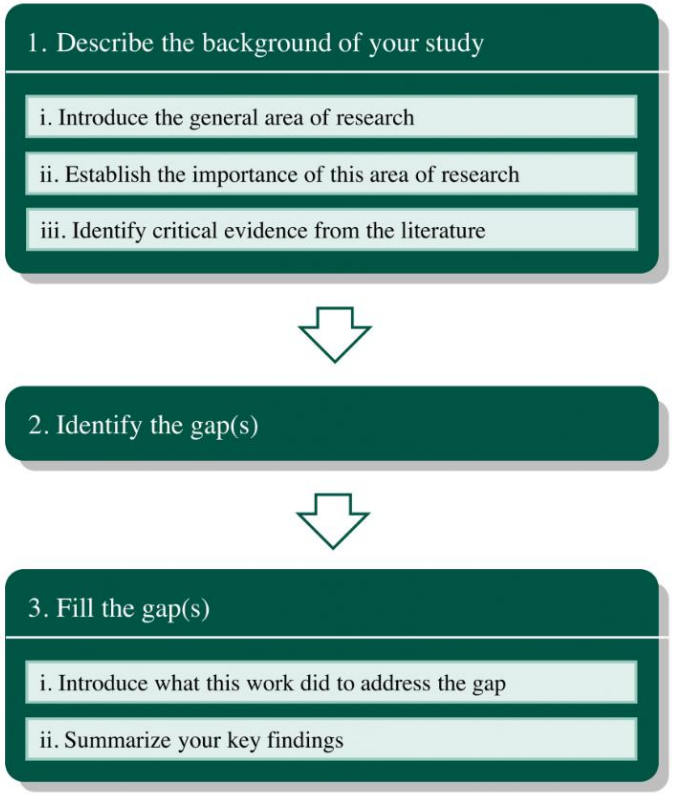
1. The dried cell extract dissolved completely after continual stirring.
2. Using an oscilloscope, the frequency was determined to be less than 25 Hz.
3. Genetic information is compactly stored in cells using DNA. *["DNA" usually does not have to be spelled out, as it is common knowledge.]*
4. Sediment accumulation from a storm event the week previous hindered drainage from the stream into the main lake.

Step 1: the structure – Journal article

- Content elements:
  - Introduction: relevant background information, identify the problem (hypothesis) and why your study is novel
  - Methods: introduce the study system (model setup, experimental setup), explain methods used
  - Results: objective statement of your results (visual information with written guide for understanding)
  - Discussion: self-contained story tying your introduction and results together – open by explicitly stating your major findings and remind the reader about the knowledge gap (identified problem), then address your hypothesis with your specific evidence (interpretation of your results)
  - Conclusion: your final opportunity to state the significance of your work, summary including new insights/questions that arose because of your research
- Broader structural elements: title, abstract, acknowledgement, references…
- Always mark each section with clear headings!
- Most scientific journals have their own rules and guidelines for formatting your paper. Always check them!

Step 1: the structure – Introduction

- Introduction: always moves from most general to the most specific information
  - Think of it like a funnel: start wide and put your research into a broad context (someone outside your field should also understand), then narrow it until you reach your specific question that you are trying to answer.
  - Perform thorough literature research, but only put the relevant findings into your paper!
  - Clearly state the problem that your paper addresses (knowledge gap) and how your work will contribute to filling this gap THE OVERARCHING STORY



Step 1: the structure – Introduction

Task: identify the gap statement, and then the statement that attempts to fill it in the following example from Costa, Robertson and Quilliam (2015):

"Paralytic shellfish poisoning occurs worldwide, and harmful algal blooms, including those responsible for PSP, appear to be increasing in frequency and intensity. PSP outbreaks in Portuguese waters have been associated with blooms of Gymnodinium catenatum in the late 1980s to early 1990s, then again after 2005. According to the national monitoring program in Portugal, G. catenatum were not reported along the Portuguese coast during the 10-year period from 1995 to 2005. The aims of this study were to fully characterize the toxin profile of G. catenatum strains isolated from the NW Portuguese coast before and after the 10-year absence of blooms to determine changes and potential implications for the region. Hydrophilic interaction liquid chromatography tandem mass spectrometry (HILIC-MS/MS) was utilized to determine the presence of any known and emerging PSTs in sample extracts."

Gap: "According to the national monitoring program in Portugal, G. Catenatum were not reported along… from 1995 to 2005."

Fill: "The aims of this study were to fully characterize… and potential implications for the region."

Step 1: the structure – Introduction

Task: identify the gap statement, and then the statement that attempts to fill it in the following example from Littler, Ciringh and Lindsey (1999):

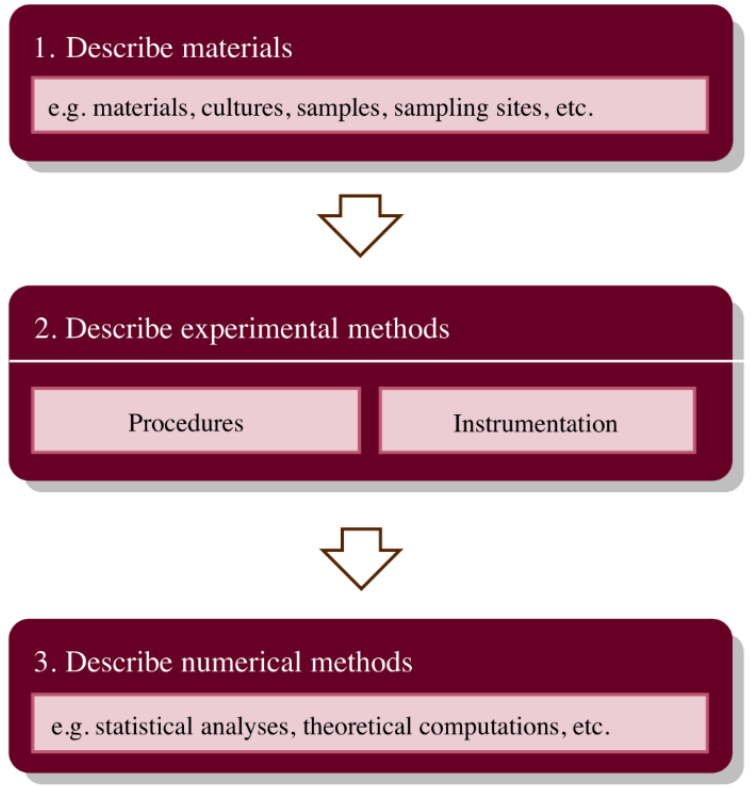
"The exchange process frequently observed in polypyrrane condensations is proposed to occur by the acid-catalyzed fragmentation of a polypyrrane 1 into pyrrolic 2 and azafulvene 3 components. As illustrated in Scheme 2, recombination of 2 and 3 can form a new polypyrrane 4 that cannot be formed by direct condensation of the dipyrromethane and aldehyde. Ultimately this process leads to the production of a scrambled mixture of porphyrins. The factors that promote the scrambling process in MacDonald-type 2 + 2 condensations are poorly understood, but suppression of scrambling is essential for preparing large quantities of pure trans-porphyrins. In this paper we describe a study of a wide range of reaction conditions for the 2 + 2 condensation that has led to refined synthetic procedures for the preparation of trans-porphyrins."

Gap: "The factors that promote the scrambling process in MacDonald-type 2 + 2 condensations are poorly understood…"

Fill: "In this paper we describe a study of a wide range of reaction conditions for the 2 + 2 condensation that has led to refined synthetic procedures for the preparation of trans-porphyrins."

Step 1: the structure – Methodology

- Methodology: demonstrate that you used scientifically valid methods AND provide the reader with enough information to recreate your experiment.
  - Chronological order of all steps you took
  - Materials: list in full sentences all items used in your problem setup – as much information as an expert would need to recreate your results, BUT remember to use the Appendix for not primary information
  - Methods: describe all methods that were used to obtain your results. The level of detail is determined by your target audience!
  - Numerical methods: describe all statistical/mathematical method that used to manipulate (post-process) any of your direct model output.



Step 1: the structure – Methodology

Task: identify the methodological element (material, method, numerical method) of each of these sentences.

1. To a suspension of 50 × 10-3 mol of NaH (80% in oil) in dry 100 ml of THF, 0.1 mol of dialkyl malonate was added dropwise over 30 min. (Trabelsi, Szönyi, and Geribaldi 2001)
(method)

2. The porous medium used in these experiments was spherical glass beads (Particle Technology Ltd., Hatton, Derbyshire, UK) in a size range of 300-425 µm, with a mean diameter of 355 µm. (Lecoanet, Bottero, and Wiesner 2004)
(material)

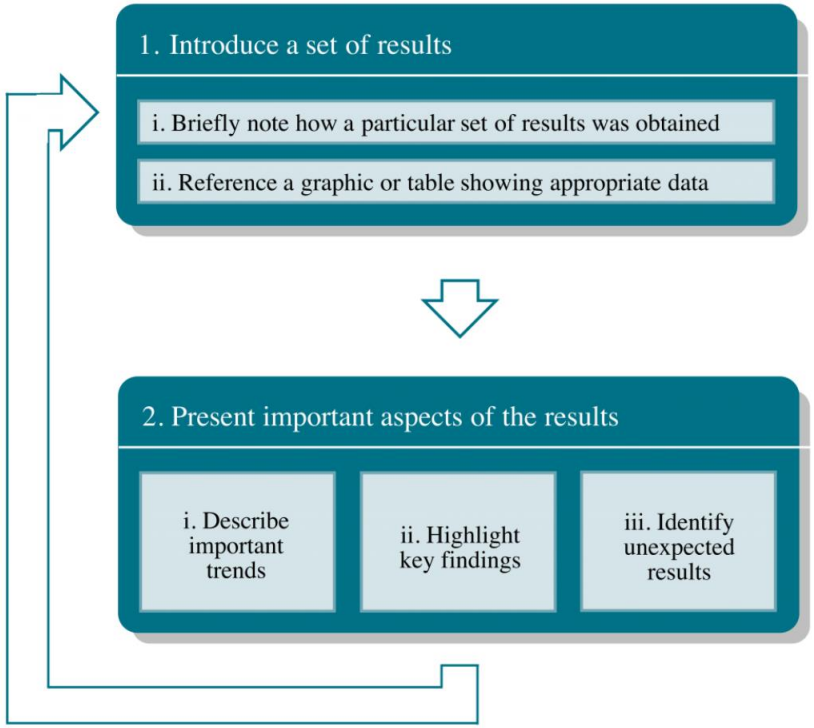
3. For several runs, we also performed velocity measurements with an 8 MHz ultrasonic Doppler velocity profiler (UDVP). (Weill et al. 2014)
(method)

4. For each numerical electron, we integrate over time from 0 to t to obtain the gain components Γz to Γ⊥. (Pukhov and Meyer-ter-Vehn 2002)
(numerical method)

5. In this area are 156 stations, but we remove stations with instrumental timing errors using a time symmetry argument for noise cross correlations as introduced by Ref. 4. (Obermann et al. 2014)
(material)

Step 1: the structure – Results

- Results: purely objective presentation of your results
  - Key task: identify which graph, table and data are absolutely necessary!
  - Good practice: group result into smaller chunks and include a few descriptive sentences for each chunk.
    - Introduce result: brief reminder from methodology on how the result was obtained, then refer reader to figure/table
    - Aspects of the result: explain what the reader should see in the figure/table – trends/key features/anomalies/differences
      - Try to follow the order represented in your figure/table.



Step 1: the structure – Results

Task: identify which representation (figure/table/word) fits best to present the data in each instances given below.

1. Population size and sex ratios for 4 different organisms grouped by habitat types to convey more detailed information about each organism. → table (2 x 4 data point with no correlation between data)
2. The positive correlation of population size to sex ratios for 3 different organisms in your study. → figure (2 x 3 data point with correlation warrants figure)
3. The relative amounts (in percent yield) of each of 4 compounds in a reaction. → word (too few data point)
4. The surface features and average hardness and size of 18 different rock samples. → table (3 x 18 data point with no correlation)
5. The location of a lake where random water samples were taken to generally understand what kind of algae grows in that lake. → words (the location does not seem to be a relevant information)
6. The location of 6 different sediment samples in each of 4 major regions of interest in a stream for which you want to identify how contaminant levels vary at key points. → figure (location is an important information of the data)

Step 1: the structure – Results

Task: identify as many formatting errors as you can in the figure below and suggest a correction to improve the quality.

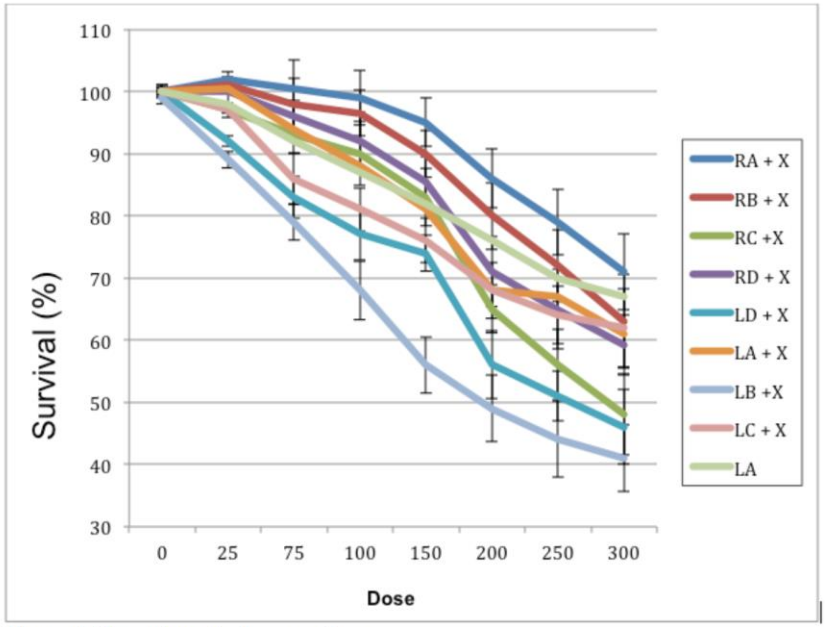


Figure 4. Percent survival versus dose.

Issues:

- Inconsistent font styles and size in axis title and label
- Meaningless use of colours
- Curves and error bars are too cluttered
- Misleading scale on y-axes (0-110!)
- Missing unit on x-axis, axis labels don't match with ticks
- Grid lines are unnecessarily cluttering the plot
- Un-informative figure title
- Legend labels are not informative
- Figure is not understandable without further explanation

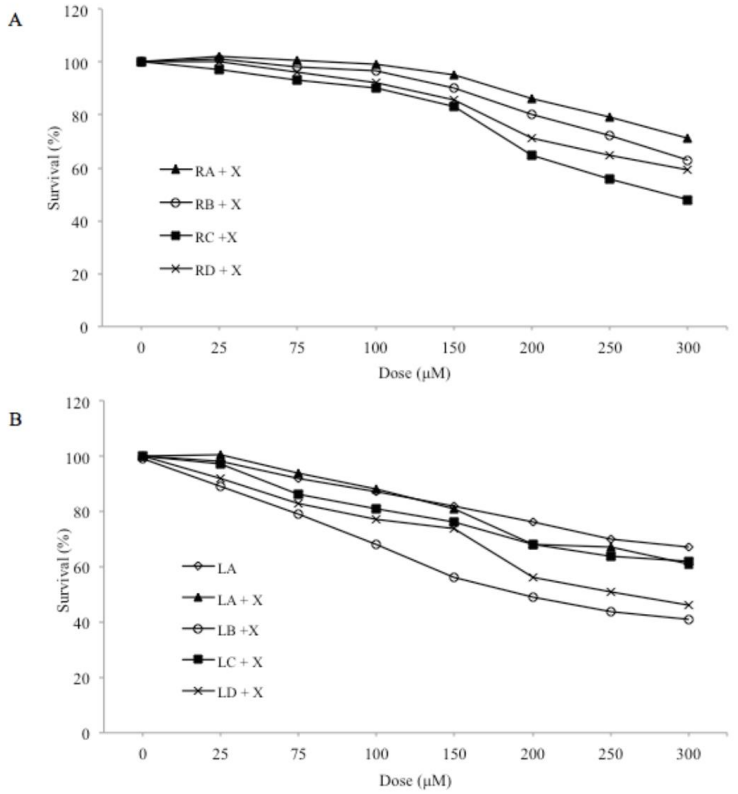


Figure 4. Dose response of 9 mutants with increasing dosage of XMR20. Cultures were treated for 48 hours before measurement. Treatments were performed in triplicate and are reported as averages (standard deviation = 2%). **A** shows Rena mutants; **B** shows Lipora mutants.

Step 1: the structure – Results

Task: identify as many formatting errors as you can in the table below and suggest a correction to improve the quality.

Table A

Tsunami forecast source from deep-ocean tsunami measurements XLV and XLF.

Sample	Location	Strike	Dip	Depth	Source coefficient
RT78D	154.388E, 67.482N	185	14	14.0 km	5.83 m
RT55A	154.138E, 66.914N	185	15	14.0 km	8.33 m
RT90B	153.837E, 66.752N	185	14	14.0 km	11.4 m
RT23F	153.089E, 66.223N	193	15	14.0 km	9.62 m
RT87A	152.762E, 66.744N	193	14	14.0 km	5.14 m

Issues:

- Cell frames make the table too cluttered (unnecessary horizontal and vertical lines)
- Redundant column "Depth"
- Not conventional table label (Table A → Table 1)
- Un-informative sample names (Sample 1, Sample 2…)
- Units can be moved to column heading
- Excess formatting in column heading
- Data alignment: text align to left, number align center

Additional fixes:

- Align "Source coefficient" to the decimal point for easier differentiation between the data value
- "Depth" is placed in the caption, although it could go to footnote as well

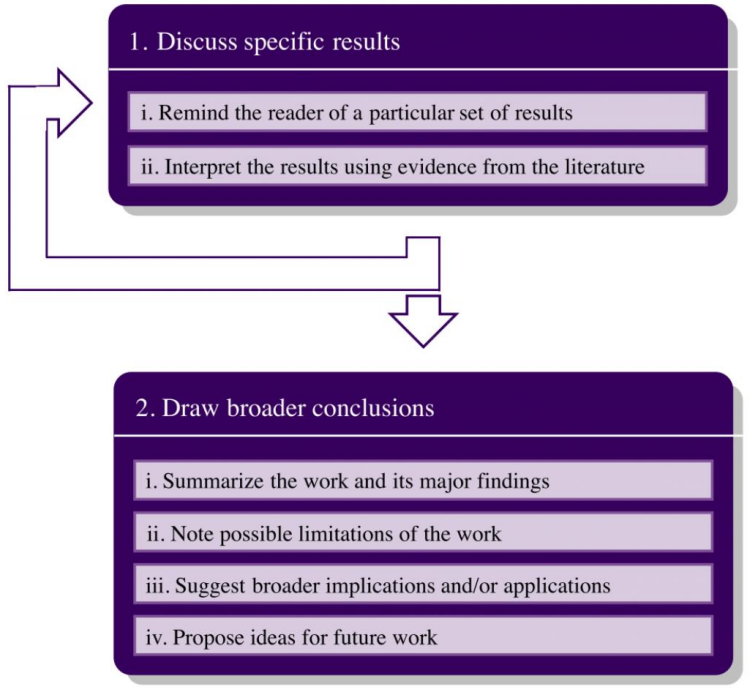
Table 1

Tsunami forecast source from deep-ocean tsunami measurements XLV and XLF. All measurements were taken at a depth of 14.0 km.

Sample	Location	Strike	Dip	Source coefficient (m)
1	154.388E, 67.482N	185	14	5.83
2	154.138E, 66.914N	185	15	8.33
3	153.837E, 66.752N	185	14	11.4
4	153.089E, 66.223N	193	15	9.62
5	152.762E, 66.744N	193	14	5.14

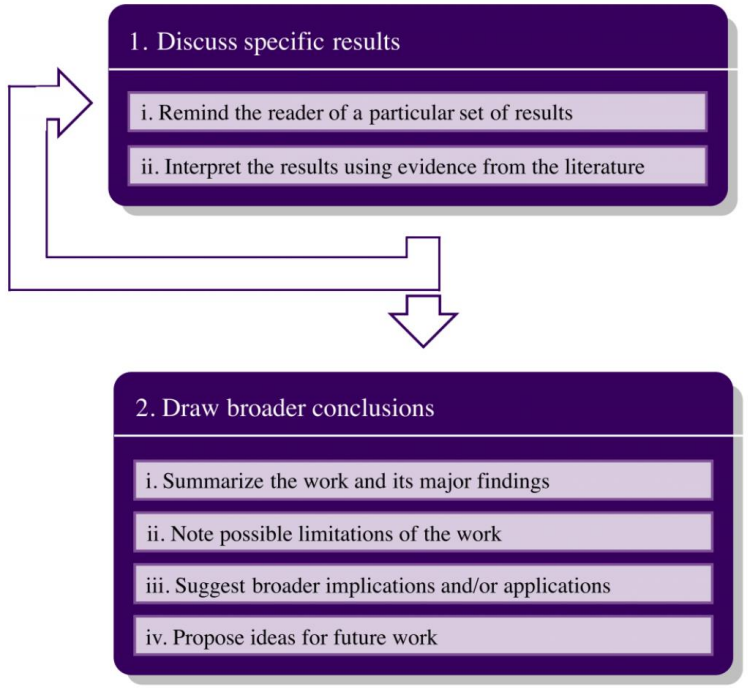
Step 1: the structure – Discussion

- Discussion: a subjective interpretation of your previously presented results
  - Self-contained story tying together your introduction (gap -> filling) and results (proof provided for your hypothesis).
  - Start narrow (specific features of your results), then broaden the view by looking at the results as a whole.
  - Good practice:
    - Begin with explicitly stating your main findings remind reader about the gap explicitly state how your results fills this gap
    - Next address each question/finding with specific evidence from your results.
    - If you can, reference pre-existing literature/report that shows how your results relate to previous findings. *("How do my results compare to those from other studies? Are they consistent or inconsistent?")*



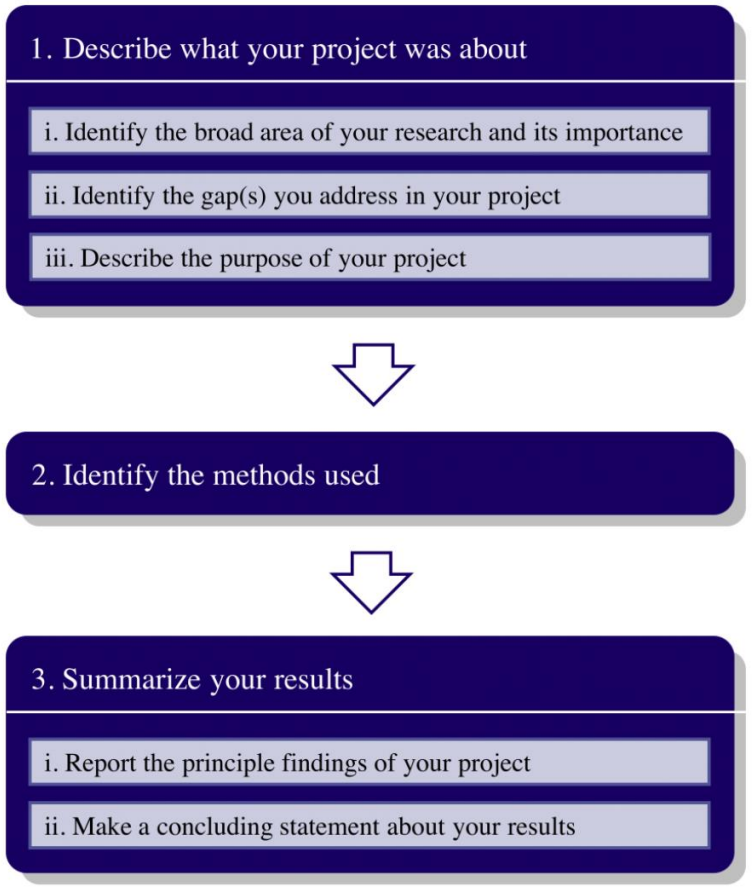
Step 1: the structure – Conclusion

- Conclusion: final opportunity to state the significance of your research.
  - Summarize the outcome of your results including new insights and state interesting questions that came up as a result of your study.
  - Could be the last paragraph of your Discussion or a stand-alone section.
    - "What should other scientists consider when thinking about the impact of your paper, including its limitations and applications?"
    - "What do you think should be done next to further the accomplishments of your project?"



Step 1: the structure – Abstract

- Abstract: incredibly condensed version of your paper
  - Your project: inform your audience about the importance of your project (project motivation)
    - The title should already tell them the principal content, so you should not repeat that – instead, tell them why your paper is worth reading.
  - The methods used: the level of details depends on the purpose
    - Teach/analyse a particular method require more details
    - Impress/spark interest needs likely less detail on the methodology, since results are more important.
  - Your results: the proof why your paper is worth the read.
    - Include only the most relevant findings – DO NOT enlist all!
    - Finish with a summary statement for possible impact of your study in a broad aspect.



Step 1: the structure – extra

- Acknowledgement:
  - Every project funded study requires an explicit statement about the source of fund (fund organization, project number).
  - You may also list contributors who are not part of your author list, but you should also explicitly state their contribution!
- References:
  - Your reference list should only contain articles that are directly cited in your paper!
  - Follow the citation style instructed by your chosen journal.
  - Be consistent is your formatting, be accurate in naming your reference type (journal article, conference proceeding, lecture material, book, technical report, website avoid Wikipedia!), and SPELL-CHECK!
  - Always reference the origin!
  - Good practice: try to reference article from the same journal

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

- A scientific paper also needs things (flow, structure, voice, word choice) that allows your sections to connect.
- Flow (coherence): reader should easily move from one concept to another (sentence to sentence, paragraph to paragraph, section to section)
  - Always remind yourself about the overarching story: your hypothesis -> your solution with proof
  - Always connect a question with a resolution
  - Always tie new concepts to previously presented ideas
  - Too short: one theme described in multiple paragraph room for more concise phrasing and merging?
  - Too long: more than one theme within a single paragraph improve by restructuring?
  - Sentence structure:
    - shorter section before the verb
    - important information at the end of the sentence
    - first given information, then new information

Example:

(1) *"Radiative transfer modeling, with kinematic data from millimeter interferometers, provides a more correct treatment."*

(2) *"A more correct treatment requires radiative transfer modeling, with kinematic data from millimeter interferometers."*

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

- Formal vocabulary: replace colloquial verbs with formal ones

Formal words that can be used to replace informal words

Informal	Formal	Informal	Formal
build up/buildup	accumulate/accumulation	make sure	ensure
cut down	decrease, diminish, reduce	(is) made up of	(is) composed of, consists of, includes
experiment	project, work	said	reported
find out, pick up	determine, discover	show how	demonstrate
get	obtain	see, look into	consider, examine, investigate
go into	enter	set up	establish
get rid of, take away	eliminate, extract, remove, withdraw	start, set up	establish, originate
hint at	imply, suggest	take	ingest
huge	large, extensive, substantial	think, hope	anticipate, expect, predict
let on	allow	way	approach, course, manner, process, procedure

Task: rephrase the following sentences to make them sound more fluid.

1. The high sensitivity is achieved by getting a big gain for the “on” state. (Adapted from Neubauer et al. 2015)
2. These borehole and moulin hydraulic heads are put together with coincident measurements of surface ice velocity, bed separation, and air temperature to get to know relationships between ice dynamics and the subglacial hydrologic system. (Adapted from Andrews et al. 2014)
3. The idea of circuit quantum electrodynamics can also be put to use for quantum information processing and quantum communication and may bring on new ways of single photon generation and detection. (Adapted from Vučković et al. 2003)

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

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Formal words that can be used to replace informal words

Informal	Formal	Informal	Formal
build up/buildup	accumulate/accumulation	make sure	ensure
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experiment	project, work	said	reported
find out, pick up	determine, discover	show how	demonstrate
get	obtain	see, look into	consider, examine, investigate
go into	enter	set up	establish
get rid of, take away	eliminate, extract, remove, withdraw	start, set up	establish, originate
hint at	imply, suggest	take	ingest
huge	large, extensive, substantial	think, hope	anticipate, expect, predict
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Task: rephrase the following sentences to make them sound more fluid.

1. The high sensitivity is achieved by ~~getting~~ obtaining a ~~big~~ large ~~gain~~ for the “on” state. (Adapted from Neubauer et al. 2015)
2. These borehole and moulin hydraulic heads are ~~put together~~ coupled with coincident measurements of surface ice velocity, bed separation, and air temperature to ~~get to know~~ characterize relationships between ice dynamics and the subglacial hydrologic system. (Adapted from Andrews et al. 2014)
3. The idea of circuit quantum electrodynamics can also be ~~put to use~~ utilized for quantum information processing and quantum communication and may ~~bring on~~ lead to new ~~ways of~~ approaches for single photon generation and detection. (Adapted from Vučković et al. 2003)

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

- Hedging: use qualifiers to acknowledge that a statement is not an absolute facts.
  - Neither experimental results, nor simulation outputs are absolute facts → suggest certain conclusions, observations, predictions.
  - Most frequently used in the Discussion section.
  - E.g. weather forecast:
    "Temperatures this summer will be 3 ˚F higher than average. Rainfall will be 1 inch."
    "Temperatures this summer are likely to be 2-4 ˚F higher than average. Rainfall may reach up to 1 inch."
  - *Avoid using the word "prove" → demonstrate/suggest*

Hedging words

• Can • Could • May • Might • Should • Would	• Possible/possibly • Probable/probably • Potential/potentially • Typically • Generally • Broadly • Likely	• Suggest(s) • Indicate(s) • Seem(s) • Support(s)

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

- Objectivity: formulate unbiased choices/observations/interpretations.
  - Avoid personal pronouns (~~our/my results, I/we did~~…)
    → focus on **what was done** rather than who did it (passive-voice)
  - E.g.:
    "We measured the height of the cliff using a laser rangefinder." → "The height of the cliff was measured using a laser rangefinder."

    "In their paper, Truan & Canto (2003) showed that the two substances are immiscible at 20 K." → "The two substances are immiscible at 20 K.(Truan & Canto, 2003)"
  - *Appropriate place to use "we…":*
    - *Introduction: fill the gap*
    - *Methods and Results: signal a deliberate choice that was made*
    - *Discussion: interpret specific result, signal deliberate choice, report/summarize finding*

"We" use examples:

- Introduction: "Here we use borehole hydraulic heads to explore the response of the unchannelized region of the bed to channelized regions."
- Methods: "Similarly to ref. 4, we probe the energy splitting of this doublet spectroscopically using a weak probe beam so that n << 1."
- Results: "Motivated by the high activity of the combination complex 8/TBAI in the formation of propylene carbonate, we evaluated the usable temperature and pressure ranges with more challenging reaction parameters (Table 2)."
- Discussion: "We interpret this as mainly owing to differences in root zone depth." / "We have adopted a level of C/C_0 = 0.001 or a 3-log reduction in particle number concentration as a basis for calculating L." / "In the present study, we confirmed the presence of *B. microti* in *I. ricinus*."

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

- Clarity: get your ideas through in a clear and structure manner.
  - Use quantitative terms when it has a scientific significance and use qualitative terms when the direction of difference is more important than its value.
  - Report exact values only to the correct level of confidence: state the number according to its significant digit.
  - Keep statistical discussion to a minimum, unless your paper focuses on mathematical/statistical operations.

Calculating and reporting significant figures

Rule	Example
Non-zero digits are significant.	1445 has 4 significant figures; 1440 has 3 significant figures.
Zeros that come after a decimal **and** are at the end of the number are significant.	1445.00 has 6 significant figures, as does 0.00144500.
Zeros that fall between 2 significant figures are significant.	0.001 has 1 significant figure; 1.000 has 4 significant figures; 1.001 has 4 significant figures.
The number of significant figures of an instrument-reported value is the number of digits reported by that instrument.	Your UV-Vis spectrometer reports an absorbance of 0.225. You know the value of the absorbance to 3 significant figures.
When **adding** or **subtracting** two numbers, round your answer to the least number of places in the decimal portion of both numbers.	45.06 + 1.00689 = 46.07 (that is, 46.06689 rounded to the hundredths place, the place farthest right in 45.06)
When **multiplying** or **dividing** two numbers, the least number of significant digits among the numbers determines the number of significant digits in the answer.	4.021 x 3.11 = 12.5 (that is, 12.50531 rounded to 3 sig figs, the least number of sig figs in both numbers)

Step 2: the structure – The nails…

You need nails to prevent the pile from falling apart…

- Clarity: get your ideas through in a clear and structure manner.
  - Appropriate verb tense: can significantly change the context!
  - Example:
    *"Changing connectivity between active and isolated components of the subglacial drainage system **does not** drive seasonal trends in ice velocity on alpine glaciers owing to the dominant control of subglacial channels."* widely accepted truth
    *"Changing connectivity between active and isolated components of the subglacial drainage system **did not** drive seasonal trends in ice velocity on alpine glaciers owing to the dominant control of subglacial channels."* assertion was only shown once (hedging!)

Guidelines for using correct verb tense

Tense	Appropriate usage(s)	Example
Past	To describe work that was done in the past	"Helium gas *was used* to purge the chamber."
	To describe specific results in your work	"The component of the reduced charge state density *decreased* by e^{-2x}."
	To share results from others' work	"Similar results *were obtained* by Author X."
Present	To state accepted scientific knowledge	"Type 1 diabetes mellitus *is* an autoimmune disease."
	To refer to a figure or table	"Results from the uterotrophic assay *are shown* in Figure 4."
	To present an overarching conclusion, implication, or application of your work	"We conclude that discharge of the ice sheet *is* a dominant factor."
Future	To present research objectives (research proposal only)	"This work *will address* the need for more sustainable bioplastics."
	To propose methodology and project timeline (RP only)	"Fluorometric assays *will be used* to detect the presence of the enzyme."
	To predict results and impacts (RP only)	"The insights gained from this work *will benefit* all future astrophysical endeavors."

Step 3: editing and peer-review

Re-reading your paper and incorporating constructive feedback can make the difference between accepted and rejected paper.

- Take a break after you finished your first draft and re-read your paper with a fresh brain. Does it still express what you wanted to say?
- Editing stages:
  1. First run-through: make sure all main ideas of your study is addressed (key-point check-list)
  2. Second read: check for the flow – fix your nails.
  3. Final read: re-read with a finer lens – check the visual information (figure/table readability), statement citations, grammar and spell check.
  4. Ask someone else to read your paper: best case – choose someone who represents your target audience.
- Peer-review: incorporate constructive criticism, and don’t be discouraged by negative comments.

Tools and resources

- Search engine:
  - Google scholar – dedicated exclusively to academic papers,
  - Zotero – free and open-source research manager (search engine with easy share function),
  - Mendeley – citation library for easy management of your references (also generates citations)
- Writing tools:
  - FocusWriter – assists in keeping the focus on writing by removing any distracting icons from your screen (highly customizable)
  - Grammarly – assists in word choice, grammar and spell check – is a must for non-native speakers!
  - Thesaurus – web-based synonym/antonym vocabulary – use with caution!
- Charting tools:
  - Google Chart, MatplotLib, OriginLab, GnuPlot…