

How to write a strong scientific manuscript

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September 8, 2026

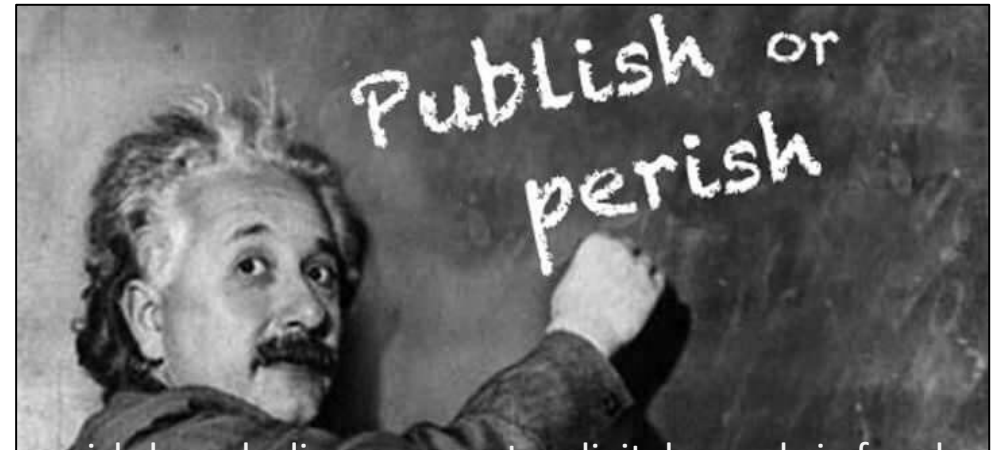


What is a Manuscript?

A document that presents findings of scientific research that is submitted to a scientific journal for publication.

Publishing manuscripts is how we build scientific knowledge

- Disseminate new information
- Allows feedback
- Establishes you as a member of the research community



Points to remember

- Writing a scientific manuscript is a work of art that is honed with experience.
- Success does not come from writing, but from writing effectively.
- It's the author's job to make the reader's job easier.
- You don't succeed by getting papers published. You succeed by getting them cited.

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What are we talking about?



MANUSCRIPT STRUCTURE



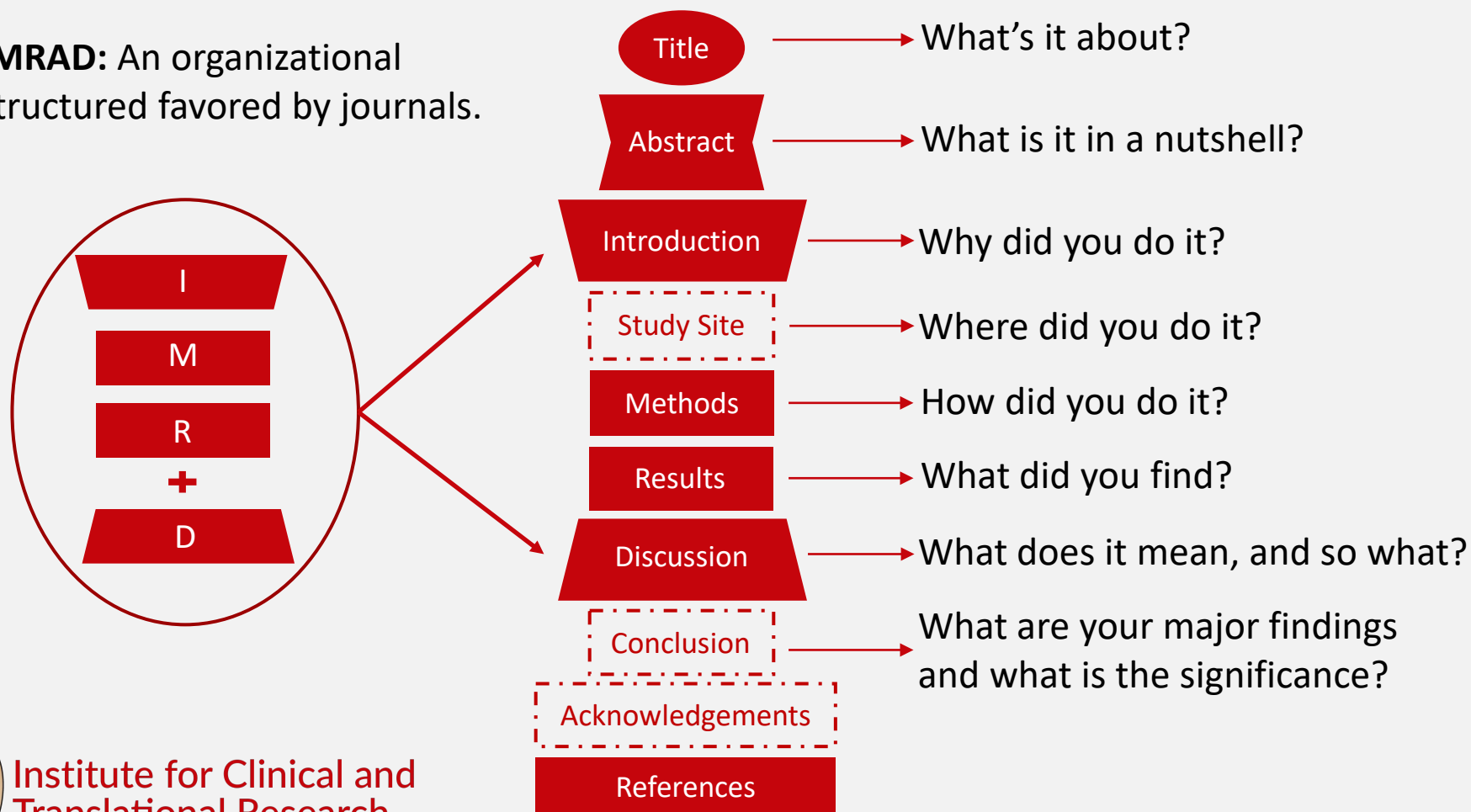
STRATEGIES TO IMPROVE



WHAT REVIEWERS REALLY
WANT

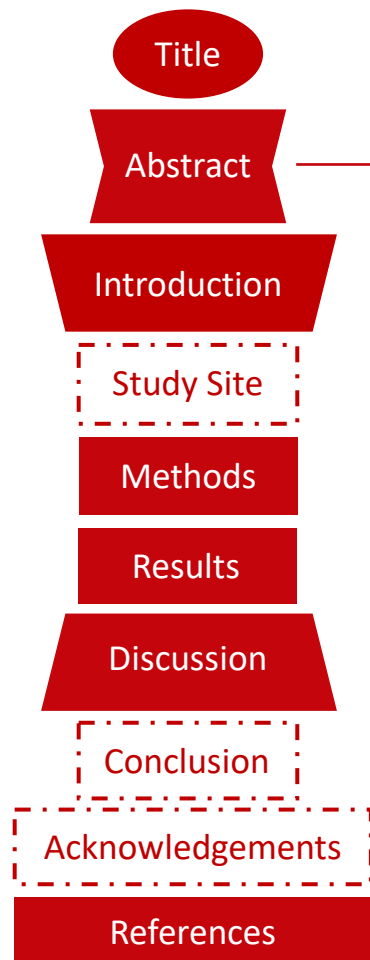
Manuscript Structuring

IMRAD: An organizational structured favored by journals.



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Manuscript Structuring - Abstract



→ What is it in a nutshell?

Goal - Engage readers

A succinct summary of the entire paper

Highlight major findings

- State the main objectives
- Describe the methods
- Summarize the most important results
- State major conclusions and significance

“When asked why they read the abstract first, the researchers gave as most important reason that the abstract provides a summary and overview of the paper and informs the decision to continue reading other sections of the paper.”

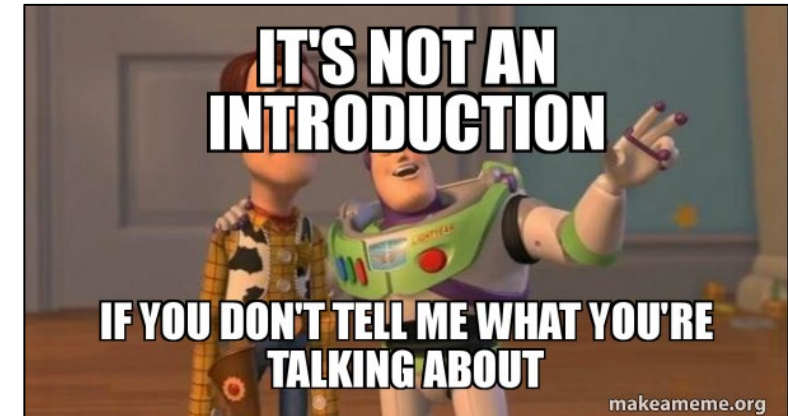
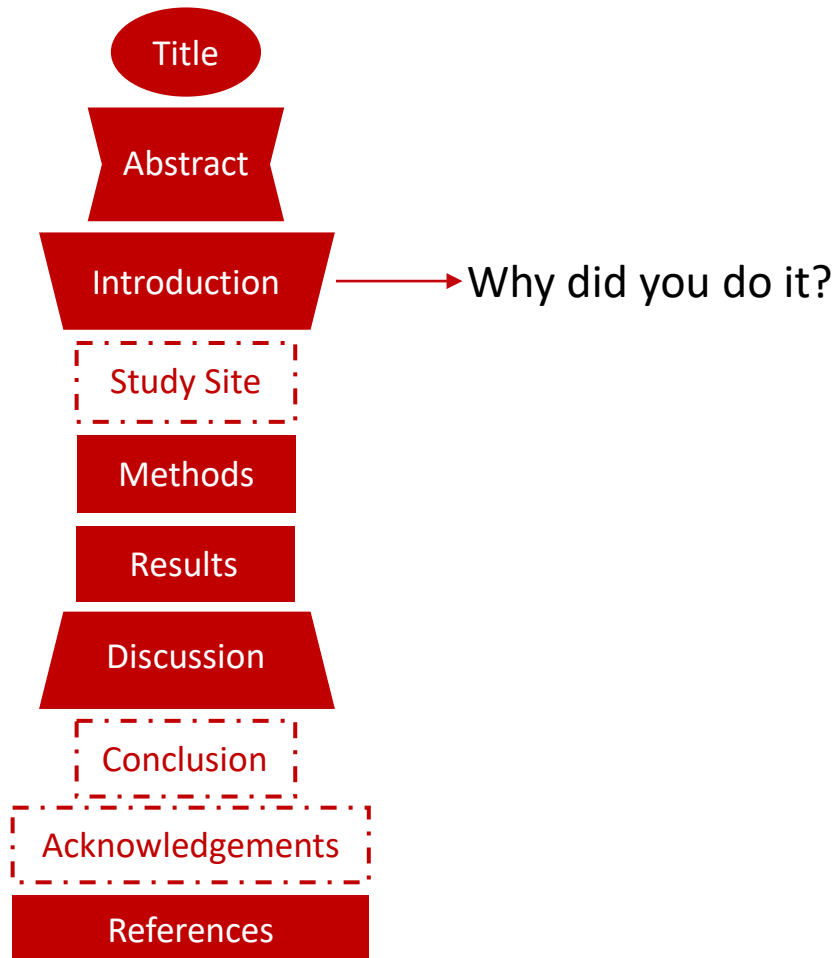
<https://doi.org/10.1098/rsos.251174>

Manuscript Structuring - Introduction

Goal - Present topic & get the reader interested

Effective introductions should answer 3 sets of questions:

1. Who cares?
2. What do we know, what don't we know, and so what?
3. What will we learn?



Manuscript Structuring - Introduction

Who cares?

Grab their interest early with a hook – a striking opening sentence

- Good hooks establish what your study is about and why its interesting
- Interesting fact or statistic, a strong statement, or a question or brief anecdote

With a Hook:

Every minute, someone in the world dies from complications related to heart disease—one of the most preventable causes of death. But what if a simple blood test could predict a person's risk years in advance, allowing for early intervention? Recent breakthroughs in biomarkers have brought us closer to this reality, with significant implications for patient care and disease prevention.

Without a Hook:

Heart disease is a leading cause of death worldwide. Recent research on biomarkers has demonstrated their potential in predicting cardiovascular risk and improving early intervention strategies. This study examines the effectiveness of these biomarkers in identifying at-risk populations.

Manuscript Structuring - Introduction

What do we know, what don't we know, and so what?

- Identify unaddressed or inadequately addressed knowledge gaps
 - Need to convince readers this gap exists, and it needs to be bridged
- It may help to think about the knowledge gap as a puzzle that needs to be solved

Make sure you

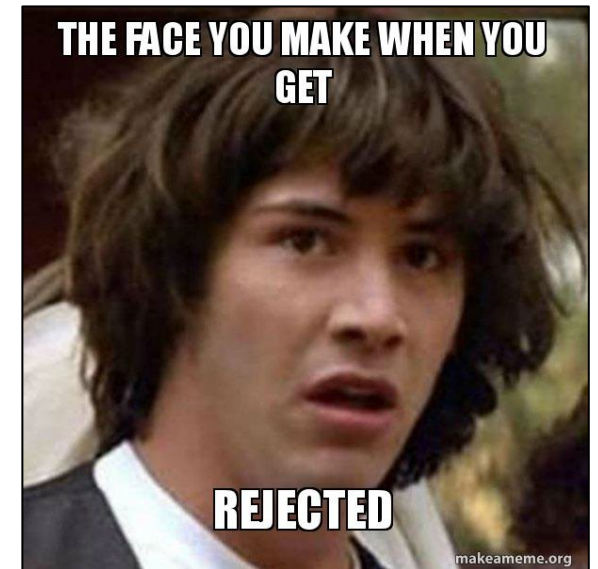
- Establish the conversation (i.e., What do we know?)
 - Identify and bring together the literature that form the conversation (research) you are contributing to, identifying where the conversation hasn't gone, and explaining why it needs to go there.
- Problematize the conversation (i.e., What don't we know? And so what?)
 - Establish how it's deficient – a deficiency that your study addresses.

Manuscript Structuring - Introduction

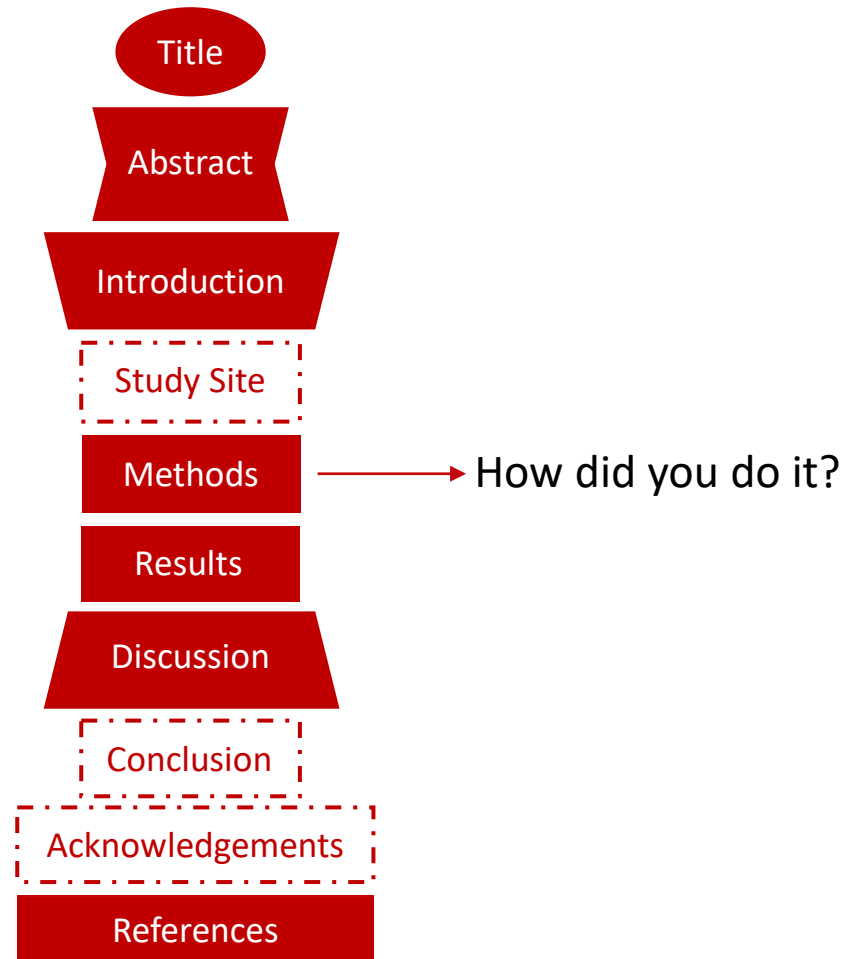
What will we learn?

- Tell readers how your contribution changes, challenges, or advances the conservation
- You may think it is obvious, but it isn't obvious to the reader

Main reason manuscripts get rejected



Manuscript Structuring - Methods

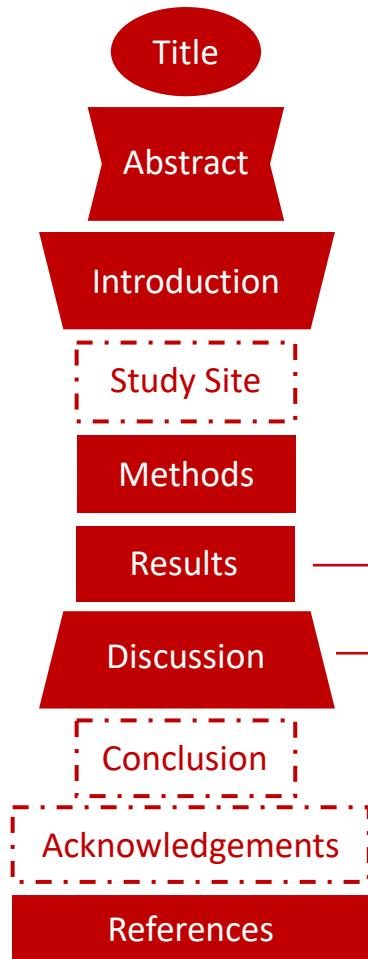


Goal - Enables replication

- Methods used
- Justifications for using the selected methods

Tip: Think of your methods section like a recipe. As the author, if you skip a step or write them in the incorrect sequence, you will ruin someone's chocolate cake.

Manuscript Structuring – Results/Discussion



Results Goal – Share data

Discussion Goal – Compare, contrast, and interpret results

Results → What did you find?

Discussion → What does it mean, and so what?

Manuscript Structuring – Results/Discussion

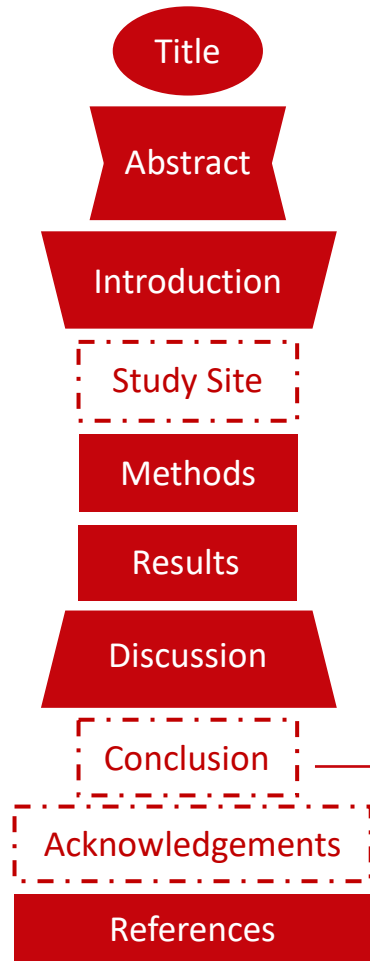
Results

- Include experimental data, but not the interpretation
- Incorporate statistical analyses where applicable
- Follow sequential organization when presenting data
- Avoid speculations
- Include figures and tables
 - Should summarize results, not present large amounts of raw data
 - Use if you want to present 3+ values simultaneously

Discussion

- Interpret and explain the findings effectively
- Explain any surprising, unexpected, or inconclusive result(s)
- List all the major findings of your study
- Mention limitation(s) if any
- Relate to what others have done
- **Do not:**
 - Resharing results
 - Introduce new topics/theories
 - Speculate outside what the data and findings support
 - Fail to tie arguments back to your story/theme

Manuscript Structuring - Conclusion



What are your major findings
and what is the significance?

Goal – Future perspectives

- Don't repeat what was in the discussion
- Don't start this section with “in conclusion” or “in summary”
- It is a brief overview—keep it short
- Reiterate why your research is important
- Address whether it answers your research question(s)
- Offer suggestions on how your research can be expanded or improved

One Problem...

Bad writing can increase rate of journal rejection and make published writing inaccessible, leading to less citations.

What makes bad writing?

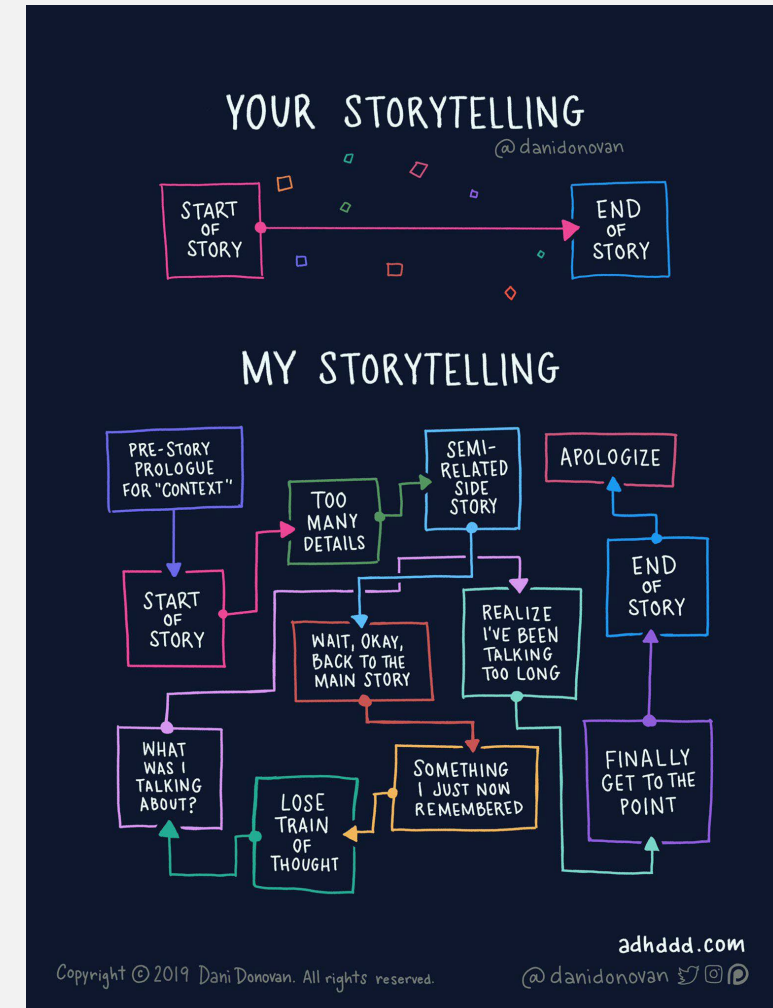
- An unclear story (i.e., narrative)
- Scattered information without a clear sense of direction
- No cohesive story results in the key message being lost

How to fix bad writing?

Use storytelling to improve **flow, readability, and organization**.



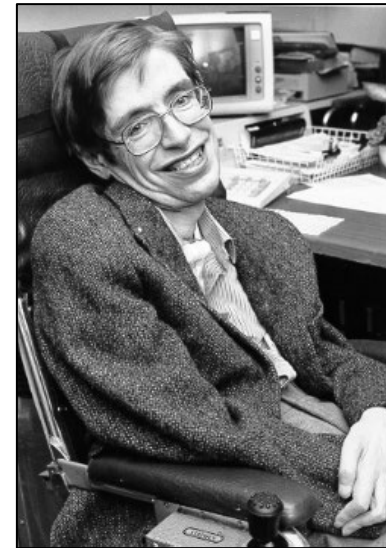
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Shift Your Mindset

You aren't just *sharing your research*, you are *telling a compelling story*

- Stories are the most powerful delivery tool for information.
- More powerful and enduring than any other art form.



Why This Matters

Effective storytelling,

- Delivers information
- Conveys Experiences
- Inspires Actions
- Entertains

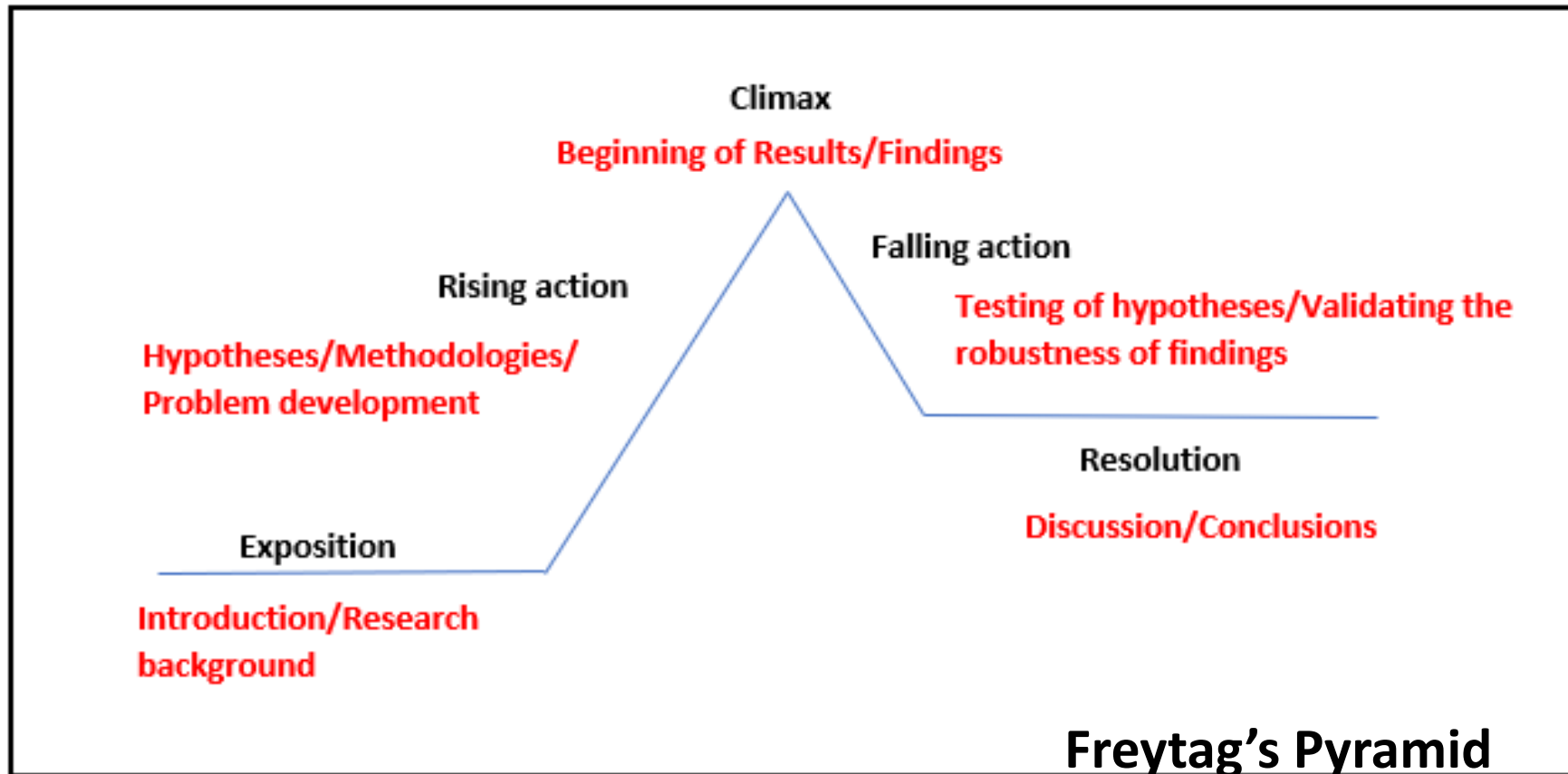


Benefits of storytelling:

- Frames how others interpret your work
- Greater publishing success
- Greater influence (i.e., more citations)
- More attractive as a coauthor



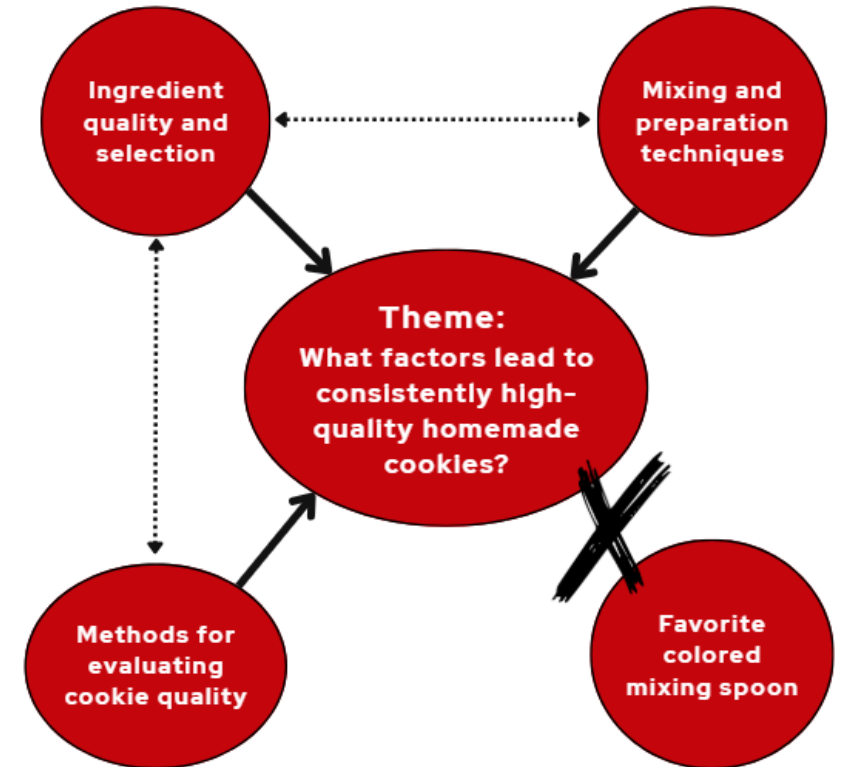
Use A Storytelling Framework



Use A Storytelling Framework

Three story essentials

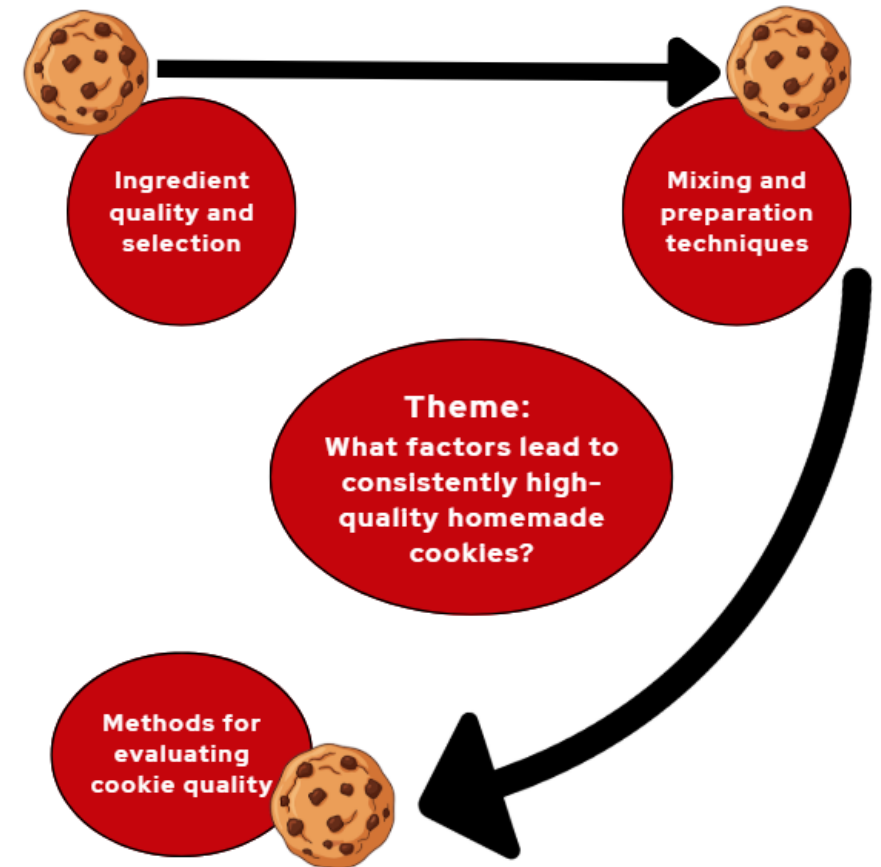
- **Main theme**
 - What the “story” is about
 - Your key takeaway/research question
 - Weaves through your narrative like a thread, bringing everything together
 - Everything you write should relate to, help develop, or help readers understand your theme



Use A Storytelling Framework

Three story essentials

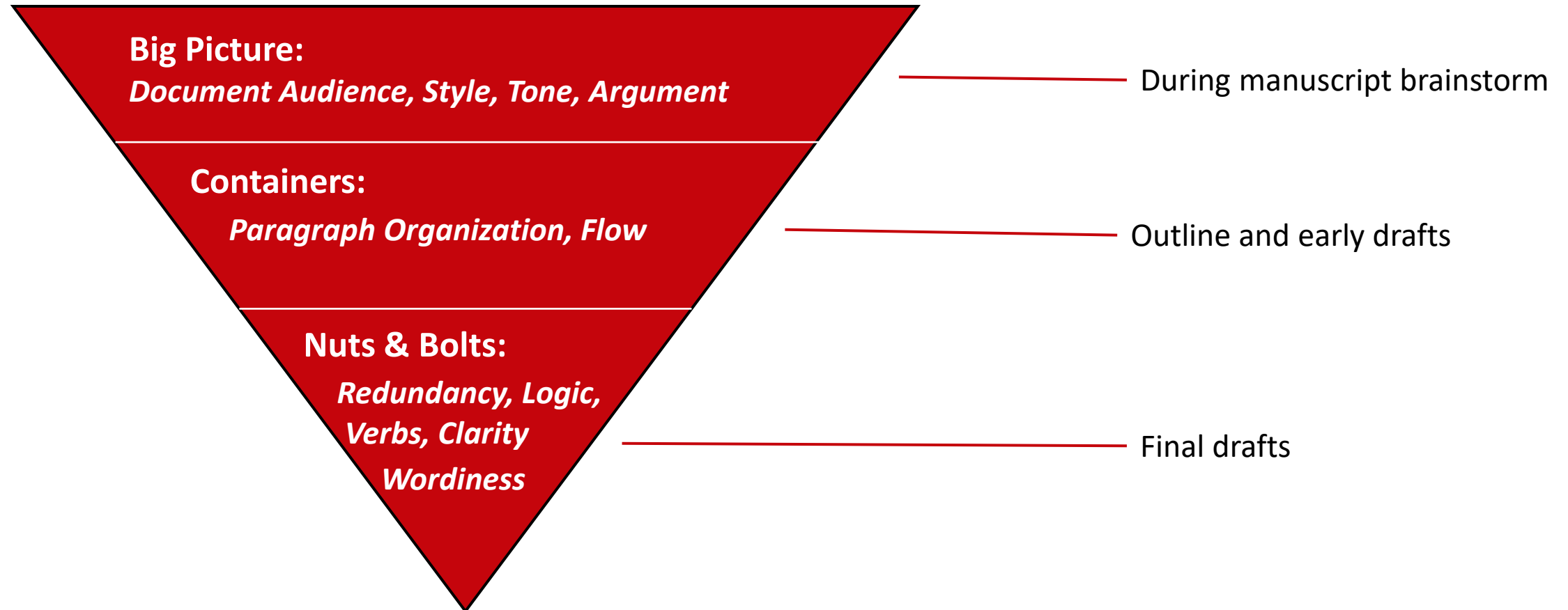
- **Chronology**
 - The most logical arrangement of the steps you took
- **Purpose**
 - Main theme + Chronology.
 - Information that doesn't quite fit or provide additional detail
 - Ask yourself, is this relevant to my key takeaway?



Time to write

Writing Levels

Timeline



Big Picture: Audience, Style, Tone



Audience

- Too often neglected
- Who are they? What style/tone?
- Values, Expectations, Needs



Style

- Characteristics of the writing
- Expression of attitude
- Complexity of sentence & diction
- Ensure consistency
- No changes in voice, perspective, tense



Tone

- Author's attitude towards subject
- Found in details: events, situations, vocabulary choice
- Ensure consistency

Containers: Paragraphs

Each paragraph is a container of information

- Your topic sentence is the label
- The transition is how you organize them

Coherence (i.e., global flow)

- Ideas are sequenced logically at the higher levels (e.g., paragraphs, sections).
- Readers move easily from one major idea to the next without confusing jumps.
- Readers can follow organization and understand how ideas are connected.

Without Coherence

The dog barked loudly in the park. My favorite color is blue. Time flies when you're having fun.

With Coherence

The dog barked loudly in the park, startling the nearby joggers and drawing attention to its playful antics. Meanwhile, I contemplated my favorite color, blue, envisioning serene skies and tranquil waters that evoke a sense of calm within me. Reflecting on the passage of time, I realized how it seems to speed up when immersed in enjoyable activities, a phenomenon often remarked upon but seldom fully understood.

Containers: Within Paragraphs

Cohesion (i.e., local flow)

- Ideas are connected clearly at the sentence level with clear connections between sentences.

Transitional expressions (e.g., similarity, however, therefore)

- Indicates the logical relationship between ideas.

Using characters as your subjects

- When a sentence describes an action completed by a person, that person should be the subject of the sentence.
- E.g., “Researchers have found X” instead of “X has been found”

Use first person language

- First person provides a human connection and improves clarity
- It lets the reader know clearly who did what

Note this is not an exhaustive list

Without Cohesion

The sun shines brightly in the sky. Birds chirp cheerfully amidst the trees. The clock strikes midnight, signaling the end of the day.

With Cohesion

As the sun shines brightly in the sky, birds chirp cheerfully amidst the trees, creating a harmonious melody. However, as the clock strikes midnight, signaling the end of the day, the nocturnal creatures begin to stir, their activities shrouded in darkness.

Containers: Within Paragraphs

Use Active Voice

When writers use active voice, they focus their sentences on **an actor** (themselves, their team, etc.) and **the action** – the two most important parts of storytelling.

The Zombie Trick



If you can add the phrase “by zombies” after the verb and your sentence makes sense, it is passive voice.

The cat was fed last night.

The cat was fed **by zombies** last night.

Makes sense - passive!

I fed the cat last night.

I fed **by zombies** the cat last night.

Doesn't make sense - active!!

Test yourself:

Which is active and passive voice?

1. Descriptive statistics were used to describe demographic data of patients.
2. We used descriptive statistics to describe demographic data of patients.

Nuts & Bolts: Omit Clutter

Remove wordy constructions

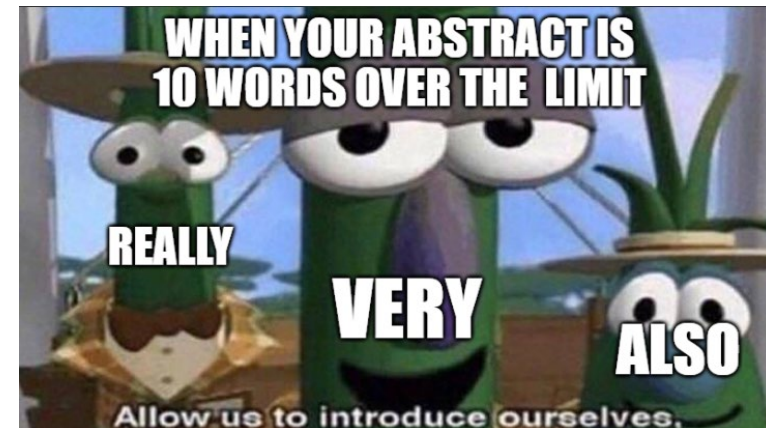
- Overused prepositional phrases (e.g., as, in, over, of, for, at, etc.)
- Stock phrases you can replace with 1 or 2 words
 - E.g., due to the fact that = since/because; in order to = to
- Qualifiers (e.g., very, often, hopefully, practically, really, basically)
 - Removing some will allow for a stronger, more direct point.

Check for wordiness

- Filler words - words that don't add to the meaning of the sentence.

Replace “weak” verbs

- Verbs that lack meaning or directness.
- E.g., “have a positive effect” can be changed to “improve”



Manuscript Evaluation

Questions journal editors and reviewers to answer:

1. Will this manuscript advance the literature?

- Is the topic timely and important?
- Will it change how we think about an issue?
- Is there anything new?

2. Is there a fatal flaw in the design or the argument?

- Is there a problem so serious that the authors will not be able to fix it in a revision?

3. How can this manuscript be improved?

- Suggestions on how this can be improved is the heart of the review.



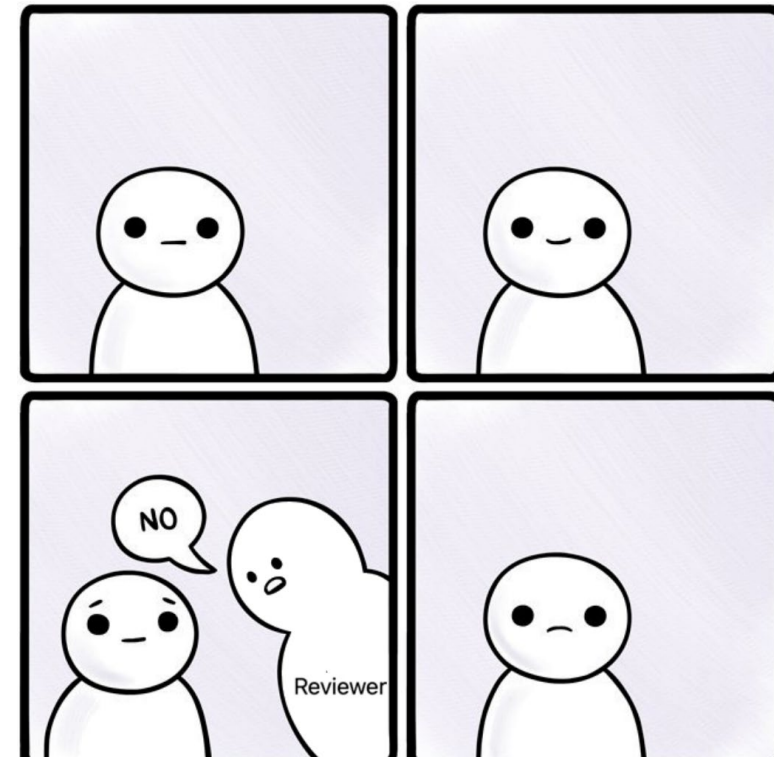
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Manuscript Evaluation

Reviewers job:

- Provide constructive, actionable feedback that details concerns and suggestions.
- Identify any questions regarding the methods, analysis, arguments, etc.
- If any additional areas to consider were proposed, reviewers must be clear as to whether they think they are essential to the project to help move science forward.
- Identify any typos/grammatical errors that affect the science.
- Make sure reviews are clear and easy to follow.

The Unhelpful Reviewer



Manuscript Evaluation

Proactive steps to minimize likelihood of a rejection:

- **Before Submitting**
 - Follow manuscript preparation and submission guidelines carefully.
 - Submit all required supporting documentation.
 - Figures in required format and resolution.
 - Read through by friend/colleague unfamiliar with your work.
 - Work with coauthors and mentors to improve clarity, style, polish manuscript.
 - Enlist assistance of a professional editor / English language expert (native speaker).

Manuscript Evaluation

Proactive steps to minimize likelihood of a rejection:

- **Returned with request for revisions and/or reject and resubmit**
 - Incorporate as much of the reviewer / editor feedback as possible.
 - Submit responses to reviewers in point-by-point format.
 - Respond respectfully and graciously.
 - Questions – contact the Editorial Office!

The Ugly Truth

You can't learn to be a good science writer in one webinar.

"The beautiful part of writing is that you don't have to get it right the first time; unlike, say, a brain surgeon." Robert Cormier

"We are all apprentices in a craft where no one ever becomes a master." Ernest Hemingway

Becoming any kind of writer takes time and experience.

Just keep writing.



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Need More?

Check out our recorded ***Draft, Submit, Revise: A Manuscript Writing Series*** on YouTube.

https://www.youtube.com/@UW_ICTR



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MANUSCRIPT
PLANNING

Draft, Submit, Revise:
A Manuscript Writing
Series

A black button with a white play icon and the text 'WATCH NOW'.

A circular inset image showing a pair of hands typing on a laptop keyboard.

The University of Wisconsin-Madison logo.

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Manuscript Writing
Series: Spring 2024

The University of Wisconsin-Madison logo.

by UW Institute for Clinical & Translational Research

Playlist • 4 videos • 200 views

Held in spring 2024, the sessions in "Draft, Submit, Revise:
A Manuscript Writing Series" were co-organized by ...more

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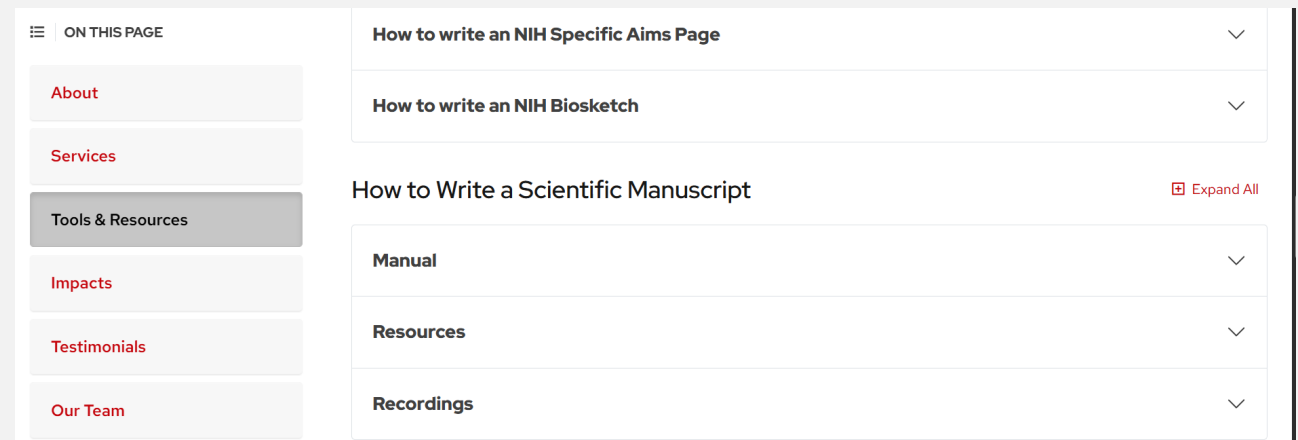
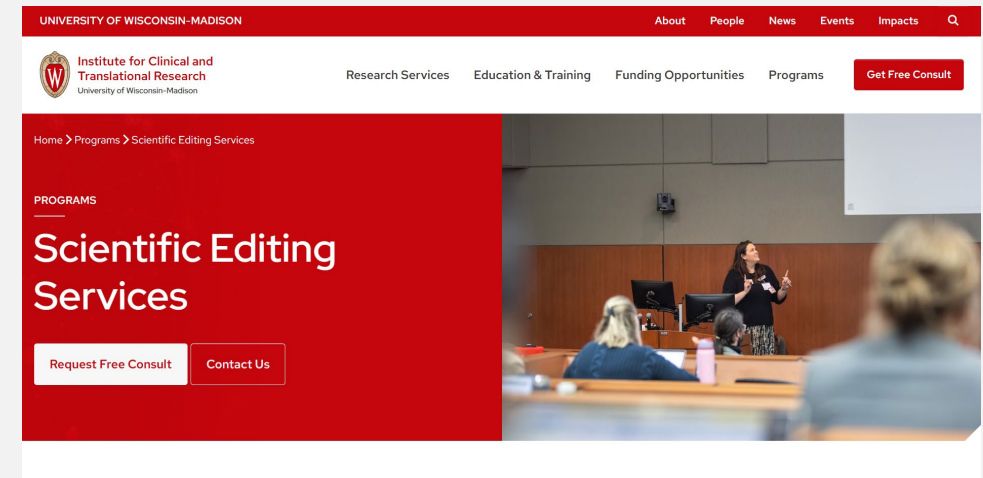
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Need More?

More resources on my webpage

<https://ictr.wisc.edu/program/scientific-editing/>



Any Questions?



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Problems with AI and Writing

AI Tools in Society: Impacts on Cognitive Offloading and the Future of Critical Thinking

by Michael Gerlich ✉ 

Hypothesis 1: *Higher AI tool usage is associated with reduced critical thinking skills.*

The findings confirm this hypothesis. The correlation analysis and multiple regression results indicate a significant negative relationship between AI tool usage and critical thinking skills. Participants who reported higher usage of AI tools consistently showed lower scores on critical thinking assessments.

Hypothesis 2: *Cognitive offloading mediates the relationship between AI tool usage and critical thinking skills.*

This hypothesis is also confirmed. The mediation analysis demonstrates that cognitive offloading significantly mediates the relationship between AI tool usage and critical thinking. Participants who engaged in higher levels of cognitive offloading due to AI tool usage exhibited lower critical thinking skills, indicating that the reduction in cognitive load from AI tools adversely affects critical thinking development.

<https://www.mdpi.com/2075-4698/15/1/6>

Publication

Your Brain on ChatGPT: Accumulation of Cognitive Debt when Using an AI Assistant for Essay Writing Task

- Writing with GenAI assistance reduces overall neural connectivity, shifts the dynamics of information flow.
- Reliance on AI tools can lead to a passive approach and diminished activation of critical thinking skills when the person later performs the tasks alone.
- Less activation of top-down executive processes (e.g., internally guided idea generation) and reduction in sustained working memory.
- Frequent AI tool use often bypass deeper engagement with material, leading to 'skill atrophy' in tasks like brainstorming and problem solving.

<https://doi.org/10.48550/arXiv.2506.08872>

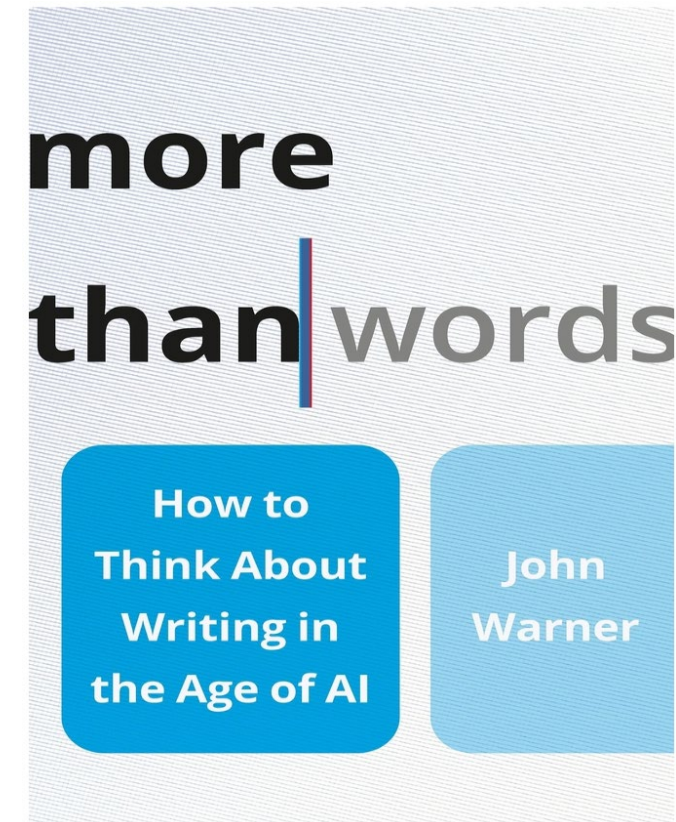
Problems with AI and Writing

“You can ask ChatGPT to tell a story, but none of those stories belong to ChatGPT.”

Other favorite quotes from John Warner.

- “ChatGPT cannot write. Generating syntax is not the same thing as writing. Writing is an embodied act of thinking and feeling. Writing is communicating with intention.”
- “Writing is thinking. Writing involves both the expression and exploration of an idea, ... Removing thinking from writing renders an act *not* writing.”
- “Reading and writing are inextricable, and outsourcing our reading to AI is essentially a choice to give up on being human.”
- “Fetching tokens based on weighted probabilities is not the same process as what happens when humans write.”
- “ChatGPT A literal averaging of intelligences, a featureless landscape of pattern-derived text.”

Note – John Warner uses ChatGPT as a placeholder for any genAI program



Problems with AI and Writing

Risks of using generative AI

- Inaccuracy and fabrication (i.e., hallucinations)
 - Can lead to immediate rejection or damage to your and the organizations credibility.
- Plagiarism and intellectual property violations
 - Trained on existed sources without proper attribution. Submitting content that inadvertently contains plagiarized material can violate funding agency guidelines.
 - Unclear ownership of output material.
- “illegal” to upload grants if you are a NIH reviewer
 - June 23 2023: The Use of Generative Artificial Intelligence Technologies is Prohibited for the NIH Peer Review Process (NOT-OD-23-149)
- Failure to meet funder-specific guidelines
- Cannot be assumed tools are compliant with rules and laws designed to ensure the confidentiality of private information (HIPAA, FERPA)
- Ethical and confidentiality concerns
 - Feeding sensitive organizational data into 3rd party platforms poses risks related to data privacy, proprietary information security, and compliance with federal grant regulations.

List not inclusive

Problems with AI and Writing

Biases of Generative AI

- Inherent biases in its training data
- Reinforces and amplifies gender, ethnicity, cultural, political, professional and societal roles, ideological and languages biases in the training data.
- Reinforces biases in human activities and more deeply engrains the bias - **an AI-mediated feedback loop.**

