Scientific Research and Thesis Writing Methodology

By

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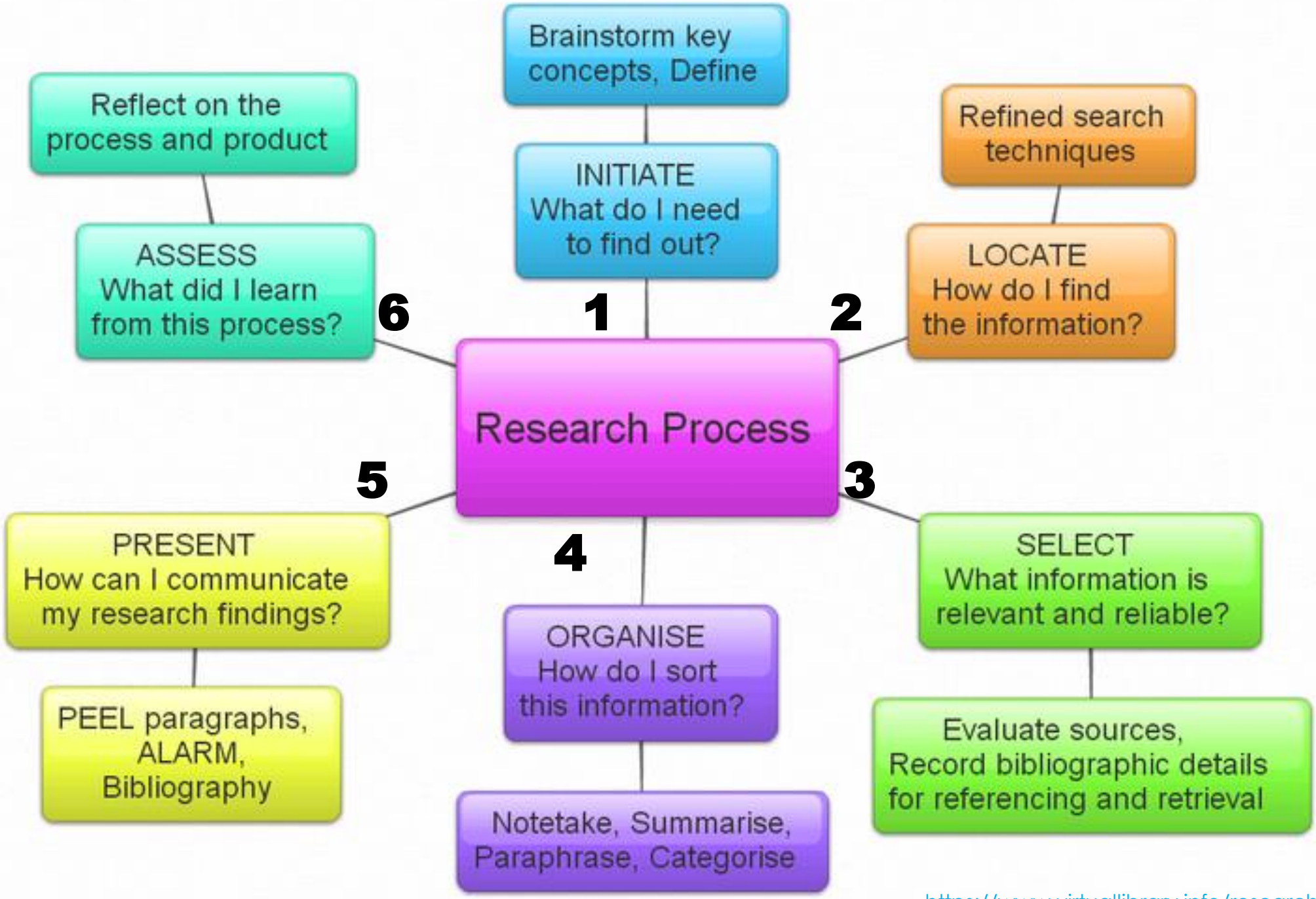
Research process overview



https://www.virtuallibrary.info/research-process.html

How to structure a paper to tell your story?

By: Gary Christian
Department of Chemistry
University of Washington
Seattle, WA 98195-1700

1. Abstract

- Be brief to the point to tell a story
- Give principle of the method
- Include a summary of important data/results
- Figures of merit
- Range of measurement
- Detection limit
- Precision
- Samples analyzed

This is NOT an introduction to justify the work
Just a summary of your study

2. Introduction

- The first sentence is the hardest to write
- Tell a story
- Why is this work important?
- What problem is being addressed?
- What has been done in the past?
- Give relevant references
- How does this advance the state-of-the art?
- Don't say work of prior authors is no good.
- What have you done (what are you reporting?)

3. Material and Methods (Experimental Section)

- Provide enough information for someone else to repeat your work:
  1. Chemicals
  2. Instrumentation
  3. Procedures
- Cite appropriate references for prior details

4. Results and Discussion

- This is the meat of your report
- Be succinct and clear
- Give the basis for your method

  - often nothing is said why a new reagent was selected or studied, although it works

  - why did you think it would work?

- Organize by topics
- Use tables and figures to summarize or illustrate results and conclusions

5. Figures & Tables

- A picture is as good as a thousand words
- Use straight lines sparingly
- Least squares lines, and r2 values
- Don’t use too many figures
- Combine info in one figure when appropriate
  -may make comparisons easier
- Don’t put in too much data
- Only that needed to repeat the experiment and to verify/report results
- Significant figures!
- Statistics - standard deviation, t-test

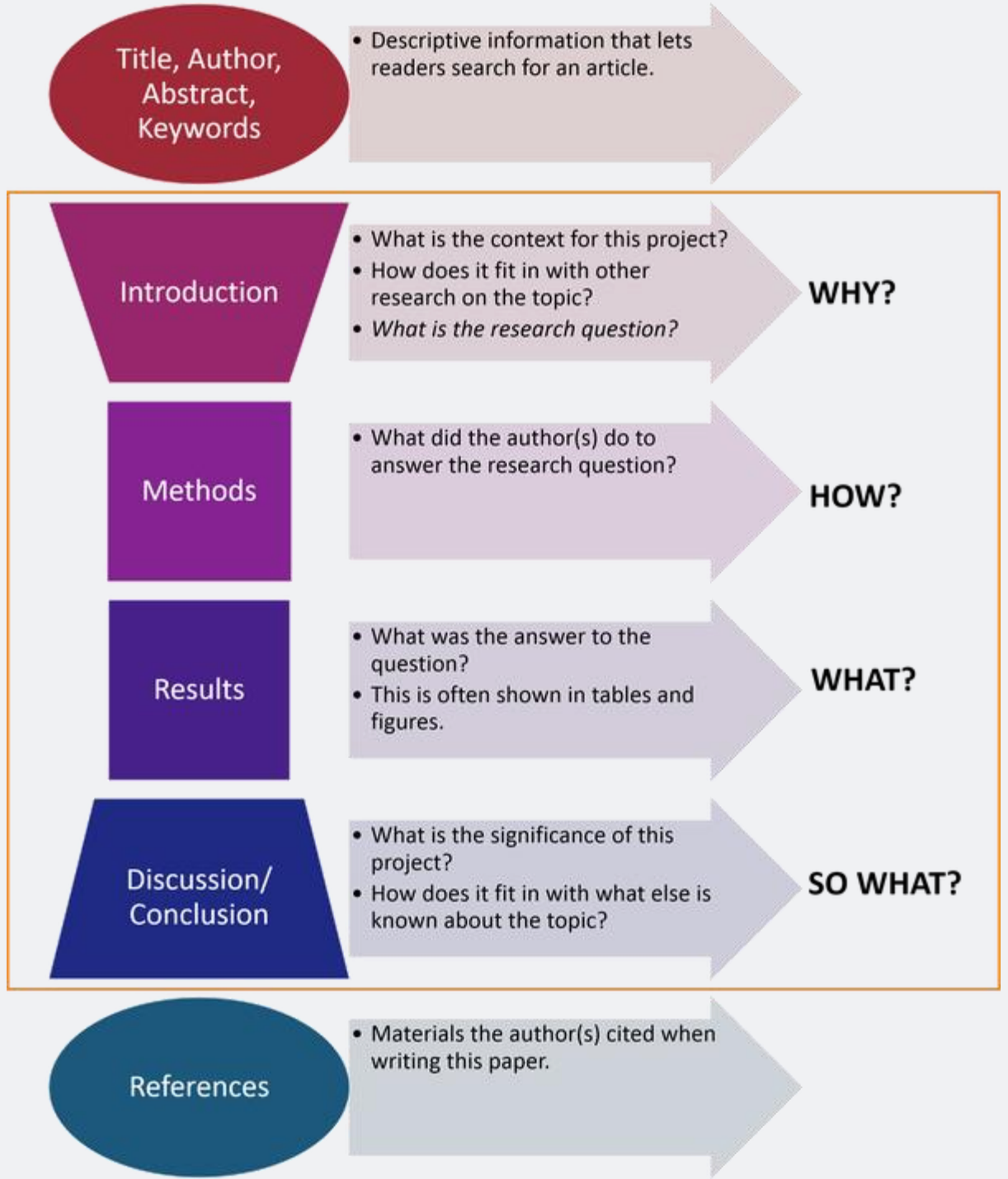
6. Conclusions

- Don’t just repeat abstract
- Often not needed
- MUST be concise and comprehensive

7. References

- You must follow the Author guidelines for the style of the references as they verify from journal to journal.

What is the structure of research papers/article?



https://www.quora.com/What-is-the-structure-of-research-papers-article

What is Scientific Research Ethics?

Scientific Research Ethics

- Scientific Research ethics provides guidelines for the responsible conduct of research. In addition, it educates and monitors scientists conducting research to ensure a high ethical standard. The following is a general summary of some ethical principles:

1. **Honesty:**
   Honestly in reporting data, results, methods and procedures, and publication status. Do not **fabricate**, **falsify**, or **misrepresent data**.

Scientific Research Ethics

2. **Objectivity:**

   Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research.

3. **Integrity:**

   Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.

Scientific Research Ethics

4. **Carefulness:**

   Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities.

5. **Openness:**

   Share data, results, ideas, tools, resources. Be open to criticism and new ideas.

Scientific Research Ethics

6. Respect for Intellectual Property:

Honor patents, copyrights, and other forms of intellectual property. Do not use unpublished data, methods, or results without permission. Give credit where credit is due. Never plagiarize.

7. Confidentiality:

Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.

Scientific Research Ethics

8. Responsible Publication:

Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.

9. Responsible Mentoring:

Help to educate, mentor, and advise students. Promote their welfare and allow them to make their own decisions.

10. Respect for Colleagues:

Respect your colleagues and treat them fairly.

Scientific Research Ethics

11. Social Responsibility:

Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.

12. Non-Discrimination:

Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors that are not related to their scientific competence and integrity.

Scientific Research Ethics

13. Competence:

Maintain and improve your own professional competence and expertise through lifelong education and learning; take steps to promote competence in science-as-whole.

14. Legality:

Know and obey relevant laws and institutional and governmental policies.

Scientific Research Ethics

15. Animal Care:

Show proper respect and care for animals when using them in research. Do not conduct unnecessary or poorly designed animal experiments.

16. Human Subjects Protection:

When conducting research on human subjects, minimize harms and risks and maximize benefits; respect human dignity, privacy, and autonomy.

17. Don't send the same work to two different journals!!

Source:

What is Ethics in Research & Why is it Important? U.S. National Institute of Environmental Health Sciences

Research Misconducts

Research Misconducts

- (a) **Fabrication** - making up data or results and recording or reporting them.
- (b) **Falsification** - manipulating research materials or changing or omitting data or results such that the research is not accurately represented in the research record.
- (c) **Plagiarism** - the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.
- (d) Research misconduct does not include honest error or differences of opinion.

Source: Definition of Research Misconduct
The Office of Research Integrity, U.S. Department of Health & Human Services

Link

Scientific Writing

- Scientific writing can be a complex and arduous process, for it simultaneously demands clarity and conciseness; two elements that often clash with each other. In addition, accuracy and integrity are fundamental components of the scientific enterprise and, therefore, of scientific writing.

- Thus, good scientific writing must be characterized by clear expression, conciseness, accuracy of what is being reported, and perhaps most importantly, honesty. Unfortunately, writing, or for that matter the entire scientific process, often occurs within the constraints of tight deadlines and other competing pressures.

Scientific Writing

- In scientific writing, perhaps the most widely recognized unethical lapse is plagiarism. Plagiarism can occur in many forms and some of the more subtle instances, while arguably unethical in nature, may not be classified as scientific misconduct by federal agencies such as the National Science Foundation (NSF) or the Office of Research Integrity (ORI). Nevertheless, the ethical professional is expected to operate at the highest levels of scientific integrity and, therefore, must avoid all forms of writing that could be conceptualized as plagiarism

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

What is Plagiarism?

- "Taking over the ideas, methods, or written words of an author, without acknowledgment and with the intention that they be taken as the work of the deceiver."

Source: American Association of University Professors (September/October 1989).

What is Plagiarism?

As the in the previous slide quotation states, plagiarism has been traditionally defined as the use others' of words, images, ideas, etc. from an author and presenting them as one's own. It is often associated with phrases, such as kidnapping of words, kidnapping of ideas, fraud, and literary theft.

Plagiarism can manifest itself in a variety of ways and it is not just confined to student papers or published articles or books.

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

Academic Self-plagiarism

- Refers to the practice of an author using portions of his or her previous writings on the same topic in another article, without specifically quoting or citing the self-plagiarized material.
- Expect criticism

  -Your professor

  -Reviewers

Salami Slicing (i.e., Data Fragmentation)

Although often associated with redundant publication, the segmenting of a large study into two or more publications is somewhat different than reporting exactly the same data in two publications, but it is a similarly unacceptable scientific practice.

Did I Plagiarize?

The Types and Severity of Plagiarism Violations

Did I Plagiarize?

- Are you CONFIDENT that your ideas are your own OR that they are so obviously common knowledge (like the fact that the earth is round) that you didn't need to cite any sources? — No / Yes
- Did you give credit to ALL original authors for any text you *directly* quoted? — No / Yes
- Did you give credit to ALL original authors for any ideas you summarized or paraphrased, even if you completely changed the wording? — No / Yes
- Did you give credit to ALL original artists for any images or graphics you used or referred to? — No / Yes
- Are you CONFIDENT that you didn't distort or misinterpret an author's or artist's original meaning when you cited them? — No / Yes
- Are you CONFIDENT that the organization and style of your work is your own creation and that you didn't mimic the style or layout of someone else? — No / Yes
- Did you use a proper and recognized citation method OR did you include enough citation information that a reader could locate the original work on his/her own? — No / Yes

Yes! If you couldn't answer "yes" to *ALL* of the questions to the right (even if you answered "yes" to all but one), then you are most likely in violation of plagiarism standards. Note that even the slightest of plagiarism infractions is serious. Even if you didn't mean to plagiarize or you weren't familiar with all plagiarism standards, you are held accountable. Lack of understanding or intent does not free you from serious penalty. However, not all plagiarism violations are treated with the same severity; some are certainly more severe than others. And repeated infractions, just like with the law, can cause harsher penalties. Follow the chart to the left and below to determine how you plargiarized and how serious it is.

No! If you're confident that what you have written and/or designed is entirely original—in concept, style, structure, diction, and everything else—then you have not plagiarized. Or, if you have used another's ideas to elaborate on or validate your own, ***but you cite the original author or artist*** (and you provide their name and all pertinent information so that your reader could locate the original source on their own), then you are also free of plagiarism violations. Plagiarism-free means you have recognized any and all individuals or organizations that influenced your thoughts, writings, and designs and that you have made every effort to cite them according to conventional citation practices.

How Serious Is It?

- Did you ***steal, copy, or purchase another's entire document*** and take full credit for it being your own? — Yes / No
- Did you ***copy large portions*** (entire paragraphs and sections) of another's work and not give full credit? — Yes / No
- Did you ***cherry-pick a few terms and phrases to change*** but keep the rest of the text and ideas from another's work relatively unchanged without giving credit? — Yes / No
- Did you ***duplicate (re-use) an entire work of your own*** for another purpose or publication and not cite yourself? — Yes / No
- Did you ***reuse large portions of a work of your own*** for another purpose or publication and not cite yourself? — Yes / No
- Did you ***paraphrase multiple sources and stitch them together***, making them sound like your own? — Yes / No
- Did you cite a source that doesn't exist or did you make up what the source actually said? — Yes / No
- Did you ***cite many sources correctly but not cite others*** at all? — Yes / No
- Did you ***misinterpret or cite a source out of context***? — Yes / No
- Did you cite everything correctly but ***use very little of your own thought***? — Yes / No
- Did you cite everything correctly but your work still ***closely reflects another's***? — Yes / No
- Did you make a ***mistake in your citation***? Wrong words, wrong author, or something similar? — Yes / No
- Did you mostly cite everything correctly but ***got a bit sloppy on some and failed to note small things*** like page numbers or publishers? — Yes

Identity Theft	Copycat	Cherry-pick	Mitosis	Recycle	Remix	Ghost Citation	Half-n-half	Warp	Mosaic	Reflection	Miscue	Half-hearted
Insanely	Extremely	Terribly	Immensely	Profoundly	Hugely	Very, Very	Very	Remarkably	Quite	Notably	Somewhat	Mildly

Plagiarism Severity Meter: How Serious Is the Violation?

TheVisualCommunicationGuy.com | 2014

References: http://www.plagiarism.org/plagiarism-101/types-of-plagiarism/

7 Deadly Sins of Plagiarism	7 Academic Integrity Commandment
Failure to give proper credit.	Do not present another's research as your own.
Copying material from the Internet without citing it.	Give proper credit to Internet sites.
Failure to cite even a few words of borrowed language.	Use quotation marks when borrowing even your neighbour's brief phrase.
Failure to cite an exact quote.	Include footnotes or in-text notes whenever quoting
Failure to cite paraphrased ideas.	Cite also paraphrased ideas.
Failure to provide an accurate citation.	Record thoroughly and accurately all sources consulted.
Thinking you can get away with plagiarism.	Do not think you're immune to being smote with the consequences of plagiarism.

Adapted with permission from Cook, D., & Sittler, R. (2008). Practical pedagogy for library instructors : 17 innovative strategies to improve student learning. Chicago: Association of College and Research Libraries.

What are the plagiarism Major types in scholarly writing?

Although plagiarism can take many forms there are two major types in scholarly writing:

1. Plagiarism of ideas.
2. Plagiarism of text.

An ethical writer ALWAYS acknowledges the contributions of others and the source of his/her ideas.

1. Plagiarism of Ideas

- ***Appropriating an idea (e.g., an explanation, a theory, a conclusion, a hypothesis, a metaphor) in whole or in part, or with superficial modifications without giving credit to its originator.***

- **In the sciences, as in most other scholarly endeavors, ethical writing demands that ideas, data, and conclusions that are borrowed from others and used as the foundation of one's own contributions to the literature, must be properly acknowledged. However, source attribution typically takes the form of either a footnote or a reference citation.**

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

2. Plagiarism of Text

- ***Copying a portion of text from another source without giving credit to its author and without enclosing the borrowed text in "quotation marks".***

- **When it comes to using others" word-for-word (verbatim) text in our writing the universally accepted rule is to enclose that information in quotations and to indicate the specific source of that text. When quoting text from other sources, you MUST provide a reference citation and the page number indicating where the text comes from.**

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

Paraphrasing/Plagiarism Exercise

ORIGINAL VERSION

"This study examines whether workers of S. invicta are able to assist their mothers in colony usurpations. First we tested whether [queens] of S. invicta are better able to usurp colonies to which their daughters have moved. Second, we tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. Aggressive behavior during these usurpation attempts was observed to determine if the presence of familiar or related workers influenced the aggressive response toward either the resident queen or the queen attempting usurpation."

PLAGIARIZED VERSION

A study was conducted to examine whether workers of *S. invicta* can assist their mothers in colony usurpations. The first hypothesis tested was whether queens of *S. invicta* are better able to usurp colonies to which their daughters have moved. For the second hypothesis, the researchers tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. The researchers observed aggressive behavior during these usurpation attempts to determine if the presence of familiar or related workers influenced the aggressive response toward either the resident queen or the queen attempting usurpation.

Paraphrasing/Plagiarism Exercise

ORIGINAL VERSION

"This study examines whether workers of S. invicta are able to assist their mothers in colony usurpations. First we tested whether [queens] of S. invicta are better able to usurp colonies to which their daughters have moved. Second, we tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. Aggressive behavior during these usurpation attempts was observed to determine if the presence of familiar or related workers influenced the aggressive response toward either the resident queen or the queen attempting usurpation."

PLAGIARIZED VERSION

To determine whether workers of *S. invicta* can assist their mothers in colony usurpations, two researchers have conducted a study in which the following hypotheses were tested: First, they wanted to see whether queens of *S. invicta* are better able to usurp colonies to which their daughters have moved. Second, they tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. The ants' aggressive behavior during these usurpation attempts was observed to determine if the presence of related or familiar workers influenced the aggressive response toward either the resident queen or the queen attempting a colony take-over.

Paraphrasing/Plagiarism Exercise

ORIGINAL VERSION

"This study examines whether workers of S. invicta are able to assist their mothers in colony usurpations. First we tested whether [queens] of S. invicta are better able to usurp colonies to which their daughters have moved. Second, we tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. Aggressive behavior during these usurpation attempts was observed to determine if the presence of familiar or related workers influenced the aggressive response toward either the resident queen or the queen attempting usurpation."

PLAGIARIZED VERSION

To determine whether workers of *S. invicta* can assist their mothers in colony usurpations, a study was conducted in which the following variables were investigated: First, *S. invicta* queens' hypothesized ability to usurp colonies to which their daughters have moved was examined. The second hypothesis tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. During these usurpation attempts aggressive behavior was observed to determine if the presence of familiar or related workers influenced aggression toward either the resident queen or the queen attempting colony usurpation.

Paraphrasing/Plagiarism Exercise

ORIGINAL VERSION

"This study examines whether workers of S. invicta are able to assist their mothers in colony usurpations. First we tested whether [queens] of S. invicta are better able to usurp colonies to which their daughters have moved. Second, we tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. Aggressive behavior during these usurpation attempts was observed to determine if the presence of familiar or related workers influenced the aggressive response toward either the resident queen or the queen attempting usurpation."

PLAGIARIZED VERSION

An investigation was carried out to determine whether S. invicta mothers are helped by their worker offspring during colony usurpations. The study's focus of investigation was the question of whether colony take-over by S. invicta queens is more effective when their daughters first invade the colonies. One hypothesis concerned the extent to which daughters' familiarity with the queen, or their genetic similarity to her, affects successful colony take-over. During attempts at taking over another colony, behavioral observations were made of usurping workers that were either familiar or genetically related to the queens to see if these variables were related to aggressive behavior toward the resident or the invading queen.

Paraphrasing/Plagiarism Exercise

ORIGINAL VERSION

"This study examines whether workers of S. invicta are able to assist their mothers in colony usurpations. First we tested whether [queens] of S. invicta are better able to usurp colonies to which their daughters have moved. Second, we tested whether the effect of daughters on usurpation success is due to familiarity with the queen or to genetic relatedness. Aggressive behavior during these usurpation attempts was observed to determine if the presence of familiar or related workers influenced the aggressive response toward either the resident queen or the queen attempting usurpation."

PLAGIARIZED VERSION

Balas and Adams carried out an investigation to determine whether S. invicta mothers are helped by their worker offspring during colony take-overs. These authors asked whether colony take-over by S. invicta queens is more effective when their daughters first invade the colonies. A second hypothesis concerned the extent to which daughters' familiarity with the queen, or their genetic similarity to her, affects successful colony take-over. During these occupation attempts, aggressive behavior of usurping workers that were either familiar or genetically related was observed to see if these variables mediated aggressive behavior toward the invading or the resident queen.

Ethically Inappropriate Writing Practices

1. Selective Reporting of Literature:

- When appropriate, authors have an ethical responsibility to report evidence that runs contrary to their point of view. In addition, evidence that we use in support of our position must be methodologically sound. When citing supporting studies that suffer from methodological, statistical, or other types of shortcomings, such flaws must be pointed out to the reader.

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

Ethically Inappropriate Writing Practices

2. Selective Reporting of Methodology:

- Here, investigators must explain in clear language the series of steps that were used to **establish**, **observe**, or **manipulate** the independent variables in their research plan.
- Authors have an ethical obligation to report all aspects of the study that may impact the independent replicability of their research.

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

Ethically Inappropriate Writing Practices

3. Selective Reporting of Results:

- Researchers have an ethical responsibility to report the results of their studies according to their a priori plans. Any post hoc manipulations that may alter the results initially obtained, such as the elimination of outliers or the use of alternative statistical techniques, must be clearly described along with an acceptable rationale for using such techniques.
- Designing an empirical study takes planning and careful consideration of existing theory and research in the area under investigation.

Source: http://facpub.stjohns.edu/~roigm/plagiarism/Index.html

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THANK YOU