

M.Sc. Chemistry

Name of Subject: Research Methodology

Subject code : (MCH0308)

# UNIT-III : METHODS OF SCIENTIFIC RESEARCH & WRITING SCIENTIFIC PAPERS

INDUS UNIVERSITY  
Department of Chemistry  
M.Sc. Chemistry  
Semester: III

Indus University

IISHLS

Department of Chemistry

M.Sc. Chemistry

Semester: 3

Subject Code: MCH0308

Name of Subject: Research Methodology

Unit: III - Methods of Scientific

Research & Writing Scientific Papers

## ★ **Methods of Scientific Research**

- For a clear perception of the term research, one should know the meaning of scientific method.
- **Scientific methods are defined as controlled, systematic investigations that are rooted in objective reality & that aim to develop general knowledge about natural phenomena.**
- The two terms, research and scientific method, are closely related. Research, as we have already stated, can be termed as **“an inquiry into the nature of, the reasons for, and the consequences of any particular set of circumstances, whether these circumstances are experimentally controlled or recorded just as they occur.**
- Further, research implies the researcher is interested in more than particular results; he is interested in the repeatability of the results and in their extension to more complicated and general situations.
- On the other hand, the philosophy common to all research methods and techniques, although they may vary considerably from one science to another, is usually given the name of scientific method.
- In this context, Karl Pearson writes, **“The scientific method is one and same in the branches (of science) and that method is the method of all logically trained minds ... the unity of all sciences consists alone in its methods, not its material; the man who classifies facts of any kind whatever, who sees their mutual relation and describes their sequences, is applying the Scientific Method and is a man of science.**
- Scientific method is the pursuit of truth as determined by logical considerations. The ideal of science is to achieve a systematic interrelation of facts. Scientific method attempts to achieve “this ideal by experimentation, observation, logical

arguments from accepted postulates and a combination of these three in varying proportions.

- In scientific method, logic aids in formulating propositions explicitly and accurately so that their possible alternatives become clear. Further, logic develops the consequences of such alternatives, and when these are compared with observable phenomena, it becomes possible for the researcher or the scientist to state which alternative is most in harmony with the observed facts.
- All this is done through experimentation and survey investigations which constitute the integral parts of scientific method.

## ➤ CHARACTERISTICS OF SCIENTIFIC METHODS

They are orderly & systematic processes.

Scientists attempt to control external factors that are not under direct investigation.

Their findings are based on the empirical evidences.

Findings of scientific methods can be generalized, which means that they can be used in situations other than the one under study.

Scientific methods are based on assumptions or hypothesis.

They are basically conducted to develop or test hypothesis.

## ➤ STEPS OF SCIENTIFIC METHODS

**Selecting the topic & identifying the research problem**

**Defining the objectives of the study.**

**Reviewing the literature from theory & other related studies.**

**Defining concepts & variables to be studied.**

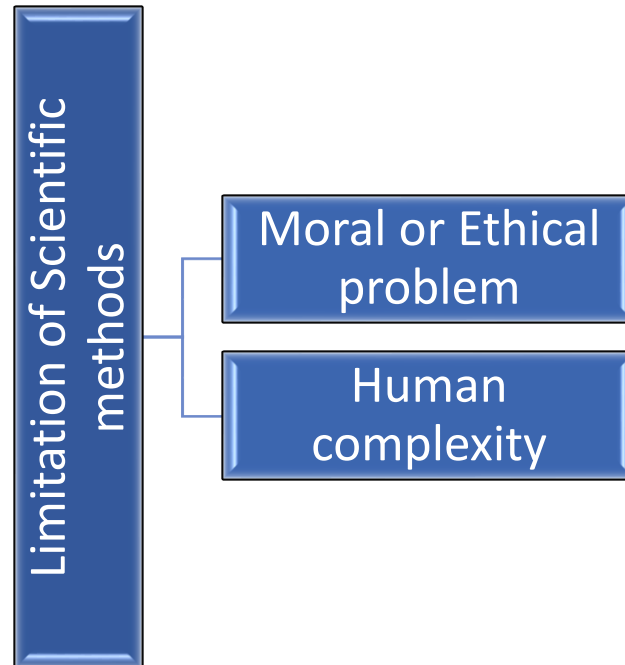
**Stating hypothesis about expected observations or phenomenon to be studied.**

**Determining the ethical implication of the proposed study.**

**Describing the research design & methods for data collection.**

**Defining study population & sample.**

**Planning the data analysis & discussion. Collecting data from subjects. Analyzing & interpreting data. Communicating finding of the study.**



### **★ Reporting Practical & Project Report**

→ The most common type of project report, a project status report provides a general state of the project to its stakeholders. It quantifies work performed and completed in measurable terms. It compares this with an established baseline to see if the project is on track or; if adjustments have to be made if the project is behind its schedule. It keeps everyone on the same page and manages each other's expectations.

### **★ Why a Project Report???**

→ The production of a good piece of technical writing for a project report is as much a part of the project as doing the experimental work. However excellent and

original a piece of work the project may be, unless the results can be communicated to other people it may as well not have been done!

→ Communicating results of an investigation in a clear and useful way is a key part of science and is the reason for devoting a lot of effort to this aspect.

★ **How much detail to include?**

→ It is not necessary, or even desirable; to describe every minute detail of what was done. One of the most important aspects of good technical writing is to be concise, yet remain informative. The ability to select what is essential, and to omit what is merely incidental detail, is a skill every scientist needs to develop.

→ In view of this, the main part of your report must be within the word limit(s) specified in the applicable module description. An overlong report will be penalized and receive a lower mark than it otherwise deserves.

★ **Format of reports.**

Whilst not mandatory, there are good reasons for the usual format of a report. Sections that you need to include are,

Title
Authors
Abstract
Table of contents
Introduction
Experimental techniques and methods
Results and discussion
Summary/conclusions
References
Appendices (if used)

## ▪ **First Page.**

→ This should contain the title, the author(s) and the date.

### ❖ **Title.**

→ This should convey the area and scope of the project.

→ For example, “Rainbows” is poor – is this an investigation of the occurrence of rainbows in medieval illuminated manuscripts? or their use as metaphors in popular art? Or what?

→ A better choice might be “Rainbows: the deflection of light by liquid droplets and the determination of droplet refractive index from measurements of rainbow phenomena”

## ▪ **Second Page.**

### ❖ **The Abstract.**

→ The second page should consist only of the abstract. The idea of the abstract is to provide a brief summary of the report.

→ The reader should be able to pick up from the abstract what the abstract entailed, how it was undertaken and an indication of what was found out.

→ An abstract should not review the report, but should rather act as a sampler of the contents of the report.

→ Typically, the abstract should be less than 200 words.

→ **A poor example of title and abstract might be,**

→ ***“The length of a piece of wood.”***

→ The length of the piece of wood was found to be shorter than it should have been. We had problems with our measuring device and could not obtain good results. With better equipment we could have got better results.



- ***It is poor because***, the length of the piece of wood was found (**how was it measured?**) to be shorter (**by how much?**) than it should (**should? – say’s who?**) have been. We had problems (**what sort of problems?**) with our measuring device and could not obtain good (**what is meant by good?**) results. With better equipment we could have got better results (**a cop out!**).
- **A better title and abstract might be,**
- ***“Interferometric measurements of the length of a piece of wood and discrepancies with previous spectroscopic measurements”***
- The length of a piece of wood was measured using an interferometric technique. Our results gave a length shorter by 1.5% than that found by Hamel et al. who used a spectroscopic technique. However, our measurements suffered from a large random error (2%), which we attribute to the use of a lamp as the source of light. An alternative interferometric measurement strategy employing a laser is suggested that should overcome this problem.

- **Third page.**

- This should comprise a ***table of contents***, indicating the page numbers of the different sections.

- **Fourth page and onwards.**

- ❖ **Results and discussion.**

- Present your results in a logical sequence, highlighting what is important and how the data you obtained have been analyzed to provide the results you discuss. You should discuss what you infer from the data. You need to adopt a critical approach.

- **Make sure that all diagrams, graphs etc. are properly labeled and have a caption.** A neat hand drawn diagram is preferable to a poorly made computer diagram, or a poor resolution image copied from the web.
- **Summary and conclusion.** This is the section in which you need to put it all together. It differs from the abstract in that, It should be more informative, something that can easily be accomplished because you may devote more words to it. You should include a concise version of your discussion, highlighting what you found out, what problems you had, and what might be done in the future to remedy them. You should also indicate how the investigation could usefully be continued.

### ❖ References

- **Book** – you need to cite title, authors, date published, edition (if not first), City of publication and publisher. e.g. “Elements of Nuclear Physics” W. E. Burcham, (London) Longman, 1979.
- **A journal article**, “The speed of light by interferometry” A. Dixon, Journal of Light, vol. 3, pp.123-234, 2003.
- **A web page**, : <http://www.gobbeldygook.co.uk>

## ★ Writing literature surveys and reviews

### ❖ What is a literature review?

- Literature reviews are literally reviews of the literature ( the academic writing e.g. academic books, journal articles etc. ) that have been published on a particular research topic. They aim to identify what is already known on the topic at that time.
- A literature review is not an annotated bibliography in which you summarize briefly each article that you have reviewed. While a summary of the what you have read is contained within the literature review, it goes well beyond merely

summarizing professional literature. It focuses on a specific topic of interest to you and includes a critical analysis of the relationship among different works, and relating this research to your work. It may be written as a stand-alone paper or to provide a theoretical framework and rationale for a research study (such as a thesis or dissertation).

→ They are necessary for several reasons. They are an essential part of the research process. They give an overview of a topic's theoretical background. Researchers use literature reviews to identify gaps in existing knowledge and to set the context for their research studies. Students can be asked to complete a literature review as part of their course to help them understand a topic more deeply. Writing a literature review can enable a student to demonstrate what they have learned about a topic and develop their own connecting ideas within that topic further.

→ **Types of literature reviews.**

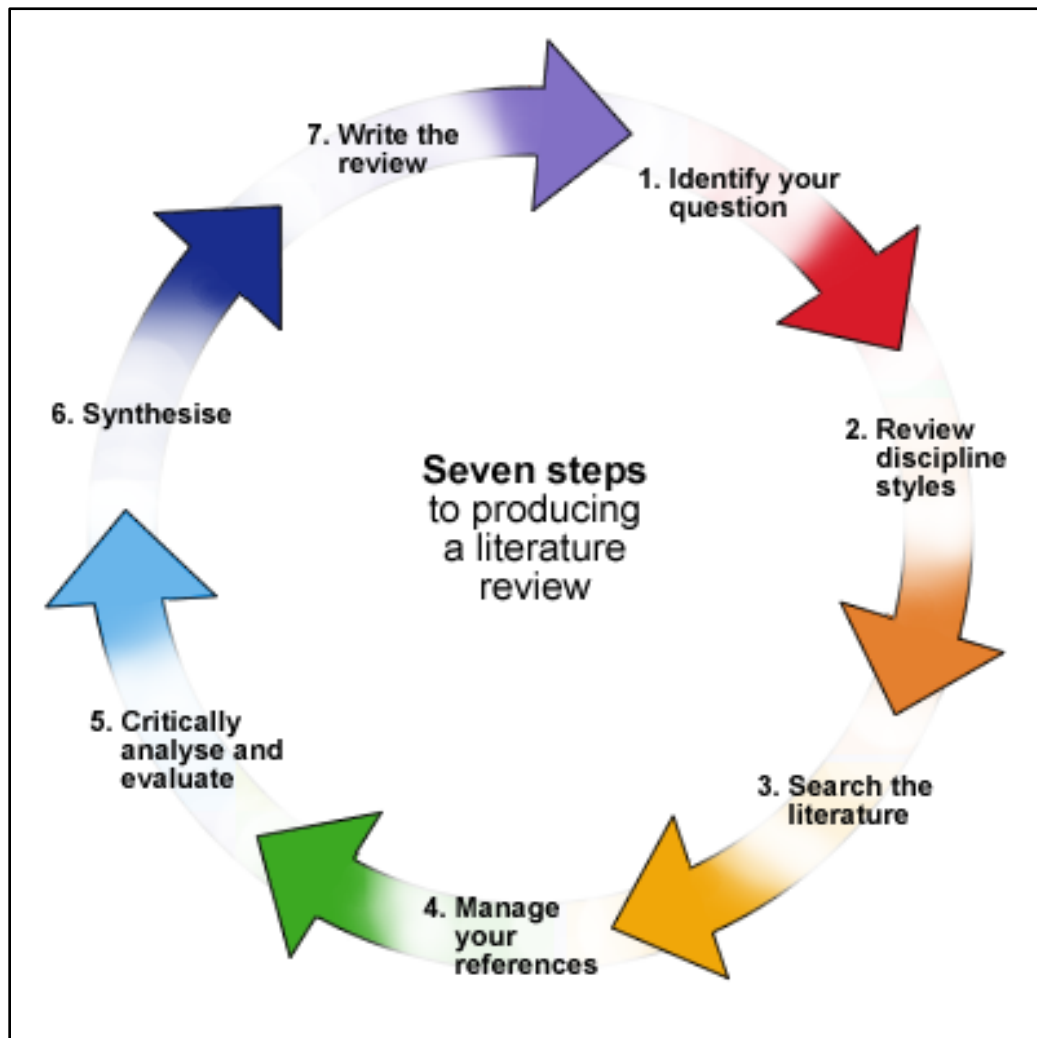
A stand alone literature review can be a single work in its own right. Examples include

1. A class assignment
2. A review article

→ Literature reviews can also be component parts of larger bodies of work. Examples include

1. A thesis / dissertation
2. An academic journal article introduction

→ Following are the steps for producing the literature review.



**Seven Steps to producing a literature review.**

### **★ Organizing a poster display**

→ A large-format poster is a big piece of paper or image on a wall-mounted monitor featuring a short title, an introduction to your burning question, an overview of your novel experimental approach, your amazing results in graphical form, some insightful discussion of aforementioned results, a listing of previously published articles that are important to your research, and some

brief acknowledgement of the tremendous assistance and financial support conned from others — if all text is kept to a minimum (500-1000 words), a person could fully read your poster in 5-10 minutes.

- *Different template for Poster*

### 1. Horizontal template with results

→ This layout gives a lot of central, visible space to the results and demotes less important sections (Literature cited, Acknowledgements, Further information) to the bottom portion of the poster.

**DO NOT PUT LOGOS HERE.**  
Doing so crowds the title and visually distracts from important graphics. Put logo on your business card, not poster.

**Title pitched at general audience that provides conclusion or at least hints at something interesting**

Colin B. Purrington, Department of Posterology, Hudson University

**DO NOT PUT LOGOS here, either.**

**Introduction**  
Three sentences max.  
Persuade reader you have novel, interesting question(s) and hypothesis. Resist urge to use all the white space.

**Results**  
Highlight your LARGE photographs, charts, maps, or in this central arena.  
Don't include every graphic you've made that relates to project. Choose one. Or two. And separate graphics with plenty of white space.  
**If you have just one or two simple graphics, viewers will be drawn to explore them. If you have too many or they are too complicated, they will be repelled.**  
Annotate graphics with arrows and callout boxes so that viewer is **visually** led through how hypothesis is addressed. The goal is to enable viewers to understand the logic behind your conclusions *without you needing to be there*.  
Keep font size of all text (even graph labels) as big or bigger than in rest of poster.

**Conclusions**  
Explain why outcome is interesting. Don't assume it's obvious. Three sentences max.  
Maybe include a sentence about what you plan to do next.  
As for Introduction, don't feel like you need to fill the entire box.  
I.e., if you retain a lot of white space you will attract more viewers. Seriously.

**Materials and methods**  
Three sentences max.  
If viewer truly wants to know gruesome details, they'll ask or email you. Sometimes adding a pic is good.

**Literature cited**  
Author, J. 2012. Article title. *Journal of Something* 1:1-2.

**Acknowledgments**  
Be brief.

**Further information**  
Please see <https://colinpurrington.com/tips/poster-design> for more templates and tips. I'm at colinpurrington@gmail.com if you have a question or comment.

## 2. Horizontal template with big central column

If you prefer a more traditional layout (just columns) but still like the big central area for results.

**Title pitched at general audience that provides conclusion or at least hints at something interesting**

Colin B. Purrington, Department of Posterology, Hudson University

**Introduction to question(s)**  
Three sentences max. **Persuade** reader you have novel, interesting question(s).  
Resist urge to use all the white space.

**Methodology**  
Three sentences max.  
Sometimes adding a pic is good.

**Results and Conclusions**

Put a question here.

Insert a **LARGE** photograph, chart, quotation, map, or table that addresses question on left. Annotate with arrows and callout text boxes so that viewer is visually led through how question is addressed. Keep font size of all text as big or bigger than rest of poster.

Put an interesting conclusion here. Three sentences max. Two better. One best.

Put another question here.

Do the same here if you have a second question.

Put an interesting conclusion here.

**Literature cited**  
Author, J. 2012. Article title. Journal of Something 1:1-2.

**Acknowledgments**  
Be brief.

**Further information**  
Please see <https://colinpurrington.com/files/poster-design> for more templates and advice. I'm at colinpurrington@gmail.com if you have a question or comment.

### 3. Portrait template

It is opted for a larger central column because your results are likely to contain charts or tables, and those don't look good when overly shrunken.

<p style="text-align: center;"><b>Title pitched at general audience that provides conclusion or at least hints at something interesting</b></p>		
DO. NOT. PUT. LOGOS. HERE.	<p><b>Colin B. Purrington, Department of Posterology, Hudson University</b></p>	DO. NOT. PUT. LOGOS. HERE.
<p><b>Introduction</b></p> <p>Three sentences max.</p> <p><b>Persuade</b> reader you have novel, interesting question(s) and hypothesis.</p> <p>Resist urge to use all the white space.</p>	<p><b>Results</b></p> <p>Highlight your LARGE photographs, charts, maps, or in this central arena.</p> <p>Don't include every graphic you've made that relates to project. Choose one. Or two. And separate graphics with plenty of white space.</p> <div style="border: 1px solid black; background-color: yellow; padding: 5px; text-align: center;"> <p><b>If you have just one or two simple graphics, viewers will be drawn to explore them. If you have too many or they are too complicated, they will be repelled.</b></p> </div> <p>Annotate graphics with arrows and callout boxes so that viewer is <b>visually</b> led through how hypothesis is addressed. The goal is to enable viewers to understand the logic behind your conclusions <i>without you needing to be there</i>.</p> <p>Keep font size of all text (even graph labels) as big or bigger than in rest of poster.</p>	<p><b>Conclusions</b></p> <p>Explain why outcome is interesting. Don't assume it's obvious.</p> <p>Three sentences max.</p> <p>Maybe include a sentence about what you plan to do next.</p> <p>As for Introduction, don't feel like you need to fill the entire box.</p> <p>I.e., if you retain a lot of white space you will attract more viewers. Seriously.</p>
<p><b>Materials and methods</b></p> <p>Three sentences max.</p> <p>If viewer truly wants to know gruesome details, they'll ask or email you.</p> <p>Sometimes adding a pic is good.</p>		
<p><b>Literature cited</b></p> <p>Author, J. 2012. Article title. <i>Journal of Something</i> 1:1-2.</p>	<p><b>Acknowledgments</b></p> <p>Be brief.</p>	<p><b>Further information</b></p> <p>Please see <a href="https://colinpurrington.com/tips/poster-design">https://colinpurrington.com/tips/poster-design</a> for more templates and tips. I'm at colinpurrington@gmail.com if you have a question or comment.</p>

## ★ Oral Presentation

### ◆ Structure of Oral Presentation

Basically there are three parts to a typical presentation:

the **Beginning** (Introduction)

the **Middle** (body)

the **End** (conclusion)

### 1. The Beginning (Introduction)

- The beginning of a presentation is the most important part.
- **II.1.A Get the audience's attention and signal the beginning.**
  - *Right. Well. OK. Erm. Let's begin.*
  - *Good. Fine. Great. Can we start?*
  - *Shall we start? Let's get the ball rolling.*
  - *Let's get down to business.*



- **II.1.B Greet audience.**

- It is important to greet the audience by saying something like:

- *Good morning ladies and gentlemen*
- *Good afternoon everyone*
- *Hello everyone*
- *Good morning members of the jury*
- *Good afternoon esteemed guests*
- *Good evening members of the board*
- *Fellow colleagues Mr. Chairman/Chairwoman*
- *Thank you for your kind introduction*

- **II.1.C Introduce oneself, (name, position, and company)**

- *Good afternoon ladies and gentlemen, let me introduce myself.*
- *Good morning everyone, I'd like to start by introducing myself.*
- *Good morning, my name is Lawrence Couderc. I am a student at the INT and I would like to talk to you today about some of my findings in a study I did on...*

- **II.1.D Give title and introduce subject**

- What exactly are you going to speak about?
- Give a rough idea or a working definition of the subject.
  - *I plan to speak about...*
  - *Today I'm going to talk about...*
  - *The subject of my presentation is...*
  - *The theme of my talk is...*
  - *I've been asked to give you an overview of...*

- **II.1.E Give your objectives**

- *What I would like to do today is to explain...*
- *to give you the essential background information on...*
- *to outline...*
- *What I want my listeners to get out of my speech is...*
- *If there is one thing I'd like to get across to you today it is that...)*

### • **II.1.F Announce your outline.**

- **You want to keep the outline simple so 2 or 3 main points are usually enough.**
  - *I have broken my speech down/up into X parts.*
  - *I have divided my presentation (up) into Y parts.*
    - *In the first part I give a few basic definitions.*
    - *In the next section I will explain*
    - *In part three, I am going to show...*
    - *In the last part I would like/want to give a practical example...*

### • **II.1. G Questions and comments from the audience.**

- **You should also let the audience know at some point in the introduction when and whether they may ask questions.**
  - *I'd ask you to save your questions for the end.*
  - *There will be plenty of time at the end of my speech for a discussion.*
  - *You may interrupt me at any moment to ask questions or make comments.*
  - *Please stop me if you don't understand any thing I say but could you keep any specific questions until after I've finished.*

## 2. The Middle (Body)

- **II.2.C Sequencing your Ideas.**
  - **Make your presentation clear by sequencing your Ideas.**
  - **Here are a few possibilities for organizing your ideas:**
    - *Logical order*
    - *chronological order*
    - *from general to specific*
    - *from known to unknown*
    - *from accepted to controversial*
    - *cause/effect*
    - *problem/solution*
    - *Whatever sequencing you choose*
- 
- **II.2. D Signposting or signaling where you are.**
  - **Indicate when you have finished one point and then go on to the next one (**transitions**).**
  - **Experienced presenters will also clearly pause, change their stance and the pitch of their voice as they move from one part of a presentation to another.**

- **To be clear and concrete.**
  - **Use examples (EVIDENCES)**
    - *Now let's take an example...*
  - **Rephrase**
    - *Let me rephrase that...*
  - **Summarize**
    - *Let me summarize by saying...*
  - **Emphasize**
    - *I'd like to emphasize the fact that...*
  - **Refer to what you have said previously**
    - *As I have already said earlier...*
  - **Refer to what you will say**
    - *We will go into more detail on that later.*
  - **Refer to what an expert says**
    - *Here I'd like to quote...*
  - **Refer to common knowledge**
    - *As you all may well know...*

### 3. The End (Conclusion)

- **II.3.A Content**
- **The end or the conclusion of your talk should include four parts:**
  1. A brief **reminder** of what you said,
  2. a short **conclusion**,
  3. **Thanks** to the audience for listening,
  4. An invitation to ask **questions**, make comments or open a discussion.

- **II.3.B Dealing with difficult questions**

- **1. Make sure you understand the question.**
  - Ask a question to see if you understand
  - Repeat the question in your own words to check that you have understood.
  - if not, ask the questioner to repeat
- **2. In answering:**
  - delay the answer (ask for time and/or repeat the question)
    - *Just a minute please. What is a...?*
    - *How can I put it?*
    - *I'm glad you asked that question.*
    - *That's a good question/point/remark.*
    - *Can I answer that question later?*

- **Question time can be the most difficult part of the presentation; especially if someone asks a difficult question beyond your capabilities.**
- **Keep in mind that most often you only have 10 minutes of question time so you must use it as efficiently as possible.**
- **Usually you may answer 3-5 questions, below are some tips to consider when being asked and answering questions.**

- **Basic rules in answering questions**

- **Let the person asking the question finish before you begin to respond.**
- **It's often helpful to repeat the question asked to you aloud.**
  - **This allows any audience member who may have missed the question to hear it again and it also allows yourself time to understand the question and prepare your answer before you respond to it.**
- **Be as brief as possible while still providing a complete answer.**
- **If you don't know how to respond, don't bluff.**

- **Handling difficult questions**

- **If you are unable to answer the question at the time, you can always say to the questioner**

- *"Your question is really interesting. I actually do not know how to answer that straight away. But it raises a relevant point. I will give it some thought and see whether I can incorporate it into my research."*

- **Make your answer interactive:**

- **get the audience involved by putting the question back to the audience, creating an opportunity for discussion.**



## **"DOs"**

- Prepare an audience analysis.
- Organized the presentation to flow from one section to another.
- Prepare and rehearse the presentation.
- Visit the room where the presentation will be given ahead of time.
- Tell the audience in the introduction your subject, who you are, and your qualifications to speak about the subject.
- State your main ideas at the beginning.
- Provide adequate support for your ideas.
- Integrate relevant, supportive, and attractive audio-visual aids into your presentation.
- Use words that express your ideas clearly.
- Use acceptable language, pronunciation, and enunciation.
- Dress appropriately.
- Avoid distracting body movements.
- Maintain eye contact with the audience.
- Display enthusiasm and genuine concern for your subject.
- Use appropriate tone.
- Use transitional devices, words, and phrases coherently.
- Allow time for a question/answer period.
- Answer questions credibly. If you don't know, say so.
- Start and stop your presentation on time.

## "DON'Ts"

- Don't be late for the presentation.
- Don't be afraid to pause and take a deep breath or two before you begin (or during your presentation, if required).
- Don't hyperventilate; just relax and breathe normally.
- Don't speak in a monotone or mumble.
- Don't slouch. (Your mother was right.)
- Don't read your notes.
- Don't sit or lean on the desk or lectern.
- Don't hide behind the lectern.
- Don't sway or rock in place.
- Don't pace back and forth.
- Don't forget your audience don't avoid eye contact.
- Don't use technical terms unfamiliar to your audience provide clear explanations and definitions.
- Don't hold the pointer when you're not using it (but don't forget where you placed it, either).
- Don't stand in front of your visual aids.
- Don't leave the overhead projector, slide projector, etc. on if the screen will be blank.
- Don't leave a visual aid in place that is no longer relevant to the current topic.
- Don't forget that giving presentations is hard, but necessary if you are to be an effective communicator.
- And don't forget to have a bit of fun-you don't ~~have~~ to be boring.

## ★ How to write an effective scientific research paper

### *The Recipe*

---

- Construct an introduction that puts your work in context for your readers
    - Tell them why it is important
    - Tell them why it is relevant
  - Materials and methods
    - Leave readers in no doubt (about) what you did
    - Write it such that they can reproduce your work if they want to
  - Present your results so that
    - Easily Understood
    - Graphs & figures tell most of results
  - Discuss your findings
    - Enabling readers appreciate the implications of the work
- 

### *Writing the Paper*

---

- Order your material
  - Construct a neat abstract
  - Write an effective introduction
  - Describe your methods so that other researchers could repeat your study
  - Report your results precisely
  - Make your discussion relevant and interesting
-

## *Basic Technique of Scientific Writing*

---

- *Thought*
    - Having some worthwhile results and ideas to publish. You need some new results to publish and you need to be able to interpret them correctly
  
  - *Structure*
    - Getting the right contents & expressions in the right place
  
  - *Style*
    - Choosing the fewest and most appropriate words and using the rules of good grammar
- 

## *That's All Fine ..... but how do i...*

---

- Getting started
    - Plan your paper
    - Choose an appropriate journal
    - Prepare your paper in the correct format
    - Make decisions about authorship
    - Decide who is a contributor and who should be acknowledged
-

## *A Draft*

Section	Question to be answered	Purpose	Expected length with A4 paper, font size 10-12 and 1.5 line spacing
Introduction	Why did you start?	Summarise the context of your study and state the aims clearly	1 page
Methods	What did you do?	Give enough detail for the study to be repeated	2-3 pages
Results	What did you find?	Describe the study sample and use the data analyses to answer the aims	2-3 pages
Tables and figures	What do the results show?	Clarify the results	3-6 tables or figures
Discussion	What does it mean?	Interpret your findings in context of other literature and describe their potential impact on health care	2-3 pages
References	Who else has done important work in your field?	Cite the most relevant and most recent literature	20-35 references
<b>Total document</b>			<b>12-20 pages</b>

## *Deciding a Journal*

- Use experience
- Match your paper with the personality and scope of the journal
- Match your subject with the journal's target audience
- Consider the impact factor and citation index of the journal
- Weigh up the journal prestige, the likelihood of acceptance and the likely time until publication
- Have realistic expectations
- Scan the journals for one that matches your content and study design
- Be robust and, if rejected, select another journal

## *Writing the Paper*

---

- Order your material
  - Construct a neat abstract
  - Write an effective introduction
  - Describe your methods so that other researchers could repeat your study
  - Report your results precisely
  - Make your discussion relevant and interesting
- 

## *Introduction*

---

Paragraph 1:  
What we know

Paragraph 2:  
What we don't know

Paragraph 3:  
Why we did this study

### **Introduction**

People who are overweight or obese are at increased risk of developing many illnesses including hypertension, cardiovascular disease, and non-insulin dependent diabetes. However, many adults continue to be overweight. In 1995, results from the National Nutrition Survey in Australia suggested that 63% of men and 47% of women were either overweight or obese.

Despite the impact of excess body weight on health, self-perception of body mass in the general population has not been properly investigated. The only information comes from small, unrepresentative samples of women, particularly younger women, or from national studies in which self-reported weights may be unreliable. Until reliable information of self-perceptions of body mass is collected, it is difficult to design effective weight loss intervention strategies.

In 1998, we conducted a large cross-sectional survey of adults in which we accurately measured height and weight. In this paper, we report information about adults' perceptions of their own body mass.

---

## Materials & Methods

### Central principle

Every measurement reported in the results section must have a description of the method used to obtain it

- *Ethics approval*
  - Described
- *Study design*
  - Design, randomization (blinding ...), sample size, optimization, justification
- *Participants*
  - Population sampled from, inclusion/exclusion, sampling scheme
- *Interventions*
- *Clinical assessment*
  - Primary & Secondary
  - Efficacy as well as safety
- *Statistical analysis*
  - Baseline treatment, data censoring, model selection, tests, levels of significance

## Results

### Paragraph 1:

Describe study sample  
Who did you study?

### Paragraph 2:

Univariate analysis  
How many participants had what?

### Paragraph 3 to n-1:

Bivariate analyses  
What is the relation between the outcome and explanatory variables?

### Last paragraph/s:

Multivariate analyses  
What is the result when the confounders and effect modifiers have been taken into account?

## Results:

### An Example

Notes	Topic sentences
The first paragraphs describe who the participants were.	A total of 1527 participants aged 18 to 73 years from two rural regions participated in this study. Table 1 shows the anthropometric characteristics of the participants ... and Figure 1 illustrates the selection criteria for our normal group. Table 2 shows that the "normal" group of participants were not significantly different from the remainder of the sample in terms of age, height, and weight ( $P > 0.05$ ).
The next paragraph describes the bivariate analyses.	The data for the normal group were used to obtain regression equations for FVC, FEV <sub>1</sub> ... with weight, age, gender, and height as the main predictors.
The next paragraphs describe how the bivariate analyses were used.	Using our prediction equations, we calculated mean percentage of predicted FEV <sub>1</sub> values for the whole sample (Figure 2). We then examined the factors that affect lung function.
The final paragraph describes the multivariate analyses.	Multiple regression showed that airway inflammation and asthma were significantly related to reductions in FEV <sub>1</sub> and that the interaction between airway inflammation and recent symptoms was also significant ( $P < 0.05$ ).

## Figures & Tables

- No more than six tables or figures
- Use Table 1 for sample characteristics (no  $p$  values)
- Put most important findings in a figure



## *Graphs & Figures*

---

- Central Principle
    - Show your most important findings as graphs and figures
    - Let your graphs & figures not take up much more space than reporting the data would
  - Symbols, abbreviations, hatching, line types, and bars
    - Very clear and explained in detail without cluttering the picture
    - Legend should be comprehensive so that the figure can be fully understood without recourse to reading explanatory text
  - What is useful in oral presentations, may not be useful in published journal articles
    - e.g., pie charts
- 

## *Tables*

---

- Tables are best instruments for presenting numerical data
  - Should not be too large
  - If data require many rows or columns
    - Consider dividing the table into two
  - Keep tables as simple and uncluttered as possible
  - Row and column headings should be brief but sufficiently explanatory
  - Standard abbreviations of units of measurements should be added in parentheses
-

## Discussion

---

### *Paragraph 1:*

What did this study show?

Address the aims stated in the Introduction

### *Paragraph 2:*

Strengths and weaknesses  
of methods

### *Paragraph 3 to n-1:*

Discuss how the results support the current literature  
or refute current knowledge

### *Last paragraph/s:*

Future directions

“So what?” and “where next?”

Impact on current thinking or practice

## Discussion

---

- *“Say what your findings mean, not what you would like them to mean or think they ought to mean”*
  - Reiterate your main findings but in the context of furthering knowledge or impacting on patient care, public health policy, or future research
  - Be honest about any limitations of your study, to explain how your findings fit in with established knowledge, and to explain any inconsistencies
  - If you are very knowledgeable in the topic, you may have a lot to discuss. That’s OK – just write succinctly and stay in focus
-

## *References*

---

- All citations must be accurate
  - Include only the most important, most rigorous, and most recent literature
  - Quote only published journal articles or books
  - Never quote “second hand
  - Cite only 20–35 references
- 

## *Finishing up Your Paper*

---

- Write a short, snappy title
  - Select and quote references correctly
  - Maximize the value of the peer review process
  - Package your paper appropriately
  - Send your paper to a journal
  - Store your data and your documentation
-

## *A Few Simple Rules for Effective Writing*

---

- Rule 1 Use concrete rather than vague language.
    - **Vague** *The weather was of an extreme nature on the West coast.*
    - **Concrete** *California had very cold weather last week.*
  
  - Rule 2 Use active voice whenever possible. Active voice means the subject is performing the verb.
    - **Active** *Barry hit the ball.*
    - **Passive** *The ball was hit.*
  
    - Notice that the responsible party may not even appear when using passive voice.
- 

## *Rules (Contd..)*

---

- Rule 3 Avoid overusing there is, there are, it is, it was, etc.
    - **Example** *There is a case of meningitis that was reported in the newspaper.*
    - **Correction** *A case of meningitis was reported in the newspaper.*
    - **Better** *The newspaper reported a case of meningitis. (Active voice).*
  
  - Rule 4 To avoid confusion, don't use two negatives to make a positive.
    - **Correct** *He is willing to help.*
    - **Incorrect** *He is not unwilling to help.*
-

## Rules (Contd..)

---

- Rule 5      Use similar grammatical form when offering several ideas. This is called parallel construction.
    - **Correct:** *You should check your spelling, grammar, and punctuation.*
    - **Incorrect** *You should check your spelling, grammar, and punctuating.*
  - Rule 6      If you start a sentence with an action, place the actor immediately after or you will have created the infamous dangling modifier.
    - **Correct**    *While walking across the street, she was hit by a bus.*  
OR  
*She was hit by a bus while walking across the street.*
    - **Incorrect** *While walking across the street, the bus hit her.*
- 

## Rules (Contd..)

---

- Rule 7      Place modifiers near the words they modify.
    - **Correct** *In my lunch bag, I have some pound cake that Esha baked.*
    - **Incorrect** *I have some pound cake Esha baked in my lunch bag.*
  - Rule 8      A sentence fragment occurs when you have only a phrase or weak clause but are missing a strong clause.
    - **Example of Sentence Fragment**    *After the show ended.*
    - **Example of Sentence**                *After the show ended, we got a cup of coffee.*
-

## Research Ethics



In research, a number of ethical principles can be identified:

- People involved in the research should be protected from physical, emotional and psychological harm or stress.
- The privacy and confidentiality of research participants should be protected.

- People should provide, without coercion, their informed consent to take part in the research.
- Research participants should not be deceived, including about the true nature of the research, unless the circumstances are exceptional
- The research should not lead people to commit acts that are illegal or diminish their self-respect.
- The research should protect people's right to self-determination.
- The risk of "negative" use of the research should be minimized.
- Research participants should be treated fairly, considerately and respectfully.

## What is plagiarism?

- According to the [Merriam-Webster dictionary](#), the verb "to plagiarize" means: *"to steal and pass off (the ideas or words of another) as one's own : use (another's production) without crediting the source"*
- The inclusion of the word "steal" in this definition, includes instances when another's ideas or words are intentionally used without crediting the source. Even accidentally using another's ideas or words without proper citation, due to carelessness, falls under this definition since your work tries to "pass off" another's work as your own.
- In our tech-forward culture, the simple act of copy-and-paste can seem harmless, but it has serious consequences in academic and professional settings.

## Why should you avoid plagiarism?

- At its core, plagiarism is an ethical issue. A writer who submits plagiarized work is committing theft with the hope of benefiting from that theft. This is true whether you're turning in a school paper to get an "A" or are a writer by trade expecting monetary compensation.
- Avoiding plagiarism is paramount as a writer because it compromises your integrity. Aside from losing the respect of your mentors and peers, it could cost you valuable professional referrals and future career advancement. If you're still in school, plagiarism may result in lost financial aid or leadership roles.
- Additionally, it takes credit or profit away from the original creator of the work which may mean more trouble if the source takes legal action against you.

## 5 ways to avoid plagiarism

### 1. **Cite your source**

When alluding to an idea or wording that's not your own, add a citation in your writing that identifies the full name of the source, the date it was published, and any other citation element that's required by the style guide you're adhering to.

### 2. **Include quotations**

If you insert a source's words into your writing, verbatim, one of the most simple yet obvious ways to avoid plagiarism is by using quotation marks around the text to



denote that the words aren't your own. A direct quote should also cite the source so that readers know who the quote is from.

### **3. Paraphrase**

Paraphrasing is rewriting a source's ideas or information into your own words, without changing its meaning. But be careful—paraphrasing can slip into plagiarism if done incorrectly.

Successfully paraphrasing without plagiarizing involves a bit of a dance. Reword and format your writing in an original way, and try to avoid using too many similar words or phrases from the source. The key is to do so without altering the meaning of the idea itself. Remember, you're still using another's idea so you'll need to include a citation to the source.

### **4. Present your own idea**

Instead of parroting the source's ideas or words, explore what you have to say about it. Ask yourself what unique perspective or point you can contribute in your writing that's entirely your own. Keep in mind that if you're alluding to a source's ideas or words to frame your own point, you'll still need to apply the guidelines above to avoid plagiarizing.

If you're writing on the same topic for multiple assignments, it can be tempting to recycle some of your previous words—this is called “self-plagiarism”. The risk involved with self-plagiarism is just as high if the publisher or your instructor didn't give you permission to reuse your old work.

## **5. Use a plagiarism checker**

While conducting your research on a topic, some phrases or sentences might stick with you so well that you inadvertently include them in your writing without a citation. When in doubt, using an online plagiarism checking tool can help you catch these issues before submitting your work.

There are several plagiarism checkers online, such as the one offered by Small SEO Tools. Grammarly also offers a plagiarism checker that scans your text for borrowed content for free. These tools let you know whether or not parts of your writing are plagiarized—and some even highlight the specific words or sentences of concern and identify where the text originated from.

These suggestions can be helpful in avoiding plagiarism in your work and is worth the effort. In addition to being more aware of what constitutes plagiarism, figuring out how to avoid plagiarism ultimately takes daily practice.