2nd year

RESEARCH PROJECTS

April-June 2019

ISae
Institut Supérieur de l'Aéronautique et de l'Espace
SUPAERO

Contents

Overview

This English course is designed to support your Research and Innovation Project (PIR), helping you to achieve four important objectives:

1. A written **bibliographic study** setting out and explaining the state of the art of the area you are studying for your PIR *(due the week of the 13th May)*

2. An **oral presentation** that accompanies your bibliographic study *(due the week of the 13th May)*

3. A high-quality conference-style **academic article** consisting of a maximum of 12 pages, including abstract, content (text and figures) and references *(due the 25th June)*

4. A **technical presentation** of 15 minutes plus questions *(on the 27th/28th June)*

All four of these will clearly communicate important information about your project, including where your research has emerged from, what it consists of, what you have done in order to realise it, and what you have found out through doing it.

We will use the bibliographic study (1) and the oral presentation (2) as the starting points from which you can develop your larger and more detailed (and more difficult!) academic article (3) and technical presentation (4).

This booklet contains 9 lessons (summarised in the table on Page 5) which are intended to support you in formulating specific parts of these written and oral texts, in practising and improving key skills, and in developing the language to do both. The first two lessons focus on your bibliography and the first presentation, and come much earlier in the calendar (19th April and 10th May).

There is then a break of 4 weeks, when you will be collecting data and actually carrying out your PIR research. Then on the 7th June, you will start a series of 7 lessons, mostly on Wednesdays and Fridays. These will help you directly with your article and your formal *soutenance.* They are concentrated in June because this is when you will need the most help with these two important elements.

It is important to remember that, ultimately, it is <u>you</u> who is writing the two documents and giving the two presentations. It is therefore you who needs to devote the necessary hours to these tasks – your teacher is there to help in any way they can, but cannot do the writing (or the presenting!) for you. With this in mind it is imperative that you:

- start work on your writing as soon as possible
- make sure you complete all homework tasks so that the following lessons can proceed smoothly

Please make sure you bring a lap top computer to each lesson

Evaluation

The evaluation for this PIR English course is as follows:

Presentation	50%
Participation	50%

Your science teachers will evaluate your finished written article; your English teachers will work with you during the course make sure it is of high quality, communicating your research clearly, and making sure your work is potentially publishable in the public domain.

Your presentation will be evaluated simultaneously for language and content. The English teacher who is at your presentation will give you a mark for the quality of your communication.

The participation mark is based on your approach to your work throughout the course, including:

- your contributions to class activities and discussions
- carrying out homework tasks to prepare for later lessons
- your sustained work on both your article and your presentation
- your attendance

Lesson Content

The content of the booklet is organized as in the table below. Your teacher will use the booklet and other materials according to your needs, so it is possible you will not complete all the material here, nor do it in the same order.

Lesson	Date	Lesson content
1	19/4	Introductions and admin; run-though of course outline 3 min oral presentation of PIR **Homework**: 1) write first draft of bibliographic study 2) prepare draft presentation
2	10/5	Review of bibliographic study Run through of presentation
3	7/6	**Structure** of written article – key sections Choosing a "writing partner" **Homework** – complete a section-by-section writing summary
4	12/6	Skills: Describing **procedures** Example paper (Owl Flight jigsaw reading) Introduction to language toolbox
5	14/6	Mapping out your **presentation** Writing review **Homework** – prepare initial Power Point
6	19/6	Skills: Discussing **data** – using and commenting on **data/graphs** Run-through of draft presentation Writing review
7	21/6	**Abstract** writing Writing review Presentation practice
8	24/6	Final writing review
9	26/6	Presentation practice

Please bring your laptop to each lesson!

Lesson 1: Introducing your research project (1)

This is the first of two lessons in which you will work on your written bibliographic state-of-the-art article, and the presentation that accompanies it.

In later lessons, you will expand upon the work you do in Lessons 1 and 2, using them as the basis for developing your final article and *soutenance*.

In this lesson, you will:

- Give a three-minute mini-presentation setting out the principal elements of your research project
- Map out the state-of-the-art of your field
- Identify key papers that inform your research

1. Three-minute mini-presentation

The purpose of this mini-presentation is to

1. help you organise the ideas surrounding your project into a coherent package
2. provide you with a first opportunity to express these in English

In your 3-minute presentation, try to communicate the "complete package" of your PIR. Think about the different aspects of your project <u>listed in the box below</u>.

Some aspects will be more directly relevant to your bibliographic study (background, aim, possibly methods/procedures used by other researchers); others will be less relevant. In the less relevant aspects (results, conclusions, maybe methods), try to <u>predict</u> – what do you <u>expect/hope</u> to happen?

- **Background:** What issues led to this work? What is it that makes this work interesting or important?
- **Interest:** Why is your PIR interesting? Why should people listen to you and read about this research you are doing?
- **Aim/Problem:** What do you plan to achieve in this work? What problem will you attempt to solve? What gap is being filled?
- **Procedures/methods:** How are you going to set about achieving your aims (e.g. experimental method, simulation approach, theoretical approach, combinations of these, etc.)?
- **Results:** What do you expect/hope the main results of the study to be?
- **Conclusions:** What main conclusions do you expect/hope to be able to draw? Where do you expect your research to lead in the future?

- ➢ Spend around 10 to 15 minutes preparing what you are going to say.
- ➢ Try and find a balance between the different parts outlined above.
- ➢ Think about how you could make your research sound interesting and valuable to
  - – your classmates **and**
  - – an imaginary audience outside Supaéro – an audience who is educated but not specialised in aerospace.

This last point is important. During your careers, it is likely that you will have to convince non-specialists (such as funding bodies and non-specialist managers/bosses) that your research is interesting and worthwhile.

Y**our project therefore has to sound INTERESTING!** Ask yourself: what makes my project worth reading/hearing about? What aspects can I emphasise in order to make my audience want to read/listen?

Note that this mini-presentation is an introduction. Your bibliographic presentation and your final *soutenance* will of course be for a more technical audience (i.e. the science profs), but you should not forget the importance of also communicating to a wider audience who will often have a different area of specialisation.

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2. Organising your bibliographic study

This activity is going to help you prepare for one part of your homework, which is to write a first draft of your 2-page bibliographic study.

While the exact form your study takes will depend to some extent on what your supervisors want, the main sections are likely to be the following:

1. **Context**
   What is the scientific and technical background to your PIR subject? Why is it important? What questions are being asked?
2. **Problem statement**
   What are the problematic areas of your PIR subject? What problem/question are you going to address?
3. **State of the art**
   How have other people investigated this area? Have they addressed the same question as you? If so, how? What are the limitations of previous work?
4. **First developments and future work**
   What work have you done so far? What future will you do?

Don't forget that your study should include a brief **abstract** which maps out your study for the reader.

There are some example bibliographic studies on the LMS page.

- ➢ In the table below, note down any thoughts/ideas you have for each section.
- ➢ Where relevant, note down the research papers that you will refer to in your bibliographic study, and the key ideas from them that you will use.

If you have not identified and read any research relating to your PIR, this will form part of the homework task.

- ➢ Show and explain your notes to another student.

	Notes and relevant papers
1.Context	
2. Problem statement	
3.State of the art	
4.First developments/ future work	

Homework:

For next lesson, Friday the 10th May

1. Write a first draft of your two-page state-of-the-art bibliographic review, using your notes to help you. If you haven't already done so, you should first identify key literature relating to your PIR

You should also make use of the document *Writing scientific articles: useful phrases* (available on LMS). You can navigate the document using the contents on the first page.

2. Prepare a 5 to 10 - minute presentation to accompany your written paper. Use this presentation to emphasise and expand on the interesting aspects of your project. You should <u>not</u> simply reproduce your paper in oral form.

It is imperative that you do this homework, as it will form the basis of the next lesson (on 10th May, the week before you have to submit this paper). **Please bring your bibliographic study draft to the next class.**

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Lesson 2: Introducing your research project (2)

In this lesson you will:

➢ review and perfect your 2-page bibliographic paper
➢ run through the accompanying presentation

1. Peer reading

➢ Exchange your paper with another student and read their paper.

Consider the following areas:

Content - is each topic clearly relevant to the PIR? Do any extra details need adding?

Clarity - is each topic clear to the reader? Is the connection between the cited articles and the topic clear?

Organisation – does the paper's information and argument lead logically from one part to the next

Language – are there any errors you could indicate?

➢ When you have finished, talk together and suggest ways your partner can improve.

2. Practice presentation run

➢ In small groups of 3 or 4, take turns to run through the presentation you will give to accompany your bibliographic study.

Again, give feedback to each other.
Remember that the objective is to help each other – so criticise if necessary!

Context – did the speaker create a context so that the information was easy to interpret?

Emphasis – were interesting aspects focused on (or did the speaker just reproduce their written paper)?

Clarity – were you (as an audience) able to follow the presentation without any trouble?

Visuals – did the visual aids used help support your understanding of the PIR topic? Where any diagrams/images easy to interpret?

Interesting – was it? Which parts were interesting?

Homework:

Go to the LMS page for this PIR course and add your key vocabulary to the "PIR Vocabulary" glossary.

Include as much information about each word or phrase as possible: the meaning/a definition; a translation; the domain (e.g. aerodynamics, propulsion, quantum mechanics etc.)

The idea is to create a collective resource, accessible to all, that everyone doing the PIR can use!

*This means technical terms that are important for explaining your research, as well as other less technical words you may need. If you do not know a particular word or expression, **it is your job to find out**!*

You should continue to add vocabulary and expand this resource throughout the course.

Lesson 3: Planning your written paper

Welcome back! We hope that you have made good progress with your projects during the last four weeks.

The remaining lessons on the course are intended to help you build the two tasks you have already done (the bibliographic study and the accompanying presentation) into a full-length conference article and a piece of high-quality verbal communication.

In this lesson, you will

1. Review Lessons 1 and 2
   ➢ look at the structure and content of your written article. This will also help give you ideas of the kind of information you want to include in your presentation.
   ➢ establish "writing partners" to help you in the process of writing your article

1. Review of Lessons 1 and 2

➢ Look around the classroom. Think back to the first two lessons and try and make a mental note of the projects that your classmates are working on. You will be tested on this!

2. Your writing partners

In this course, writing partners are other students whom you collaborate with in order to produce your written article. They act as "critical friends" (and you do the same for them). Their job is to read through what you have written, regularly (about once per week if possible) and:

- identify any points where what you have written is not immediately clear
- identify examples of ideas which do not fit together well
- note any imbalances in the way the article is organised
- point out any language mistakes you have made (including punctuation)
- suggest ways you can improve your ideas/language/organisation/presentation

Of course, you can (and should!) do all of this yourself, but your writing partners provide extra brains and extra pairs of eyes which see things from a different perspective, and which can see problems with your work that you may miss.

So…

➢ Form groups of three (if possible – the number can be flexible, but should be small!). You will be each other's writing partners and support each other throughout the course.

3. Structure and content (written paper)

This week you will continue to develop the content of what you are going to say about your project. You will be able to base some sections on the bibliographic study you have already written. The focus will be on your **written paper**, but keep thinking about your presentation too.

> ➢ You should make sure you are familiar with the document:
> _Writing scientific articles: useful phrases_ (available on LMS).
>
> ➢ There are also example articles from previous years on LMS

The table on the next page is divided into similar categories that you used to plan your mini-presentation in Lesson 1. Note that there is extra space to add extra categories if your paper has more or different categories.

You can use this table in two ways:

> ➢ If you haven't started your article (or have written very little) – make notes in the table on what the content of each section is going to be.
>
> This will help you to orientate your thinking onto the probable content, and how you are going to express it in English.
>
> ➢ If you have started your article and have made some progress writing it – make notes in the table 1) on what you have already written 2) on what you need to add or change.
>
> This will help you to review and criticise what you have already done, and take the next step towards expanding and refining it.

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Article Section	
Background	Key vocabulary
Interest	Key vocabulary
Aim	Key vocabulary
Procedures/Methods	Key vocabulary
Results	Key vocabulary
Conclusions	Key vocabulary
	Key vocabulary
	Key vocabulary

Vocabulary

➢ Now go back to each section of your notes and identify any additional **key vocabulary** that you need to express your exact meaning (see the homework for Lesson 2). Precision is important in this kind of paper (or presentation).

Homework:

For the next lesson, Wednesday 12th June

1. Write a skeleton of your written article containing the following:

- **section headings** for each section in your paper

- a short paragraph (50 – 70 words) in each section summarising what it is going to contain

- if you have identified any key vocabulary, then include it in your outline

If you have already written some of your article, do the same exercise, but write instead a paragraph for each section detailing <u>*what you still need to add*</u>.

2. Go to the LMS page for this PIR course and add any additional key vocabulary to the "PIR Vocabulary" glossary.

Lesson 4: Describing procedures

In this lesson you will:

- work with your writing partners in order to review the homework task from last week
- read and discuss part of a scientific article, focusing on the procedures and methods sections
- identify and borrow useful language from the article to form a "language tool box"

1. Homework review: writing

Last week you chose your **writing partners**. Work with them now.

> ➢ Take it in turns to show your partners the short paragraphs you have written for each section. Talk your partners through what you have written, explaining to them the significance of what you have written.

> **Writing partners**, listen attentively as your partner explains their written skeleton.
>
> Make sure you **ask questions** if anything is not clear; this will help them express themselves more clearly when they expand their paper.
>
> Be sure to **comment**!

2. Describing Procedures

This lesson focuses on **describing research procedures**, an important element of a research paper. This is the section which tells your reader/audience what action you took in order to answer your questions.

> ➢ Make sure you refer to **Sections 17 – 30** in the document
> _Writing scientific articles: useful phrases_ (available on LMS).

The lesson will centre principally on written procedures, but again should also be of help when you are thinking about how to present your research orally.

Reading

1. You are going to read and exchange information about the procedures followed in a particular piece of research, in which engineers collected data to help answer the following question:

"To what extent do owls fly silently?"

> ➢ With a classmate (or two) discuss what you think the researchers <u>did</u> in order to collect data.

2. Below is the abstract of the paper, by Sarradj, Fritzsche and Geyer, which is entitled
    "Silent Owl Flight: Bird Flyover Noise Measurements"

    ➢ Read the abstract quickly – what procedures and techniques do they mention?
    ➢ With the same classmate(s), can you give some more details about how you imagine the researchers taking measurements and processing the data?

Most genera of owls (Strigiformes) have the ability to fly silently. The mechanisms of the silent flight of the owl have been the subject of scientific interest for many decades. The results from studies in the past are discussed in detail in this paper and the rationale for the present research is given, which included flyover noise measurements on different species of birds. Successful acoustic measurements were made on a Common Kestrel, a Harris Hawk, and a Barn Owl. Measurements on three other birds did not lead to reliable results. The setup and procedure used for the outdoor measurements are discussed. These include the estimation of the trajectory from dual video camera recordings and microphone-array measurements with a moving-focus beamforming technique. The main result from the 50 successful flyovers is that the owl flight produces aerodynamic noise that is indeed a few decibels below that of other birds, even if flying at the same speed. This noise reduction is significant at frequencies above 1.6 kHz. At frequencies above 6.3 kHz the noise from the owl remains too quiet to be measured.

3. Now you are going to read a section of the paper with the heading **"Materials and Methods"**

    ➢ With one classmate, read either Text A on Page 32 or Text B on Page 33 (your teacher will tell you which).

       Identify the procedures the researchers follow, but also anything else you find interesting.

    ➢ Discuss your text together and make sure you understand it well, as you will be explaining it to another pair of students.

    ➢ Exchange information with another pair of students who have read the other text. Explain as precisely as possible what you have understood from your text.

       The whole article is available on LMS if you wish to read it.

Language work

4. In the final activity of this lesson, you have the opportunity to expand your repertoire of structures useful for writing your paper.

    The idea is to find and borrow useful language from the "Owl" paper that you can use in your own paper. It is also to develop the habit of searching and "stealing" useful language **from every paper you read in English**.

THE BEST SOURCE OF USEFUL ADDITIONAL LANGUAGE FOR YOUR WRITTEN PAPER IS YOUR READING!

➢   Look at the extract you have read from the Owl paper (Text A or Text B). Highlight or <u>underline</u> language that you think might be useful for your own writing.

➢   Write them in the appropriate part of the table below.
    Some examples from the first part of both texts are included.

Text A: Birds	Text B: Measurement Setup
➢ *it was necessary to (also) _____* ➢ *the only option for_____ was to _____*	➢ *_____ had to meet a number of requirements.* ➢ *it was necessary to _____*

Homework

For homework this week, read (or re-read) an article important for your research (this could be an English language article from your bibliographic study). "Borrow" at least three pieces of language and write them in the **Language Toolbox** space in Appendix A (Page 36).

Make sure you do this every time you read an article in English – keep your toolbox full!

Lesson 5: Your presentation:
Speaking from the mind *and* heart

During this lesson you will:

- conceptualise your presentation as a journey for your audience
- consider the notion of "a sense of wonderment"

1. <u>Your presentation as a journey</u>

➢ In what ways can a presentation be like a journey?
With another student, make a quick verbal list.

➢ Now read the statements below. They relate to presentations conceived as journeys:

1. *The journey should be mapped out, and every bit of content that you share should propel the audience toward their destination.*

2. *The experience of the journey should be positive for the audience!*

What does each statement mean for you? What advice is each one giving?

How could you make the experience of the journey positive for your audience?

Planning your journey

Make notes in the boxes below

The destination When you have finished your presentation: • Where do you want your audience to be?   • What do you want them to understand?   • What do you want them to take away from your presentation?   • How do you want them to feel?

Visiting points on the journey

Which places do your audience need to visit during their journey in order to be able to get to their destination? **(in other words, what is it important for you to tell/show them so that they arrive at the destination <u>you</u> want them to?)**
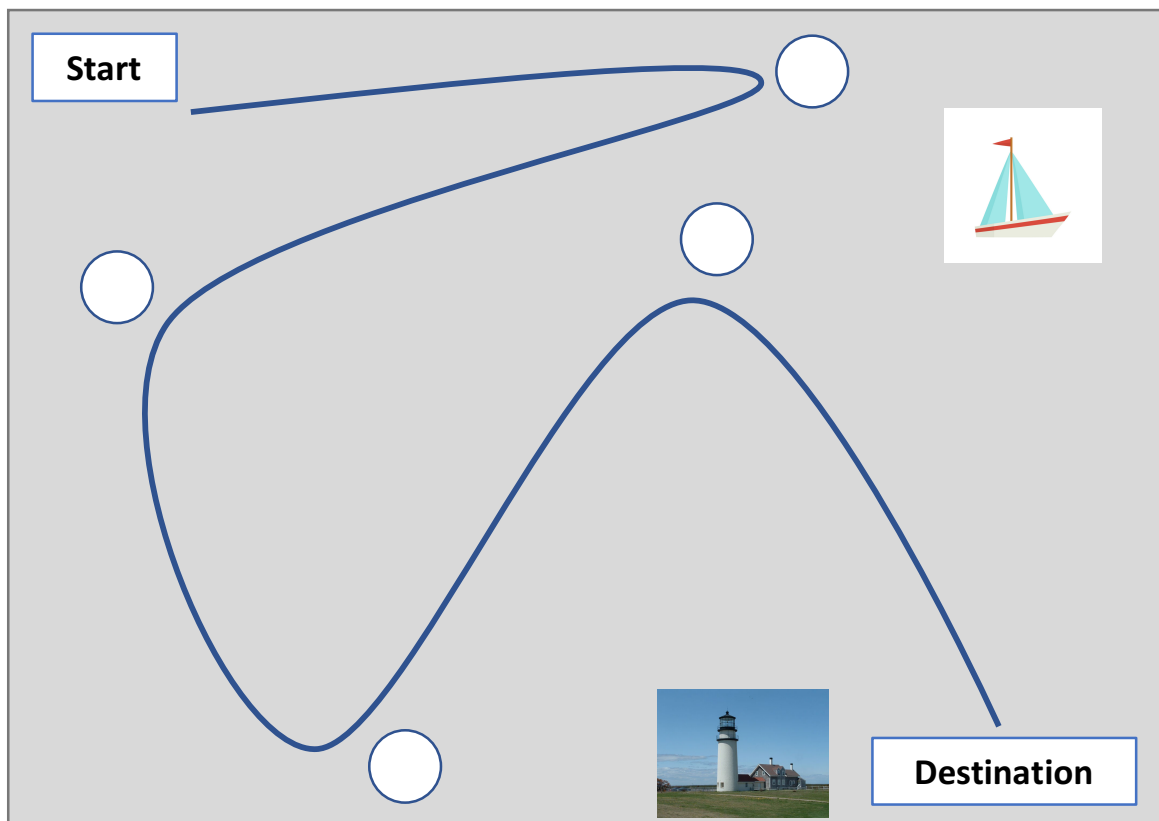
➢ Look at the map diagram on the next page

Next to each stopping point (the white circles), make a brief note of content it is essential for the audience to have on the way to the final destination (you can add more stopping points if necessary).

➢ Now use the table below to elaborate on the stopping points

Stopping point	What does the audience need to know/understand here?	How will you let them know/help them understand? What will you show them?
1		
2		
3		
4		

Map the journey

> ➢ When you have finished the two tasks (defining the destination and mapping out the journey), show another student what you have done and explain to them the important points.

2. **A sense of wonderment**

Your presentation is not just a robotic recitation of your article. You need to *engage* the audience (who is sitting right in front of you).

> ➢ Discuss the following questions with another student:
>
> What do you think is meant by the phrase "a sense of wonderment?"
>
> Why should you try to express a sense of wonderment about your PIR?

The American physicist Richard Feynman was famous for giving lectures that everyone wanted to see (if you are interested, you can find one of his most famous lectures on LMS).

Part of his charm was his frequent expression of wonder for his subject and his use of humour.

➢ Read the quotation from Feynman below:

"This law has been called the greatest generalization achieved by the human mind"

Which law do you think he is talking about?

➢ Look at the following:

Concorde	Lionel Messi	The Internet
Ice cream	Climate change	Gen. De Gaulle
The Great Barrier Reef	Brexit	The Sun
The Theory of Evolution	The Lord of the Rings	Deep Learning

Choose two, and write a sentence to convey a sense of wonderment about each one.

1. _____
_____

2. _____
_____

➢ Now think about your own PIR. It may not be as grand as the Law of Gravitation but you can still highlight the wonderful/interesting aspects of different parts.

Try here:

3. Additional practical advice on presentations

You can find additional information relating to best practice in presenting in **Appendix B, P.41**. Some of this is linked to useful videos on LMS.

> ## Homework
>
> - Prepare a first version of your Power Point presentation. It doesn't have to be the definitive, final version, but it should reflect the structure and content of your presentation.
>
> Be prepared to talk your classmates through what you plan to say in your presentation. You won't have to do the presentation itself, but you should be prepared to talk <u>about</u> it.
>
> - Please bring with you a graph or plot of some (or all) of your data.

Lesson 6: Talking about data

In this lesson, you will:

- Look at ways of presenting and talking about the data you have collected
- Talk your classmates through your presentation
- Review your written article

1. <u>Graphs, charts, tables and figures</u>

1. With another student:

   ➤ make a quick list of tips you could give about presenting your data using graphs, charts and so on.

   Now choose <u>your best three</u> ideas and formulate them into sentences in the spaces below.

   Take care to consider points such as the following:

   - the types of graph, table etc. that are available
   - the information that your reader/audience needs to have
   - the caption which tells readers what the graph is about
   - the labelling of the axes
   - the use of space
   - the use of colour
     (and so on)

The important thing to remember is that the graph/chart/table is a <u>communication tool</u> which is intended to make your results clear to your audience or reader. You can then highlight the most important parts by writing or talking about them – this will be difficult if your audience isn't clear about what they are looking at.

<u>Three tips</u>

Write your three tips here:

1. _____
   _____

2. _____
   _____

3. _____
   _____

➢ Compare your tips with another pair of students, and then share them with the whole group.

2. Now have a look at the tips from the University of Notre Dame (USA) in Appendix A on Page 37.

   Compare them with your own and the group's advice.

3. Form small groups of three or four students.

   In each group, take it in turns to show the graphs, charts, tables etc. you have created for your own research. Give and receive feedback, and discuss ways you could improve your work.

Extra material

➢ You can find the complete pdf of advice from Notre Dame on LMS.
➢ There is also a video (mp4) from Stanford Medical School on LMS. The focus is medicine, but she gives some good advice on tables (at around 12 min) and different types of graph (around 31 min 40 sec). If you have time, I would recommend the whole video.

2. Sharing your presentation plan

1. Your teacher will divide you into groups.

   ➢ Each of you in turn will talk the other students in your group through your presentation while you show them your slides.

What the speaker should do

Show your Power Point slide by slide and explain to the others what you will talk about when each slide is on the screen.

Example 1
Introduction to the topic: "*Here you can see an exoskeleton being used to help an elderly person to walk more confidently. In this part of my presentation, I'm going to talk about the increasing interest in and use of exoskeletons around the world (such as in Japan) in places such as hospitals and other medical contexts. In particular, … There is a need for…*"

Example 2
Procedures *"In this part of the presentation I'm going to explain how we collected the data we needed. What we did was capture the motion of an able-bodied child while they were wearing the exoskeleton. We did this by…*

What the listeners should do

➢ While the speaker is talking, feel free to politely interrupt and ask them to clarify anything which is not clear to you.

➢ When they have finished speaking, feel free to comment on any part of what they have said, or on any part of the Power Point.

It's important that you say what is on your mind. If something is not quite right with the speaker's presentation, then it is better that the speaker knows. You are the best equipped to spot things relating to the content which the language teacher may not detect!

3. Article review

Your teacher may use part of the lesson to review your written article with you.

Lesson 7: Writing your abstract

This lesson is divided broadly into two halves:

1. working on your written paper, especially the **abstract**.
2. practice presentations.

<u>Abstracts</u>

If all has gone well, you should be close to a final draft of your written article. Now is the time to write your abstract, and to proof-read and edit the article (again!).

1. With a classmate, discuss the following questions:

   ➢ What is an abstract?
   ➢ What is the purpose of an abstract?
   ➢ What information should an abstract contain? In what order?

On the next page, you'll find some concise advice from a Berkeley professor ("How to write an abstract: Tips and Samples"). Compare your ideas with what she says.

One thing you'll notice is that the parts of the abstract are very similar to the way you divided up your mini-presentation in Lesson 1. In fact, in some ways you have come full-circle. The objective of an abstract is to provide an easy-to-follow summary of the Why? What? How? questions that surround your research.

You can find more detailed guidelines on how to construct an abstract in Appendix A on Page 40.

2. Now look at Example Abstract 1, also on the next page (from the same source), and identify the different components of the abstract as outlined by Dr. Carroll.

HOW TO WRITE AN ABSTRACT: Tips and Samples. Leah Carroll, Ph.D., Director, Office of Undergraduate Research

An abstract is a short summary of your completed research. If done well, it makes the reader want to learn more about your research.

These are the basic components of an abstract in any discipline:

1) Motivation/problem statement: Why do we care about the problem? What practical, scientific, theoretical or artistic gap is your research filling?

2) Methods/procedure/approach: What did you actually do to get your results? (e.g. analyzed 3 novels, completed a series of 5 oil paintings, interviewed 17 students)

3) Results/findings/product: As a result of completing the above procedure, what did you learn/invent/create?

4) Conclusion/implications: What are the larger implications of your findings, especially for the problem/gap identified in step 1?

However, it's important to note that the weight accorded to the different components can vary by discipline. For models, try to find abstracts of research that is similar to your research.

Source: University of Berkeley
http://hsp.berkeley.edu/sites/default/files/HOW%20TO%20WRITE%20AN%20ABSTRACT.pdf

Example Abstract 1

"Quantifying the Mechanics of a Laryngoscopy"

Laryngoscopy is a medical procedure that provides a secure airway by passing a breathing tube through the mouth and into the lungs of a patient. The ability to successfully perform laryngoscopy is highly dependent on operator skill; experienced physicians have failure rates of 0.1% or less, while less experienced paramedics may have failure rates of 10-33%, which can lead to death or brain injury. Accordingly, there is a need for improved training methods, and virtual reality technology holds promise for this application. The immediate objective of this research project is to measure the mechanics of laryngoscopy, so that an advanced training mannequin can be developed. This summer an instrumented laryngoscope has been developed which uses a 6-axis force/torque sensor and a magnetic position/orientation sensor to quantify the interactions between the laryngoscope and the patient. Experienced physicians as well as residents in training have used this device on an existing mannequin, and the force and motion trajectories have been visualized in 3D. One objective is to use comparisons between expert and novice users to identify the critical skill components necessary for patients, to identify the mechanical properties of the human anatomy that effect laryngoscopy, and thus enable the development of a realistic training simulator. In the future an advanced training mannequin will be developed whose physical properties will be based on our sensor measurements, and where virtual reality tools will be used to provide training feedback for novice users.

Example Abstract 2

3. This activity is intended to make you think in more detail about how your abstract will be structured.

    Work with a classmate. Look at Example Abstract 2 below. It uses "nonsense" vocabulary in order to help you focus on structure rather than meaning.

    ➢ Identify the nonsense words and record them below:

    Nouns: *widgetology*_____

    Verbs: _____

    Adjectives: _____

---

(1) In widgetology, it's long been understood that you have to glomp the widgets before you can squiffle them. (2) But there is still no known general method to determine when they've been sufficiently glomped. (3) The literature describes several specialist techniques that measure how wizzled or how whomped the widgets have become during glomping, but all of these involve slowing down the glomping, and thus risking a fracturing of the widgets. (4) In this thesis, we introduce a new glomping technique, which we call googa-glomping, that allows direct measurement of whifflization, a superior metric for assessing squiffle-readiness. (5) We describe a series of experiments on each of the five major types of widget, and show that in each case, googa-glomping runs faster than competing techniques, and produces glomped widgets that are perfect for squiffling. (6) We expect this new approach to dramatically reduce the cost of squiffled widgets without any loss of quality, and hence make mass production viable.

Source: http://www.easterbrook.ca/steve/2010/01/how-to-write-a-scientific-abstract-in-six-easy-steps

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➢ Continue working with your classmate. What could each nonsense word mean? Think about a piece of imaginary research (not necessarily your own – it could be anything that interests you) – assign an idea to each word. *For example, maybe* **widgetology** *= virology (***widegets** *= viruses),* **glomp** *= tag/label,* **squiffle** *= inject etc.*

➢ Now consider your own research. What could each nonsense word mean? It doesn't have to match exactly – what is important is your thinking process in this activity.

Article review

Your teacher may use part of the lesson to review your written article with you.

Presentation Practice

Some members in your group may do a final practice of their presentation.

Your job is to listen carefully and give them honest feedback. You can use the grid in the Appendix C, Page 46 to make notes.

Lesson 8: A last look at your written article

In this lesson, your teacher will have a last look at your written article before you submit it, giving you final advice and making any final corrections.

Lesson 9: Final presentation practice

In this final lesson, you will

- watch the remaining students give their final practice presentations, and provide feedback (again, you can use the grid on Page 46).

- have a final opportunity to ask your teacher any last questions about your project

APPENDIX A: Lesson material

In this appendix, you will find material to support some of the activities in Lessons 1-8.

Lesson 4 Describing Procedures

Text A: Birds

As the research should deliver results regarding the flight noise from owls compared with other species, it was necessary to also include nonsilently flying birds in the analysis. The only option for having several different species available for testing was to use birds held in captivity. To perform the measurements, the birds have to cooperate and must be trained to do so. Although an indoor measurement setup can provide a quiet environment, considerable training of the animals is required. Thus, it was decided that the experiments should take place in an outdoor environment. Addi-tionally, it is more likely in this case that the birds are flying according to their natural habit and under natural flying conditions. The main problem that arises from the outdoor measurement is that environ-mental conditions, such as rain (making measurements utterly impossible) or wind, have to be taken into account in the planning of the measurements and the presence of disturbing noise from other sound sources cannot be totally prevented.

The measurements were conducted in the wildlife park Johannismühle near Berlin on six different birds, belonging to three nonquietly flying species (Common Kestrel, Harris Hawk, and Saker Falcon) and two quietly flying species (Barn Owl and Eurasian Eagle Owl). Table 1 gives an overview of the birds. The animals belonged to a falconry that is part of the wildlife park and presents the birds in two public shows per day. The measurements had to be conducted in the break between the two shows, leaving a time frame of 3 h to install the equipment, perform the tests, and unmount the equipment. Since each bird would only do a certain number of flights per day, is was not possible to include all birds in a single measurement campaign. Instead, only one or two birds were taken out of the public program and were available for the measurements per day. Not all birds that are shown in the public shows could also be used for the test. The eagle, for instance, might have destroyed the measurement equipment in an attempt to explore it.

Table 1 Birds used for the test

Species	Genus Mass, g	Wingspan, cm (approx.)
Common Kestrel (Falco tinnunculus)	198	59
Harris Hawk (Parabuteo unicinctus)	660	95
Saker Falcon (Falco cherrug)	940	100
Barn Owl (Tyto alba)	298	84
Eurasian Eagle Owl (Bubo bubo), male	1630	120
Eurasian Eagle Owl (Bubo bubo), female	2420	133

For the experiments, the birds were mostly flying from the hand of one falconer to a second falconer, who lured the bird with food. One of the Eagle Owls flew from one perch to another and the Saker Falcon was flying in circles diving for a bait fixed on a flexible pole and operated by one falconer. The advantage of the respective methods was that the birds were already trained to do the exact same procedure for the public shows of the falconry, and hence no additional training of the birds was necessary. The falconers were instructed to try to influence the flight trajectory of the birds by changing their distance and the position and posture of their hand in a way that the bird was flying in gliding flight

above the microphone array (without flapping of the wings). Each flyover ended with the bird decelerating its flight by stalling its wings and moving steeply upward to land on the hand of the falconer. This flight phase was excluded from the analysis. Figure 4 shows a photograph of a flyover measurement on a Barn Owl, which is just flying over the camouflaged microphone array toward one of the falconers.

Circumstances that noticeably complicated the measurements and the post-processing of the data were the background noises, caused either by rustling leaves on nearby trees, ambient sounds from distant sources, or the other birds of the falconry, which were occasionally shrieking.

Text B: Measurement Setup

The setup for the acoustic measurements had to meet a number of requirements. First, since it had to be used outdoors on a grassland area, its construction had to be sufficiently robust and insensitive to moisture. Second, the short time frame between the two public shows of the falconry required a setup that could be assembled and disassembled very fast, with very little adjustments required. Finally, in order to not distract the bird from its daily routine, it was necessary to camouflage parts of the equipment using green-colored cloths made of lightweight fabric that was highly permeable to air and to sound.

The low gliding-flight noise of owls required an acoustic measurement setup that is very sensitive and allows for the efficient suppression of background noise to provide a signal-to-noise ratio that is as high as possible. Additionally, it should provide a sufficient spatial resolution to localize the sound sources connected with the flying birds. The acoustic measurements were conducted using a 92-channel horizontal microphone array mounted on the ground. The array consisted of a planar 0:5 0:5 m center array that holds 64 flush-mounted $\frac{1}{4}$ in. electret microphone capsules and four linear extensions, each holding additional seven $\frac{1}{4}$ in. microphones with logarithmically scaled spacing. The four extensions were mounted to the sides of the center array, increasing the aperture of the complete array to 3.5 m (see Sec. II.D for further details). The microphones were connected to a computer-controlled front end and were sampled using a frequency of 61,440 Hz and a respective alias-free bandwidth of 29,800 Hz. The resulting data were recorded and processed at a later time.

Another aspect of the flyover measurement setup that had to be considered carefully was the measurement technique applied to capture the flight path and the speed of the bird. Although it is also necessary to know the trajectory of the object under test in vehicle drive-by or airplane flyover measurements using an array, the techniques implemented (see, e.g., Guérin et al. [19]) in such cases could not readily be applied here. For example, it is not possible to use Global Positioning System, light barriers, laser distance meters, or any sort of markers to track the flying birds. Application of such devices would possibly harm the animals, could cause distress, and would violate the Animal Welfare Act. In addition to that, the method had to allow deviations from the desired flight path above the array up to a certain degree, which is difficult when using light barriers. Thus, two charge-coupled-device (CCD) video cameras (The Imaging Source, type DMK 21BG04.H, Gigabit Ethernet CCD monochrome camera, 640 480 pixels) were used to capture the flight path. The camera signals were transmitted via Gigabit Ethernet to the same computer that was recording the microphone signals and recorded synchronously with these signals. The frame rate was set to 30 frames/second, thus resulting in 2048 audio samples per video frame.

The cameras were positioned at a height of 1 m above the array center, with the camera axes perpendicular to each other and parallel to the ground, meeting at a point 1 m above the array center. The distance of the cameras from this point was 10 m, and the distance between the cameras was 14.14 m. Figure 5 shows a scheme of the measurement setup, including the microphone array, consisting of a square center array and four linear extensions, the two CCD cameras, and a possible bird flight path.
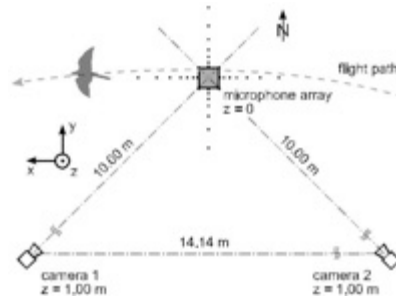
Fig. 5 Schematic top view of the measurement setup used for the bird flyover measurements.

The general procedure of the flyover measurements was as follows: When the bird started its flight, an observer triggered the synchronous recording of both the microphone array and the camera signals. When the bird had passed the microphone array, the observer triggered the end of the recordings. Any necessary labeling of the measured data was done completely during the post-processing of the data. Therefore, it was also possible to capture more than one flight during one active measurement.

Measurements were only performed under dry weather conditions (no rain or fog) and with wind speeds below 3 m=s. To monitor this, a portable weather station (type PCE-FWS 20) was used that recorded the wind speed with an relative accuracy of 10% and the temperature with 0.1 C accuracy. The recorded wind speed was also used together with the wind direction to correct the bird speed over ground to airspeed during the subsequent analysis. The temperature was used to estimate the correct speed of sound to be used in microphone-array data processing.

Lesson 4 Continued – Language toolbox

The box on the next page is a place for you to note down useful language structures or patterns that you have "borrowed" from articles and other texts related to your project. You can use these to help you write your own article.

You have already taken some from the "Owl" article. You should continue to add to your collection whenever you can (some more examples, taken from another article, have been added).

Language toolbox

The paper/article is organised as follows…

It is found that…

Since _____, it is essential to _____

Tips for presenting data

Source: Notre Dame University: https://www3.nd.edu/~pkamat/pdf/graphs.pdf

1. **Figure Captions**

How to phrase good figure captions?
- Describe "(Vertical axis quantity) vs. (Horizontal axis quantity)"
- Include all important experimental details
- Identify multiple curves or traces
- Match the graphic

The examples below illustrate some of these points about figure captions. Some are good examples, others show problematic figures (if there is a problem, it is indicated).

Describe what is graphed

"(Vertical axis quantity) vs. (horizontal axis quantity) for (experiment)"
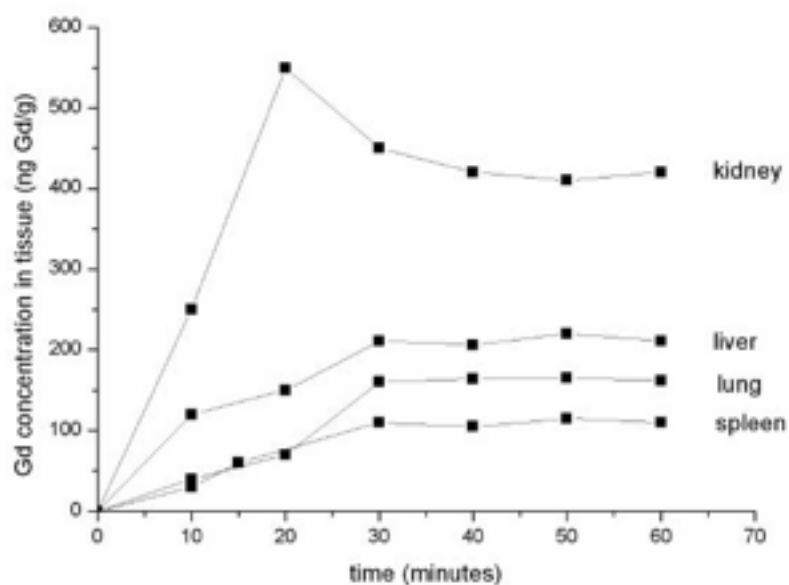
Figure 4. Biodistribution of Gd in kidney, liver, lung, and spleen in mice at different time after administration of Gd@C82(OH)22±2 nanoparticles.

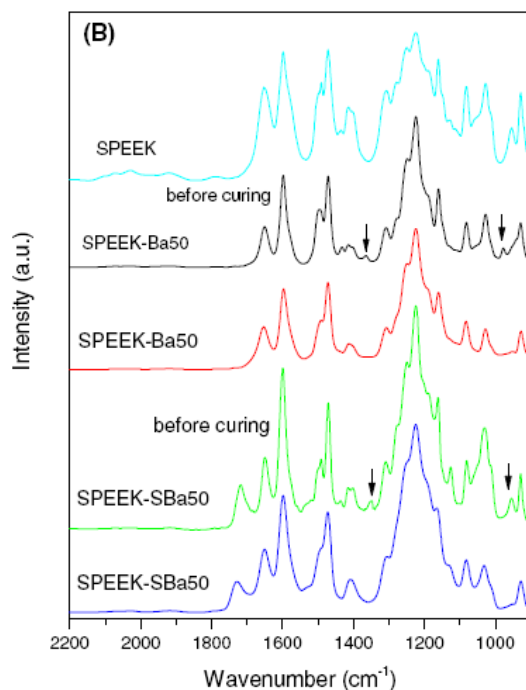## Include important experimental details in the caption
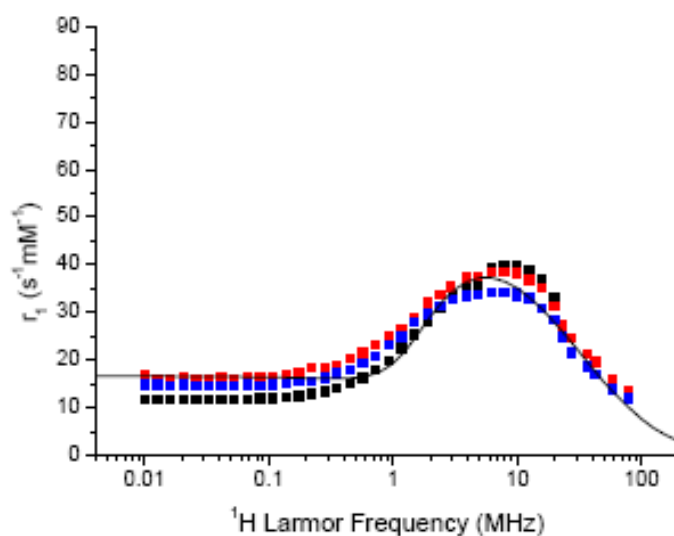
Figure 2. NMRD profiles for the Group I samples A (■), B (■) and C (■). The solid line is a simulation for a SPM dispersion with D_{core} = 12 nm, ΔE_{anis} = 1 GHz, M_s = 49 emu.g^{-1}. All measurements were carried out at 25°C ± 1°C, with a measuring frequency of 9.25 MHz, on a Stelar FFC2000.

Identify multiple curves or traces

Problem: It's not clear here which is crosslinked SPEEK and which is uncrosslinked SPEEK

Figure 2. The FTIR spectrum of (A) Ba, ABa and SBa (B) uncrosslinked and crosslinked SPEEK with Ba and SBa membranes, respectively.

2. Be concise

Example 1

Problem: the information is not at all clear. One solution is to expand the y-axis, but this might distort the curves too much. Another solution is to use colour.
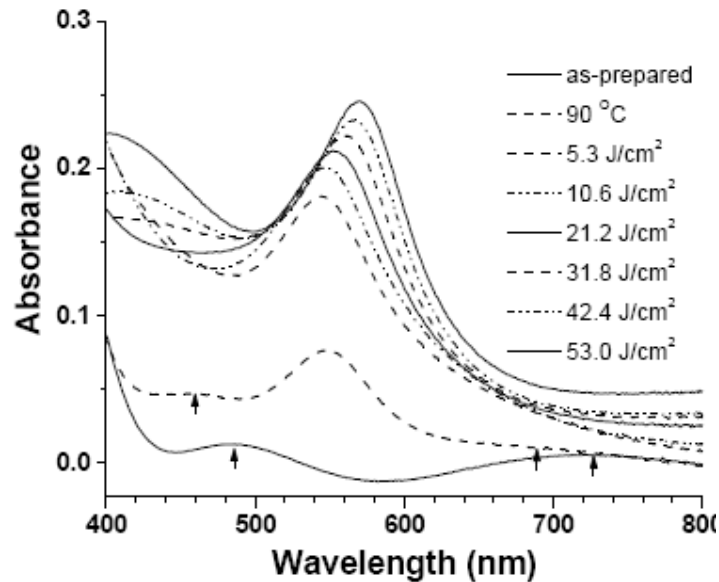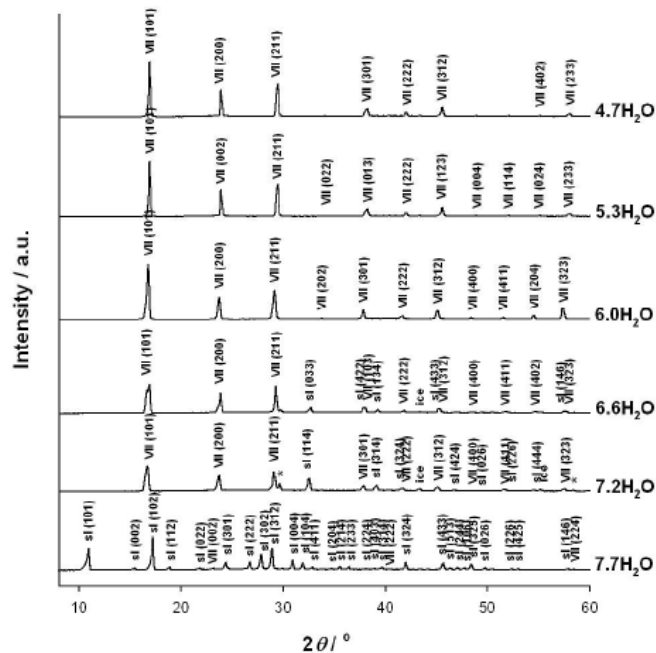

Figure 3 Optical absorption spectral evolutions of in-situ generated Au nan inside the hybrid (SiO₂-TiO₂–PEO) film matrix with respect to the thermal treatment energies.

Example 2

Problem: there is too much information pushed into a small space. Maybe the speaker/writer is clear about what this is saying, but the audience will not be.

Extended advice on writing an abstract for a scientific paper (edited)

Source:http://www.easterbrook.ca/steve/2010/01/how-to-write-a-scientific-abstract-in-six-easy-steps

The key trick is to plan your argument in six sentences, and then use these to structure the entire thesis/paper/essay. The six sentences are:

1. **Introduction. In one sentence, what's the topic?** Phrase it in a way that your reader will understand. If you're writing a PhD thesis, your readers are the examiners – assume they are familiar with the general field of research, so you need to tell them specifically what topic your thesis addresses. Same advice works for scientific papers – the readers are the peer reviewers, and eventually others in your field interested in your research, so again they know the background work, but want to know specifically what topic your paper covers.

2. **State the problem you tackle**. What's the key research question? Again, in one sentence. (Note: For a more general essay, I'd adjust this slightly to state the central question that you want to address) Remember, your first sentence introduced the overall topic, so now you can build on that, and focus on one key question within that topic. If you can't summarize your thesis/paper/essay in one key question, then you don't yet understand what you're trying to write about. Keep working at this step until you have a single, concise (and understandable) question.

3. **Summarize (in one sentence) why nobody else has adequately answered the research question yet**. For a PhD thesis, you'll have an entire chapter, covering what's been done previously in the literature. Here you have to boil that down to one sentence. But remember, the trick is *not* to try and cover all the various ways in which people have tried and failed; the trick is to explain that there's this one particular approach that nobody else tried yet (hint: it's the thing that your research does). But here you're phrasing it in such a way that it's clear it's a gap in the literature. So use a phrase such as "previous work has failed to address…". (if you're writing a more general essay, you still need to summarize the source material you're drawing on, so you can pull the same trick – explain in a few words what the general message in the source material is, but expressed in terms of what's missing)

4. **Explain, in one sentence, how you tackled the research question.** What's your big new idea? (Again for a more general essay, you might want to adapt this slightly: what's the new perspective you have adopted? or: What's your overall view on the question you introduced in step 2?)

5. **In one sentence, how did you go about doing the research that follows from your big idea**. Did you run experiments? Build a piece of software? Carry out case studies? This is likely to be the longest sentence, especially if it's a PhD thesis – after all you're probably covering several years worth of research. But don't overdo it – we're still looking for a sentence that you could read aloud without having to stop for breath. Remember, the word 'abstract' means a summary of the main ideas with most of the detail left out. So feel free to omit detail! (For those of you who got this far and are still insisting on writing an essay rather than signing up for a PhD, this sentence is really an elaboration of sentence 4 – explore the consequences of your new perspective).

6. **As a single sentence, what's the key impact of your research?** Here we're not looking for the outcome of an experiment. We're looking for a summary of the implications. What's it all mean? Why should other people care? What can they do with your research? (Essay folks: all the same questions apply: what conclusions did you draw, and why would anyone care about them?)

APPENDIX B: Extra Material

In this Appendix, you will find material on the following subjects:

- <u>Presentations</u>
  Advice on how to create an effective presentation and avoid problematic features.

- <u>Using other people's words</u>
  Guidance on summarising and paraphrasing

Presentations

The following is an extra activity on presentations, dealing more with the practical side of Power Point presentations.

It can be done in normal class time with your teacher, or you can do it independently.

Power Point

Watch the video on LMS entitled "Thinking about Power Point". It focuses mostly on what <u>not</u> to do when you create and use a Power Point.

1. Before watching – what points do you think the speaker will make?

   ➢ Watch the video. In the table below, note down at least three points the speaker makes about Power Point presentations

   Choose points which are either **interesting** or are things which **you do yourself**.

Point made by speaker	Additional information he gives on each point
-	
-	
-	
-	
-	

➢ Compare what you've noted down with a classmate near you. Which points do you most agree with? Are there any points you think are wrong or not so important?

Presentations: dos and don'ts

2. Now you've thought a little about Power Points, consider presentations in general.

➢ With a classmate or two, note down any dos and donts relating to presentations (including the Power Point) that you think are important.

Do…	Don't…

That was a quick exercise to get you thinking again about presentations. There are more detailed lists of what you should/should not do in a presentation on LMS.

Using other people's words/ideas

SUMMARISING

The large amount of information you will come into contact with during your research means that you are unlikely to reproduce texts or videos (or sections of them) in full, word-for-word. As well as the dangers of plagiarism (on which more will be seen in the section on paraphrasing), you simply do not have the room, especially not on a poster. The ability to summarise is therefore essential.

Summarising is intimately linked with note-taking, and some of the advice inevitably overlaps.

Tips for summarising a text:

- Read the original text thoroughly to make sure you understand its overall meaning.
- Be aware that sometimes you might have to 'read between the lines' to pick up 'hidden' information.
- Use a dictionary or ask someone who knows to help you find the meaning of any unfamiliar words.
- Underline or highlight the main points of the text, ignoring any unnecessary facts, descriptions or opinions. Make a note of the most important details - you could even draw a diagram or use pictures if this helps.
- Link together the key points using sentences or paragraphs, as appropriate. If images provide additional meaning then these can also be included in your summary.
- Use headings or sub-headings if the text you're shortening is long.
- Read your draft to make sure you haven't lost the overall point of the original information.
- Make amendments to your draft, as necessary.

Remember:

- A written summary should be a brief, 'easy to read' version of a longer piece of writing.
- A summary must contain the main points of the original text and should be written in your own words. Don't just copy out chunks of the original version.
- Write your summary using correct grammar, punctuation and sentences.
- A summary does not need to contain information, descriptions or opinions that do not support the general meaning of the text.

Example text

Imagine you had to summarise the information in the text below, which is about rare US one-cent coins. Three example responses are given after the text.

A penny for your thoughts? If it's a 1943 copper penny, it could be worth as much as fifty thousand dollars. In 1943, most pennies were made out of steel since copper was needed for World War II, so the 1943 copper penny is ultra-rare. Another rarity is the 1955 double die penny. These pennies were mistakenly double stamped, so they have overlapping dates and letters. If it's uncirculated, it'd easily fetch $25,000 at an auction. Now that's a pretty penny.

Weak response 1

This text is about pennies.

- This response is too short.
- It does not include key ideas.

Weak response 2

The 1943 copper penny is worth a lot of money. Copper was hard to get during the war so there aren't many of them. The 1955 double die penny is worth a lot too. These pennies were stamped twice on accident.

- Too much unnecessary information.
- The main idea is not clear.

Strong response

This text is about two very rare and valuable pennies: the 1943 copper penny and the 1955 double die penny.

- Includes key information.
- Doesn't include unnecessary information
- Is a complete sentence.

PARAPHRASING

https://owl.english.purdue.edu/owl/resource/563/02

The ability to paraphrase is going to be useful to you during your project, as you will need to present and use the ideas of others while at the same time avoiding plagiarism.

Paraphrasing means to rewrite an author's ideas in your own words. This means that you still have to cite the original text. Often you are expressing the ideas from a text in more detail than you would in summary – certain parts of the detail are important (unlike in a summary), but you are expressing that detail in your own words. You may in fact only need or want to paraphrase one or two sentences. In effect, paraphrasing enables you to explore and interrogate individual ideas at a deeper level.

<u>Tips for paraphrasing</u>

- Reread the original passage until you understand its full meaning.
- Set the original aside, and write your paraphrase on a note card.
- Jot down a few words below your paraphrase to remind you later how you envision using this material. At the top of the note card, write a key word or phrase to indicate the subject of your paraphrase.
- Check your rendition with the original to make sure that your version accurately expresses all the essential information in a new form.
- Use quotation marks to identify any unique term or phraseology you have borrowed exactly from the source.
- Record the source (including the page) on your note card so that you can credit it easily if you decide to incorporate the material into your paper.

<u>Examples for comparison</u>

The original passage:

Students frequently overuse direct quotation in taking notes, and as a result they overuse quotations in the final [research] paper. Probably only about 10% of your final manuscript should appear as directly quoted matter. Therefore, you should strive to limit the amount of exact transcribing of source materials while taking notes. Lester, James D. *Writing Research Papers*. 2nd ed., 1976, pp. 46-47.

A legitimate paraphrase
In research papers students often quote excessively, failing to keep quoted material down to a desirable level. Since the problem usually originates during note taking, it is essential to minimize the material recorded verbatim (Lester 46-47).

An acceptable summary
Students should take just a few notes in direct quotation from sources to help minimize the amount of quoted material in a research paper (Lester 46-47).

A plagiarized version
Students often use too many direct quotations when they take notes, resulting in too many of them in the final research paper. In fact, probably only about 10% of the final copy should consist of directly quoted material. So it is important to limit the amount of source material copied while taking notes.

APPENDIX C: peer evaluation sheet (presentations)

For each of the practice presentations that you see, use the criteria below to give your classmates useful feedback.

	😀	😐	😧	Notes, comments etc.
Clarity *Is the presentation easy to follow?* *Does the presenter speak clearly?* *Does the speaker explain ideas/concepts when necessary?*				
Structure *Is the structure clear?* *Is it clearly signalled?* *Is the structure effective?*				
Connections *Does the speaker connect with the audience?* *Do they connect with their visual aids?*				
Language *Does the speaker know key vocabulary?* *Does the speaker use appropriate grammar?*				
Professionalism *Has the speaker clearly prepared well?* *Does the speaker use notes?* *Does the speaker respect the time?*				

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