

Technical Writing and Speaking in English

Class 5: Organizing the Content for the Audience.¹

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¹This course is based on the book The Craft of Scientific Writing, Michael Alley.

Objectives

- Understand the general structure of a scientific document (papers, reports, etc.)
- Good practices on how to write in each of the structure components

Overall scientific document structure

- Examples of scientific documents
 - Research papers
 - Research proposals
 - Reports
 - Thesis
- General Structure
 - Title
 - Introduction
 - Middle
 - Conclusion

- The single most important phrase in a document

Title

- The single most important phrase in a document
- Objectives of a title:
 - Identifies what the document contains
 - Engages people who want or need to read your work
- A title does not:
 - Encite as many people as possible to read your work

Title: a two-items recipe

- A strong title orients readers by:
 - 1 Identifying the field of work of the document
 - 2 Separating the document from all other documents in that field

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Effects of Humidity on the Growth of Avalanches

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This is better! Where are the (1) and (2)? ☺

Effects of Humidity on the Growth of Electron Avalanches in Electrical Gas Discharges

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"I think I got the (1) right, but I still failed. Why?" ☹

Studies on the Electrodeposition of Lead on Copper

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Studies on the Electrodeposition of Lead on Copper

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Effects of Rhodamine-B on the Electrodeposition of Lead on Copper

Can a title be too long?

- Yes. You have to limit the number of details

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Do you feel overwhelmed by reading this title? Where are (1) and (2)?☹

Effects of Rhodamine-B and Saccharin on the Electric Double Layer During Nickel Electrodeposition on Platinum Studied by AC-Cyclic Voltammetry

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Effects of Rhodamine-B and Saccharin on the Electric Double Layer During Nickel Electrodeposition on Platinum Studied by AC-Cyclic Voltammetry

This is better! Where are the (1) and (2)? Notice the short words giving relationships between the terms!☺

Using AC-Cyclic Voltammetry to Study How Organic Agents Affect the Electrodeposition of Nickel on Platinum

More title examples

Where are (1) and (2)? What the document is about?☺

10 MWe Solar Thermal Electric Central Receiver Barstow Power Pilot Plant Transfer
Fluid Conversion Study

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Proposal to Use a New Heat Transfer Fluid in the Solar One Power Plant

More title examples

If (1) and (2) need a large number of essential details, I can use a colon to separate them 😊

Baltica from the Late Precambrian to Mid-Paleozoic Times: The Gain and Loss of a Terrane's Identity

The introduction

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- Questions answered by the introduction:
 - What exactly is the work?
 - Why is the work important?
 - What is needed to understand the work?
 - How will the work be presented?

Introduction: What exactly is the work?

I can give more details than in the title or abstract, but the details need to be clearly linked to answering the question☺

This paper presents a **model to describe the electrical breakdown of a gas**. We call this **model** the **two-group model** because of the similarity between the problem of gas breakdown and the problem of neutron transport in nuclear reactor physics. The **two-group model** is based on electron kinetics and applies to a broad range of conditions (breakdown in pure gases, for example). The **model also** provides a continuous picture of the initial phase of breakdown above the Townsend regime, both in structure of the breakdown and in the physics of the processes

Introduction: What exactly is the work?

I must specify the scope and limitations. The limitations can be inferred by the scope, but I can explicit if I judge necessary 😊

In this paper, **we compare the life expectancies of three different groups of people**: heavy alcohol drinkers, moderate alcohol drinkers, and people who do not drink alcohol. **Not considered, however**, are the social, medical, or economic makeup of these groups – three elements that could affect life expectancies significantly more than alcohol intake.

Introduction: Why is the work important?

I'm telling that the work is important? What did I do wrong? ☹

This paper presents the effects of laser field statistics on coherent anti-Stokes Raman spectroscopy intensities. The importance of coherent anti-Stokes Raman spectroscopy in studying combustion flames is widely known.

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This paper presents the effects of laser field statistics on coherent anti-Stokes Raman spectroscopy intensities. The importance of coherent anti-Stokes Raman spectroscopy in studying combustion flames is widely known.

This is better! Now I'm **showing** that the work is important, not just telling. Note the examples (previous class!) 😊

This paper presents a design for a platinum catalytic igniter in lean hydrogen-air mixtures. This igniter has application in light-water nuclear reactors. For example, one danger at such a reactor is a loss-of-coolant accident, in which large quantities of hydrogen gas can be produced when hot water and steam react with zirconium fuel-rod cladding and steel. In a serious accident, the evolution of hydrogen may be so rapid that it produces an explosive hydrogen-air mixture in the reactor containment building. This mixture could breach the containment walls, allowing radiation to escape. To eliminate this danger, one proposed method is intentionally to ignite the hydrogen-air mixture at concentrations below those for which any serious damage might result.

Introduction: What is needed to understand the work?

- The key question: How much background information the introduction should provide?
 - We go back to class 1: understanding your audience
 - The less your audience knows, the harder it is to write the background section
 - Teacher's tip: do not overestimate the audience's knowledge
- This can be separated from the introduction. In a section called, for instance, "Preliminary Concepts". This section can go right after the introduction.
- The size varies in function of how much the readers are expected to know and the type of document

Introduction: How will the work be presented?

We map re remaining sections of the document 😊

This report discusses the effects of smoke on the earth's climate following a large-scale nuclear war. In the first section of the report, we present a war scenario in which 10,000 megatons of high-yield weapons detonate. The second section of the report then introduces assumptions for the amount of smoke produced from resulting fires, the chemical characteristics of the smoke, and the altitudes at which the smoke initially enters the atmosphere. Presented in the third section are computer models that show how the smoke distributes

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 - We finish by positioning our work among the gaps shown

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- In a Computer Science paper, what is the “Middle”?
- What is the “Middle”?
 - Methods for testing research questions, methods to construct an algorithm/framework, etc.
 - Results of the test, results of experiments with the algorithm/framework
 - The meaning of the results (interpretation)
- These are often subsections of the “middle”

The Middle: Choose appropriate strategies

- How to organize the presentation of your work?
 - **Chronological** organization: for timeline processes or cyclic processes
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- How to organize the presentation of your work?
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 - Things that have “stages” or “phases”
 - **Spatial** organization: for “objects”
 - Computer Science example: Software
 - Other organizations exist: Classification, division, etc.

Subsections

I'm being too concise 😊

1 - Slurry

1.1 – Combustion

1.2 – Pollution

2 - Dry

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 - 1.2 - Pollution
- 2 - Dry
 - 2.1 - Combustion
 - 2.2 - Pollution

Now it describes the content better 😊

- 1 - Coal-Water Slurry
 - 1.1 - Combustion Efficiency
 - 1.2 - Combustion Emissions
- 2 - Dry Pulverized Coal
 - 2.1 - Combustion Efficiency
 - 2.2 - Combustion Emissions

Subsections

Weak headings ☹️

- 1 - Introduction
- 2 - Debris Recovered
- 3 - Cataloguing
- 4 - Interpretation
- 5 - Results
 - 5.1 - Placement
 - 5.2 - Bomb Makeup
- 6 - Work to be Done
- 7 - Interpretation

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Strong Headings 😊

- 1 - Introduction
- 2 - Completed Work
 - 2.1 - Recovering Debris
 - 2.2 - Cataloguing Debris
 - 2.3 - Interpreting the Debris
- 3 - Preliminary Results of Work
 - 3.1 - Placement of Bomb
 - 3.2 - Construction of Bomb
- 4 - Future Work

The Middle: Depth

- General rule of thumb: paragraphs with 4 to 6 lines
- Each paragraph presents digestible portions of the information

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The Environmental Protection Agency has tightened emission standards by 60 percent.

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Depth 1: good, but I may need to increase the depth ☺

The Environmental Protection Agency has tightened emission standards by 60 percent.

Depth 2: It's deeper, but what did I do wrong? ☹

The Environmental Protection Agency has tightened emission standards from 0.25 g/hp-h to 0.1 g/hp-h. The particulates include hydrocarbons, carbon monoxide, and nitrogen oxides.

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The Environmental Protection Agency has tightened emission standards by 60 percent.

Depth 2: It's deeper, but what did I do wrong? ☹

The Environmental Protection Agency has tightened emission standards from 0.25 g/hp-h to 0.1 g/hp-h. The particulates include hydrocarbons, carbon monoxide, and nitrogen oxides.

Depth 3: once you raise questions at a certain depth, you are obliged to answer those questions.



The Environmental Protection Agency has tightened emission standards by 60 percent: from 0.25 g/hp-h (grams of particulate/horsepower-hour) to 0.1 g/hp-h. The particulates include hydrocarbons, carbon monoxide, and nitrogen oxides. All three particulates are considered pollutants.

Conclusion

- The conclusion summarizes the middle and provides a future perspective
- General narrative (this can change from field to field):
 - You quickly remind the reader about the scope and importance of the work
 - You summarise your work and present a short analysis of the results as a whole
 - Here, we must not reveal new results/analysis. These must arise from the findings presented in the middle
 - You present future perspectives of the work
 - Recommendations
 - Directions that your work will head

“Another way to look at a conclusion is to see it as bringing together the loose ends of your work. Although you often cannot tie everything into a neat package, you can convey a sense of closure for your audience. Put another way, you do not have to reach a peak in your conclusion, but you should reach a plateau.”