

Technical Writing and Speaking in English

Class 6: writing research methodology

Danilo Carastan-Santos¹

¹Université Grenoble Alpes, Grenoble INP, Inria, LIG, France
email:danilo.carastan-dos-santos@inria.fr

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The methods section

- The method section is useful to readers who want to know how the methodology you used to achieve the results presented in the results section
- It is also useful for people who are interested in replicating or extending your study
- Common elements found in the method section
 - Procedures used for testing research questions
 - Description for constructing an algorithm/model/proof
- Other related terminology: experimental, experimental procedures

Information elements in the method section

This order is not mandatory, but it provides you with a good model. Not all elements must be present, but **Procedures** and **Materials** are almost always included explicitly or implicitly.

- 1 Overview of the Experiment
- 2 Population/Sample
- 3 Location
- 4 Restrictions/Limiting Conditions
- 5 Sampling Technique
- 6 **Procedures** (e.g., algorithm/workflow/framework description)
- 7 **Materials** (e.g., used hardware)
- 8 Variables
- 9 Statistical Treatment

Procedures: Choose appropriate strategies

- How to organize the presentation of your work?
 - **Chronological** organization: for timeline processes or cyclic processes
 - Things that have “stages” or “phases”

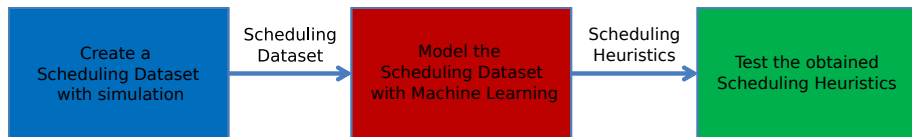
Procedures: Choose appropriate strategies

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

Methodology organization

An example

Real paper example: Obtaining scheduling heuristics with simulation and Machine Learning¹



¹Method source: **Obtaining dynamic scheduling policies with simulation and machine learning**. Danilo Carastan-Santos, and Raphael Y. Camargo. In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis, SC, Denver, USA 2017. <https://inria.hal.science/hal-01618940/file/paper-hal.pdf>

Methodology organization

Descriptive headings (i.e., L^AT_EX subsections)

It's not descriptive

3 - Method

3.1 – Phase 1

3.2 – Phase 2

3.3 – Phase 3

Methodology organization

Descriptive headings (i.e., L^AT_EX subsections)

It's not descriptive

- 3 - Method
- 3.1 – Phase 1
- 3.2 – Phase 2
- 3.3 – Phase 3

Now it describes the content better

- 3 - Obtaining scheduling heuristics with simulation and Machine Learning
 - 3.1 – Simulation Scheme
 - 3.2 – Machine Learning Scheme
 - 3.3 – Testing Scheme

An even better example

- 3 - Obtaining scheduling heuristics with simulation and Machine Learning
 - 3.1 – Creating a Scheduling Datasets
 - 3.2 – Modeling the Scheduling Dataset as Scheduling Heuristics
 - 3.3 – Testing the created Scheduling Heuristics

Overview of the method

Example

A paragraph introducing the content of the methods section

3 - Obtaining scheduling heuristics with simulation and Machine Learning

We designed our method into three schemes. The first scheme uses simulation to observe the scheduling patterns under distinct conditions and creates a scheduling dataset. The second scheme feeds this scheduling dataset into machine learning algorithms to create task sorting heuristics that model the observed patterns. Finally, the third scheme tests the created heuristics as task schedulers, which choose the next task to execute from a waiting queue. The sections below describe each of these schemes in detail.

3.1 – Creating a Scheduling Datasets

Exercise 1

Open document `Exercises/6-writing-methodology.pdf` and follow the instructions of exercise 5.2

Exercise 1 answers

- 1 Overview
- 2 Location
- 3 Limiting conditions
- 4 Samples description
- 5 Sampling technique/procedure
- 6 Procedure/Materials
- 7 Procedure/Materials
- 8 Procedure/Materials
- 9 Variables/sampling technique
- 10 Statistical analysis

Exercise 2

Open document `Exercises/6-writing-methodology.pdf` and follow the instructions of exercise 5.3

Exercise 2 answers

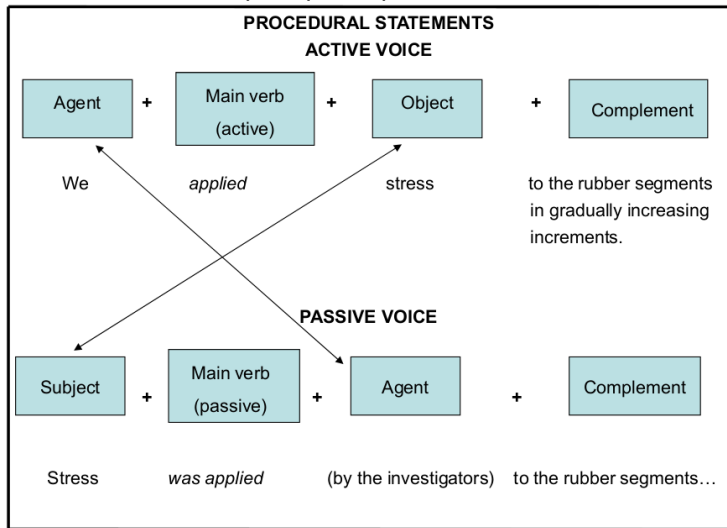
- ① E : Sample overview, location
- ② C : Overview & Design, materials
- ③ A : Procedure/restrictions
- ④ D : Procedure & variables
- ⑤ F : Procedure/materials
- ⑥ B : Variables

Choosing the Correct Verb Tense in Procedural Descriptions

- The procedures you used in carrying out your study should usually be described in the **simple past tense**.
- Sentences included under method that are **not written in the past tense** usually do **not refer to the procedures used in the study** being reported. Instead, they **may describe standard procedures that are commonly used by others**.
- The **passive voice** and short forms of some passive constructions are commonly used in this section of the research report.

Active or Passive voice

Notice that the formation of the passive voice requires the be auxiliary + the past participle of a verb.



Active or Passive voice

- The **passive voice** is conventionally used to describe procedure in order to **depersonalize** the information, **placing the emphasis on the procedure and how it was done**
 - Example A: For reasons related to personal safety, the test facility was constructed (by us) in a remote area 4 miles from the main road.
 - Example B: Tests were conducted (by me) with four different types of reactors.
- Using passive voice may be a useful technique to place **old information near the beginning** of the sentence and **new information at the end**
- Example C: The four reactors we tested in the work reported here all contained a platinum catalyst (Active)
 - Follow-up sentence: Each **reactor-catalyst configuration** will be described separately (Passive)

Allternating the active and passive voices may increase the readability of a text. Excessive use of passive voice may reduce its readability.

Exercise 3

Open document `Exercises/6-writing-methodology.pdf` and follow the instructions of exercise 5.9

Exercise 3 answers

- Sentence 1: was
- Sentence 3: was, estimated/calculated
- Sentence 4: were, thought/used/employed
- Sentence 5: used
- Sentence 6: used/consumed, excluded
- Sentence 7: excluded
- Sentence 8: were
- Sentence 9: used/employed, be
- Sentence 10: were, associated

Checklist for the Method section

Describing experimental procedure

- Information
 - Include all information necessary for someone to replicate your procedure
 - Describe the procedure chronologically
- Language
 - Use the past tense to describe procedure
 - Use the passive voice to depersonalize procedural descriptions and to keep old information at the beginning of sentences
 - Mix passive voice and active voice to increase the text readability

Open document `Exercises/6-writing-methodology-extra.pdf` and follow the instructions.