

Section 3. Methodology as an IMRD component

Unit 1. Methodology: Structural analysis

Outline

- Basic components of the methodology section of a research paper
- Structural/functional analysis of a sample methodology section

Methodology

Methods

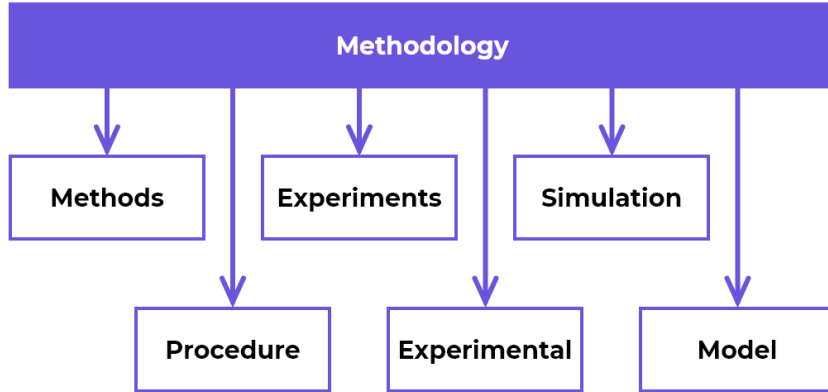
Experiments

Simulation

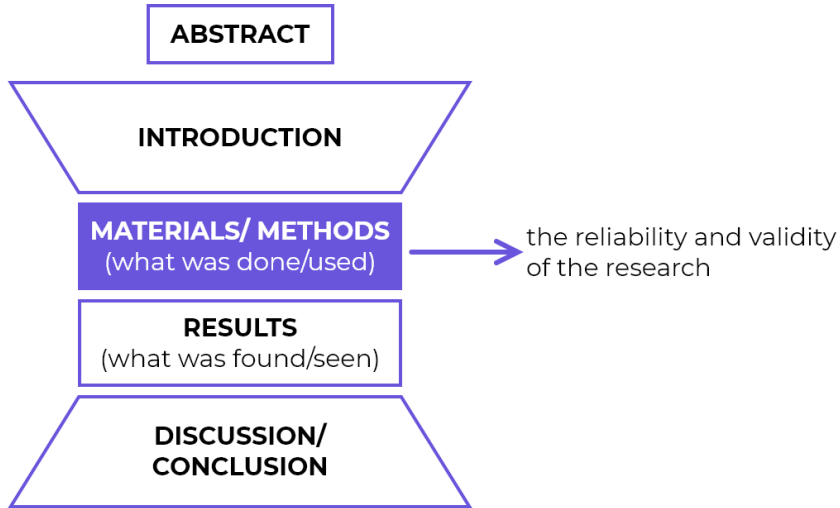
Procedure

Experimental

Model



Wineglass model for IMRAD structure



Grammar and vocabulary clues

Ask yourselves:

What is the tense of the main verb?

What is that tense normally used for?

Is it the same tense as in the previous sentence?

If not, why has the writer changed the tense?

What words has the writer chosen to use?

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 1: a general overview of the subsection

Why does Methodology need introductory material?

- Easy transition into that section
- To provide a broad overview of what was done and used
- To arrange the information in an effective order

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 2: background information and justification

Why does the writer need to justify for what they did?

- Clarity for reader
- Avoiding doubt
- Understanding methodology
- Evaluation of work
- Persuasive element
- Enhancing trust

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 2: background information and justification

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. 2. The sites were selected from the Norilsk area, which is located in the north of Russia and **has been frequently** used to distinguish the composition of different alloys.^{2,3,4} 3. A total of 18 samples was collected and then analysed for their physical and chemical properties. 4. Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. 5. The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ 6. Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ 7. This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. 8. The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). 9. All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 2: background information and justification

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys.
- 2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties.
- 4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination.
- 5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵
- 6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily.
- 8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

**Sentence 3: an overview
of the procedure/method**

Why is there an overview of the procedure itself?

- reader-friendly, writer-responsible technique
- a smooth move from a «general to specific»
- a crystal-clear understanding

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

**Sentence 3: an overview
of the procedure/method**

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3. A total of** 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

**Sentence 3: an overview
of the procedure/method**

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 4: what was done/used, shows that care was taken

How much details should be provided?

- Slightly too much information is preferable
- Each specification and detail must be included
- Give a chance to duplicate the work and produce comparable results

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 4: what was done/used, shows that care was taken

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. 2. The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} 3. A total of 18 samples was collected and then analysed for their physical and chemical properties. 4. Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. 5. **The filled bottles** were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ 6. Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ 7. This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. 8. The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). 9. All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 4: what was done/used, shows that care was taken

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. 2. The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} 3. A total of 18 samples was collected and then analysed for their physical and chemical properties. 4. Samples 1–9 were collected in **thoroughly-rinsed** 25 ml brown glass bottles which **were filled to the top** and then **sealed tightly to prevent contamination**. 5. The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ 6. Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ 7. This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. 8. The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). 9. All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 4: what was done/used, shows that care was taken

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 5: detailed description of what was done, emphasizing care through language choice

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. 2. The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} 3. A total of 18 samples was collected and then analysed for their physical and chemical properties. 4. Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. 5. The filled bottles were shipped **directly** to two **separate** laboratories at MISIS University, where they were analysed using standard methods **suitably** miniaturised to handle small quantities of alloy material.⁵ 6. Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ 7. This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. 8. The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). 9. All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Reliability

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys.
- 2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties.
- 4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination.
- 5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵
- 6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily.
- 8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 6: the description of what was done by referring to the existing methods in the literature

Why should the writer refer to other research?

- Acknowledging expertise
- Enhancing method understanding
- Providing reader inclusivity

Present Simple — the method's context

Past Simple — the writer's actions

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys.
- 2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties.
- 4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination.
- 5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵
- 6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily.
- 8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 7: detailed elaboration on the effective method choice

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys.
- 2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties.
- 4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination.
- 5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵
- 6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily.
- 8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 8: more details of the method

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
- 3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
- 7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
- 9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

Sentence 9: a possible difficulty in the methodology

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

- 1.** The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys. **2.** The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4} **3.** A total of 18 samples was collected and then analysed for their physical and chemical properties. **4.** Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination. **5.** The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵ **6.** Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶ **7.** This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily. **8.** The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD). **9.** All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, variation among samples was negligible.

**Methodological issues
did not affect the results!**

Problems with methodology: good or bad?

- Methodology problems don't imply bad work
- Ignoring flaws suggests unawareness, harming credibility
- Concealing issues raises doubts, weakening trust in results

What is the purpose of each sentence?

Changes in the chemistry of alloys in the sites of Norilsk

Methodology

1. The current investigation involved sampling and analysing six sites to measure changes in the properties of new alloys.
2. The sites were selected from the Norilsk area, which is located in the north of Russia and has been frequently used to distinguish the composition of different alloys.^{2,3,4}
3. A total of 18 samples was collected and then analysed for their physical and chemical properties.
4. Samples 1–9 were collected in thoroughly-rinsed 25 ml brown glass bottles which were filled to the top and then sealed tightly to prevent contamination.
5. The filled bottles were shipped directly to two separate laboratories at MISIS University, where they were analysed using standard methods suitably miniaturised to handle small quantities of alloy material.⁵
6. Samples 10–18 were prepared in our laboratory using a revised version of the smelting method established by the NNN Institute in France.⁶
7. This method obtains the desired alloy through the combination of different metals; the resulting alloy can be cooled and stored easily.
8. The samples were subsequently shipped to NNN for analysis by X-ray diffraction (XRD).
9. All tubing used was stainless steel, and although two samples were at risk of oxidation as a result of brief contact with air, **variation among samples was negligible.**

The functions of the sample methodology section:

Sentence 1: a general overview of the subsection

Sentence 2: background information and justification

Sentence 3: an overview of the procedure/method

Sentence 4: what was done/used, shows that care was taken

Sentence 5: detailed description of what was done, emphasizing care through language choice

Sentence 6: the description of what was done by referring to the existing methods in the literature

Sentence 7: detailed elaboration on the effective method choice

Sentence 8: more details of the method

Sentence 9: a possible difficulty in the methodology

Methodology «Menu» to choose from

- I. Provide a general introduction and overview of the materials/methods
 - Restate the purpose of the work
 - Give the source of materials/equipment used
 - Supply essential background information
- II. Provide specific and precise details about materials and methods (i.e. quantities, temperatures, duration, sequence, conditions, locations, sizes)
 - Justify choices made
 - Indicate that appropriate care was taken
- III. Relate materials/methods to other studies
- IV. Indicate where problems occurred

Summary

