



5.6

The structure of scientific research articles

In this activity, students examine the structure of scientific research articles highlighting the differences between review papers and scientific reports.

Outcomes

Students will be able to:

- formulate criteria for evaluating written work
- carry out self-assessment of their own work
- formulate suggestions for improvements to the work.

Time required

Allow 40 minutes.

Outline of the activity

- 1 Start with the slides to explain the purposes of research papers and review articles.
- 2 Place the students in pairs or small groups. Issue your chosen paper, and display the slide titled 'Structure of a research paper', which outlines the first activities the students need to complete. This is also covered in the briefing sheet. You could issue the paper after getting students to think about the structure of a research paper.
- 3 Use the slides to look at the correct order for the different sections, and discuss the contents of the different sections.
- 4 Ask students if they spotted anything unusual in the structure of the paper they are looking at. Discuss any points that arise.
- 5 Show the students examples of different types of scientific articles, either as paper copies or using a data projector. As a group, highlight differences in structure between the types of article. Finally, draw out common features of scientific articles.
- 6 Ask the students why they think that scientific articles are generally written with similar structures.

Tips and strategies

Point out that students are not expected to understand the content of the papers. They have been selected because of their relevance to A-level specifications and more able students may be able to read them comfortably. However, the papers are beyond average A-level students - this is an exercise in reading and comprehension.

Not all papers will have each section labelled explicitly (e.g. 'Conclusion' may not be shown as a sub-heading, but concluding remarks can normally be found at the end of the discussion). Different journals have different requirements, which may account for some of the inconsistencies.

Explain that students will learn more about the different sections of research papers and reviews when they complete subsequent tasks in Skill Area 5.

You may choose to issue different papers to different pairs / groups. A follow up activity could be for one member of each pair or group to swap with another so they can compare their findings and identify differences in the structure of different papers.

When looking at the differences between review articles and research papers, it should be pointed out that review articles generally do not have 'results and discussion' or 'experimental procedures' sections. They also tend by nature to have far more extensive bibliographies.



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Slides

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Learning Skills for Post-16 Sciences

SEP
Science Enhancement Programme

Nuffield
Curriculum Centre

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Research paper vs review

- A research paper describes a new experiment, conducted by the author(s). It describes the methods, results and conclusions regarding the work and its implications in relation to the wider field.
- A review paper is a summary of work which has been published in a number of papers in a particular field of research. Many reviews draw information from papers by a number of different authors.

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Structure of a research paper

Your teacher will give you a copy of a research paper. Your tasks are to:

- 1) Place the sections listed on the right in the correct order.
- 2) Explain the purpose of each section.

Introduction

Abstract

Conclusion

Results & discussion

Bibliography

Experimental procedures

Title

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Slides

Structure of a research paper

- Title
- Abstract
- Introduction
- Results & discussion
- Conclusion
- Experimental procedures
- Bibliography

This is one typical format for research paper.

In some papers, the experimental procedures are placed after the introduction.



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What is in the different sections?

- **Introduction:** Provides background information and gives more specific objectives of the research. It should contain relevant information from other papers (without becoming a review).
- **Experimental procedures:** Often placed at the end of the paper, just before the bibliography. These outline the detailed practical procedures and analytical methods employed, with enough information for somebody else to repeat the work.



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What is in the different sections?

- **Results and discussion:** Sometimes presented as two separate sections.
 - o Results will be given, with a discussion of sources of error. Graphs and tables of data may be used where appropriate.
 - o The discussion relates scientific theory to the observed results, giving explanations and proposing ideas and theories.



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What is in the different sections?

- **Conclusions:** Sometimes tagged onto the end of the discussion. It states how well the research answers the questions originally posed by the researcher, as outlined in the introduction. The significance of the work to the wider field will be discussed. New theories and ideas regarding future research may be included.
- **Bibliography:** This is a list of all the other research articles that have been referenced in the paper.



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How does a review article differ from a research paper in structure?

A review typically:

- has no results and discussion or experimental methods.
- has the main body of the article broken into sections under sub-headings.
- has a larger bibliography since it draws on a broad base of prior research.



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