

Supporting students in the Sciences

IA3: Research investigation

Effective processes and practices: Research

Purpose

Effective implementation of a research investigation involves five processes organised around a research question, as shown below. This resource supports students in conducting research.



What are effective and efficient research skills?

Research includes locating, gathering, recording and analysing information in order to develop understanding. In the research investigation, students gather secondary evidence by researching scientifically credible sources.

Effective and efficient research is conducted by:

- planning — applying a systematic approach to gather and record evidence
- using keywords — using refined search techniques and keywords
- gathering evidence — searching interesting, accessible and credible sources
- reviewing evidence — checking that the evidence gathered is relevant and sufficient.

Key questions for effective and efficient research

Planning

- How will I document my research findings?
- What previous learning and resources can I draw on?

Using keywords

- Am I using keywords and refined search techniques?
- Have I refined my keywords to narrow down my research?

Gathering evidence

- What is a good place to start my research?
- How do I identify useful sources?

Reviewing evidence

- How can I make sure that I understand the evidence?
- Do I have sufficient, relevant evidence to address my research question?

Ideas for effective and efficient research

Planning

Do I have a systematic approach to gathering and recording evidence?

- How will I document my research findings?
 - Use a logbook to record your research and monitor your progress.
 - The logbook could be physical or electronic.
 - For each aspect of your investigation, identify the relevant descriptors from the ISMG and the characteristics you are aiming for in your response.
 - Use a scaffolded summary to collate evidence in your own words. For example, use a table with headings such as:
 - Article overview — summary of the article
 - Evidence — outline of the methodology, trends/patterns/relationships and limitations
 - Conclusions — summary of the evidence
 - Relationship to research question — highlight the parts of the research question that this evidence addresses.
 - Before using an article, try to explain it to your teacher or another student. If you cannot explain it in your own words, then do not use it.
 - If you copy a dataset, write dot points under it identifying the trends and explaining, in your own words, how this evidence helps to answer your research question.
 - Create simplified data tables from scientific articles by highlighting specific rows or columns to identify relevant evidence.
- What previous learning and resources can I draw on?
 - Use the knowledge you have gained as part of your course and apply this to the aspect of the claim you are investigating.
 - Consider QCAA samples, subject reports and past examples of your own work and other students' work to review the type of evidence that is suitable.

- Am I using keywords and refined search techniques?
 - Use keywords from the claim and relevant subject matter from the syllabus and textbooks to limit searches.
 - Conduct refined searches by using keywords, phrases and words from relevant subject matter to ensure that evidence is in scope.
 - Highlight the keywords and phrases in articles that are relevant to your research question.
- Have I refined my keywords to narrow down my research?
 - After your preliminary research, dig deeper into the aspects of the claim that are interesting to you to develop a broad research question.
 - Check that any new keywords and phrases used to develop your refined research question still align to the claim and syllabus subject matter.
 - Develop a research question that can be clearly refuted or supported, i.e. has a yes or no answer.
 - If you cannot find credible sources, then change direction and modify your research question.

- What is a good place to start my research?
 - Start with interesting sites rather than complex research articles.
 - Use textbooks to find keywords and concepts as a starting point for your research.
 - Look for interesting videos (e.g. on YouTube) and follow any links to references or open access articles.
 - Read general audience science articles (e.g. New Scientist magazine, ABC Science) about your topic, then look at the listed references and go to the original articles.
 - Use Wikipedia and educational or general interest websites as a starting point, and then look at the peer-reviewed articles and textbooks listed in their references.
 - Look for a specific real-world example linked to the claim as the context for your investigation.
 - Collect evidence before developing your rationale.
 - Use the evidence you find as a rationale for your investigation rather than pre-judging what the rationale will be.
 - Refine your research question according to the evidence you find.
 - Create a reference list as you refine your research question.
- How do I identify useful sources?
 - Look for credible sources that have data tables, graphs, images and abstracts.
 - When you find a possible source:
 - start with the title — it should contain some keywords that you are searching for
 - read the abstract — if this is useful then download the article or request a copy of it
 - look at the images or references — these may be more useful than the text of the article
 - highlight the evidence in the article — consider whether the highlighted information addresses your research question
 - write a summary of the article without looking at it — if you cannot explain the article in your own words, then do not use it
 - try reading the article out aloud — if it does not make sense to you, then find another source that does.
 - Start with one good article with clear graphs or data tables that looks at the relationship between the two variables in your research question. Then find another article to corroborate that evidence and compare the two articles. Repeat this for further articles.

- How can I make sure that I understand the evidence?
 - Answer the following questions about each source.
 - What was the purpose of the study?
 - What was the methodology?
 - What were the dependent and independent variables?
 - How was the data analysed?
 - What was the result of the study?
 - How does it link to syllabus subject matter?
 - How can the evidence be used to address the research question and evaluate the claim?
 - If you cannot answer these questions, then look for another source.
- Do I have sufficient, relevant evidence to address my research question?
 - Separate research findings into ‘evidence for arguments’ and ‘background information’. Use the background information to inform your rationale.
 - Write a dot-point summary of the evidence you have collected. Explain how it
 - relates to syllabus subject matter
 - answers your research question
 - can be used address the claim.
 - Remove any irrelevant evidence that is not aligned with the subject matter.
 - Once you have enough evidence to narrow down your research question, you should only make minor changes to it; the main concepts being investigated should remain the same.



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