

Supporting students in the Sciences

IA3: Research investigation

Effective processes and practices: Critiquing evidence

Purpose

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



What is critiquing evidence?

In the research investigation, secondary evidence related to the research question is gathered from credible scientific sources in order to evaluate a claim.

Evidence is critiqued by:

- analysing — identifying trends, patterns, relationships and limitations of the evidence
- interpreting — using the evidence to draw conclusions
- evaluating — testing the validity and reliability of the evidence to check that it is repeatable and accurate.

Key questions when critiquing evidence

Analysing

- Can I identify relevant trends, patterns and relationships in my evidence?
- What limitations can I identify in my evidence?

Interpreting

- Can I use the evidence to justify scientific arguments?
- Does my evidence support a conclusion to the research question?

Evaluating

- Have I evaluated the quality of my evidence?
- How do my findings relate to the claim?
- How could I improve or extend the investigation?

Considerations when critiquing evidence

Analysing

How do I analyse the evidence?

- Can I identify relevant trends, patterns and relationships in my evidence?
- Describe how the data was displayed and analysed.
 - Explain which data analysis methods were used and why.
 - If you cannot explain this in your own words, then the data analysis is probably too complex, so look for another dataset.
- Identify the types of trends, patterns or relationships in the data.
 - Identify which variable (i.e. independent or dependent) of your research question the evidence relates to.
 - Describe the relationships in the data, e.g. direct, inverse, exponential growth/decay.
 - Explain how you know that the trend is due to the variable in your research question.
 - If you cannot describe the trends, patterns and relationships in your own words, then look for another dataset.
- Consider constructing your own data tables and graphs that are specific and relevant to your research question.
 - Use tables to present data concisely.
 - Use graphs to clearly show relationships and trends.
 - Explain what the dataset is about. If you cannot do this in your own words, then either go back to the source for more information or find a different dataset.
- Explain how the evidence helps you answer your research question.
- What limitations can I identify in my evidence?
- Identify how many samples were used and the size of the samples.
- Identify which part of the claim your findings can answer.
- Identify which parts of the claim are not addressed.

- Can I use the evidence to justify scientific arguments?
 - Identify why the evidence is credible and how it is relevant to the research question. If you cannot explain the evidence or it is not credible, then do not use it.
 - Provide examples to justify your reasoning and only use evidence that you understand.
 - Only use the parts of the data that address the research question rather than the whole dataset.
- Does my evidence support a conclusion to the research question?
 - Interpret the evidence from each source in your own words and compare this to the conclusions made by the author. If you cannot interpret the evidence, then do not use it.
 - Draw on the skills you have learned from other assessment techniques, e.g. data test, student experiment.
 - Ensure that your conclusion directly answers the research question and identifies the key evidence and its limitations.

- Have I evaluated the quality of my evidence?
 - Determine the validity and reliability of the evidence by checking that the methodology is accurate and repeatable.
 - Explain, in your own words, how the data was obtained. This will help you to identify limitations of the evidence.
 - Describe how the methodology relates to your research question.
 - Discuss the strengths and weaknesses of your own research process.
 - Identify what was good about the evidence, e.g. it comes from credible sources; it addresses the research question.
 - Identify the limitations of the evidence, e.g. What was missing? What was not explicit? Was there corroborating evidence?
- How do my findings relate to the claim?
 - Consider how your findings can be applied to evaluate the claim, e.g. Can the claim be supported, partially supported or not supported?
 - Explain how the evidence you found gave you a new insight into the claim.
- How could I improve or extend the investigation?
 - Your research question will have changed throughout the investigation. Use these changes as a clue to possible improvements and extensions to the investigation.
 - Evaluate your research journey, as well as the quality of the research sources used.
 - Use the limitations of the evidence you identified in your analysis as a starting point — your improvements should address these.
 - If your evidence is reliable and valid, then discuss how you could extend the investigation to consider a different set of data or different conditions.
 - Your suggested improvements and extensions should address how well the evidence answers your research question and how it relates to the claim, not the sources of the datasets.
 - Consider the following questions:
 - How could you improve your answer to the research question?
 - How could you collect better evidence?
 - How would you extend the investigation to make a better link to the claim?
 - Could you research a different example? Why would it be relevant?



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