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Weighing up, citing and designing your poster

FTS-03 · Future Technologies and Sustainability

Prof. Dr. Thorsten Jungmann

GUIDING QUESTIONS

- How do you weigh up your three answers into a balanced, reflective answer?
- What makes a good scientific poster, and what belongs on yours?
- How do you cite everything on your poster that does not come from you?
- How do you present your poster in an elevator talk?



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INTENDED LEARNING OUTCOMES

- You check the answer of the artificial intelligence (AI) against the scientific sources, compare the three answers and weigh them up into a balanced, reflective answer with claim, evidence and conclusion.
- You design your poster in the fixed layout from the template and decide what belongs on it and what does not.
- You cite every element on your poster that does not come from you – statements, figures, pictures and AI output – according to the guide to Scientific Work.
- You structure your elevator talk on your question and your balanced, reflective answer.



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AGENDA

1. Three answers, one conclusion: weighing up
2. What makes a good scientific poster
3. Your poster step by step
4. Citing everything that is not your own
5. The elevator talk
6. What have you learnt today?



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REVIEW OF FTS-02

- 17 Sustainable Development Goals (SDGs) and their targets; companies and employees contribute
- 13 criteria of scientific work, from relevance to fairness
- Steps 1 to 4: question, your own answer, AI answer, scientific answer
- Phase 1: from your question to your poster and your elevator talk
- Today: step 5 and your poster

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1 Three answers, one conclusion

- Claim, evidence, conclusion
- Your own answer against all the evidence
- Your balanced, reflective answer – an example

CLAIM, EVIDENCE, CONCLUSION

- Step 5: weigh up the three answers – the result is your balanced, reflective answer
- Claims are supported by evidence; conclusions follow from the data (Jungmann 2025, p. 17)
- The conclusion answers only your question and names its limitations (Gundogan et al. 2016, p. 70)

Part	Example from the hydrogen question
Claim	Hydrogen can make steel production almost free of emissions.
Evidence	If renewable electricity is used, steelmaking by hydrogen direct reduction has essentially zero emissions (Vogl et al. 2018, p. 736). Zero-emission electricity alone is not enough for zero-emission steel: carbon dioxide (CO_2) still comes, for example, from mining iron ore and limestone, from making lime and from the carbon that steel needs (ibid., p. 740).
Conclusion	Almost free of emissions, but not entirely – and how close it comes depends on the electricity.

YOUR OWN ANSWER AGAINST ALL THE EVIDENCE

- Where do the answers agree, where do they contradict each other – and why?
- Objectivity: all the evidence, including the evidence against your own answer (Jungmann 2025, p. 14)
- Reflexivity: question your own assumptions (ibid., p. 21)
- The AI answer is never evidence, but it can point to evidence if the AI has researched properly – always check yourself
- A claim of the AI that no source supports is a finding
- Example: water forms (Vogl et al. 2018, p. 738) – but 3.48 MWh of electricity per tonne of liquid steel (ibid., p. 736)



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YOUR BALANCED, REFLECTIVE ANSWER

- First sentence: the answer, as clear as the evidence allows
- Then: conditions and limits, each with its short reference
- Finally: your own answer and the AI answer compared – what you take away
- Example: ‘Almost, but not entirely.’ Essentially zero emissions with renewable electricity (Vogl et al. 2018, p. 736); carbon dioxide (CO_2) remains, for example from mining ore and limestone, making lime and the carbon in steel (ibid., p. 740)
- Traps: repeating one of the three answers; going beyond the evidence

2 Ten seconds to win a reader

- Posters at scientific conferences
- A snapshot that starts a conversation
- The 13 criteria on a single slide
- Less is more: text, space and legibility



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A SNAPSHOT THAT STARTS A CONVERSATION

- A snapshot of your work that starts a dialogue (Erren and Bourne 2007, p. 777)
- Readers may move on at any moment: clear design, content reduced to its core (Gundogan et al. 2016, p. 69)
- A few seconds to win a reader: put a decisive question in the centre (Erren and Bourne 2007, p. 777)
- Short, clear title, like a headline (ibid., p. 777)
- Distil your work: its message and its line of argument have to survive (ibid., p. 777)
- Your poster: question – three answers – balanced, reflective answer

THE 13 CRITERIA ON A SINGLE SLIDE

- All 13 criteria apply to your poster – these show most

Criterion	What it means on your poster
Logical argumentation	Your balanced, reflective answer consists of claims, evidence and a conclusion that follows from the evidence.
Objectivity	You consider all the evidence, including the evidence against your own answer.
Reflexivity	Your balanced, reflective answer says how your own answer compares with what you have learnt since.
Honesty	Your own answer stays as you wrote it and apart from the ideas of others; every picture that you have not created yourself carries its source.
Traceability	A reader can see which artificial intelligence (AI) service you asked, when and with which question.
Verifiability	Every statement from a scientific source carries its short reference with the page.
Comprehensibility	Everybody who reads your poster understands your question and your balanced, reflective answer.

LESS IS MORE: TEXT, SPACE AND LEGIBILITY

- ‘Everything on the poster should help convey the message.’ (Erren and Bourne 2007, p. 778)
- No overload of formatting and pictures; key points (Gundogan et al. 2016, p. 69)
- About 100 words per section (ibid., p. 70)
- White space; guide the eye in a logical order (Erren and Bourne 2007, p. 778)
- At least 24 points (ibid., p. 778); 32 points for headings (Gundogan et al. 2016, p. 70)
- Contrasting colours, no more than two for the text, sharp images (ibid., p. 70)
- Check your poster in the Portable Document Format (PDF) as one page on screen – as on the projector

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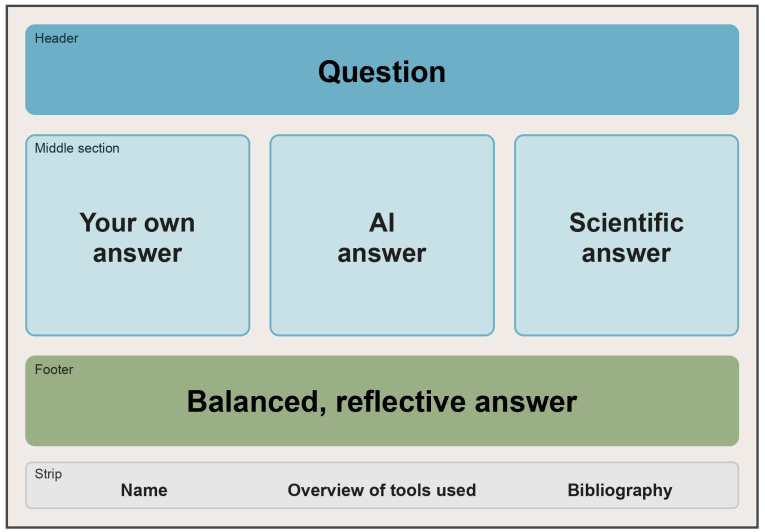
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3 Your poster step by step

- Header, middle section, footer
- What belongs on your poster – and what does not
- From the template to the PDF

HEADER, MIDDLE SECTION, FOOTER



- Header: your question, word for word
- Middle section: your own answer, AI answer, scientific answer
- Footer: your balanced, reflective answer
- Strip at the bottom: name, bibliography, overview of tools used
- Reads from top to bottom like the five steps

WHAT BELONGS ON YOUR POSTER – AND WHAT DOES NOT

Belongs on your poster	Does not belong on your poster
Your question, word for word	Data and facts from the AI answer
Your own answer, unchanged	The AI answer as evidence for a statement
The AI answer as a quotation, with its long reference and the note that it is not evidence, and what you found when you checked its sources	The long reference of the AI answer anywhere other than at the quotation
The scientific answer, each statement with its short reference and page	Statements from sources without a short reference
Your balanced, reflective answer	Pictures without a source
Your name, the bibliography and the overview of tools used	Pictures and formatting that only decorate
Figures and pictures, if there is space – each with a caption and its source	The dummy text, the headings and the logo boxes of the template

FROM THE TEMPLATE TO THE PDF

- HSBI template for scientific posters, A0 landscape, in the ILIAS course
- Adapt it – do not use it as it is: it has four columns instead of three, for example

1. Header: your question; below it your SDG
2. Middle section: four columns become three
3. Footer: a text box across the whole width
4. Strip: name, bibliography, overview of tools used
5. Replace all dummy text
6. Pictures only where they add to the content – no decoration, no marketing

- Export as PDF, check, upload in ILIAS by Wednesday 28 October 2026 at 23:55

4 Whose words, whose picture?

- Statements from your sources
- The AI answer: a quotation, never evidence
- Figures, tables and pictures
- Bibliography and overview of tools used on your poster
- The example poster

STATEMENTS FROM YOUR SOURCES

- Whatever is not your own carries its source, directly at the point (guide to Scientific Work, 3.5)
- Direct quotation: the exact words, in quotation marks
- Indirect quotation: in your own words, with a short reference as well
- Example: According to Vogl et al. (2018, p. 736), producing one tonne of liquid steel takes 3.48 MWh of electricity, most of it for making the hydrogen
- Each short reference has its long reference in the bibliography; only key references (Gundogan et al. 2016, p. 70)

THE AI ANSWER: A QUOTATION, NEVER EVIDENCE

- Quoted only to examine it: never a source, never evidence (guide to Scientific Work, 2.10)
- Long reference directly at the quotation: product, access source, model and mode, date – and the note
- No short reference; the long reference stands nowhere else
- Example from the hydrogen question, with the Hydrogen Breakthrough Ironmaking Technology (HYBRIT) project:
  - ‘Commonly cited reductions are in the range of 80 to over 90 % compared with the blast furnace route, depending on assumptions. […] Pilot projects show the technology works, for example HYBRIT in Sweden, which delivered its first fossil-free steel in 2021.’ (Claude, Claude app for macOS, Claude Opus 5.5 with effort xhigh, queried 2026-10-16) – *AI output, quoted as an example – not evidence.*
- Checked: no sources named; the range ‘80 to over 90 %’ in neither source – its upper end fits Vogl et al. (2018, p. 741), its lower end does not; first fossil-free steel in 2021 not confirmed

FIGURES, TABLES AND PICTURES

- Caption below the figure: ‘Figure 1: …’, the source on the next line (guide to Scientific Work, 3.6)

What you have done	How you cite it
Copied the figure unchanged	as a direct (image) quotation: (*author year*, p. *page*)
Used its content or design and revised it	with ‘cf.’ at the beginning: (cf. *author year*, p. *page*)
Drawn your own figure based on an existing one	‘(based on *source*)’ after the description
Combined data from several sources	all sources

- Photo from the internet: short reference in the caption, long reference in the bibliography
- AI picture: only a scene, never evidence; check its content
- Caption names the tool; the tool appears in the overview of tools used

BIBLIOGRAPHY AND OVERVIEW OF TOOLS USED

- In the strip at the bottom, next to your name
- Bibliography: all long references, including those of figures; alphabetical; in a smaller font (Gundogan et al. 2016, p. 70)
- Overview of tools used: the AI tools that have helped you as tools (guide to Scientific Work, 2.10)

Product name	Access source	Software functions used	Scope of use
name of the tool	*address*	*model, mode*	*purpose*

- In it, but not as a reference: the AI service whose answer you examine

The example poster for the hydrogen question

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Does hydrogen make steel production climate-neutral?

Sustainable Development Goal 9: Industry, innovation and infrastructure

Your own answer

I think so, because when hydrogen reacts, only water is produced. I know that steelworks today use a lot of coal and emit a lot of carbon dioxide. I assume that hydrogen could replace the coal and so remove most of these emissions. But I do not know where the hydrogen comes from and how much energy its production needs. I am also not sure whether a steelworks needs other materials that cause emissions.

AI answer

'With green hydrogen and renewable electricity, emissions can drop sharply. Commonly cited reductions are in the range of 80 to over 90 % compared with the blast furnace route, depending on assumptions. That is "near-zero", not strictly climate-neutral. […] Pilot projects show the technology works, for example HYBRIT in Sweden, which delivered its first fossil-free steel in 2021.' (Claude, Claude app for macOS, Claude Opus 5.5 with effort xhigh, queried 2026-10-16) – *AI output, quoted as an example – not evidence.*

Checked: The answer names no sources. Neither scientific source gives '80 to over 90 %', and the case study of the Hydrogen Breakthrough Ironmaking Technology (HYBRIT) project from 2019 cannot confirm fossil-free steel in 2021.

Scientific answer

Producing one tonne of liquid steel by hydrogen direct reduction takes 3.48 MWh of electricity, most of it for making the hydrogen by electrolysis (Vogl et al. 2018, p. 736). With renewable electricity, the process has essentially zero emissions (Vogl et al. 2018, p. 736); with a power grid that emits more than 532 kg of CO_2 per MWh and without scrap, it emits more than the blast furnace route (Vogl et al. 2018, p. 740). Even with zero-emission electricity, CO_2 still comes, for example, from mining iron ore and limestone, from making lime and from the carbon in the steel (Vogl et al. 2018, p. 740). The HYBRIT project speaks of 'fossil free' rather than zero emissions (Nikoleris 2019, p. 2).

Balanced, reflective answer

Almost, but not entirely. With renewable electricity, steelmaking by hydrogen direct reduction has essentially zero emissions (Vogl et al. 2018, p. 736); with a power grid that emits more than 532 kg of CO_2 per megawatt-hour and without scrap, it emits more than the blast furnace route (ibid., p. 740). Even with zero-emission electricity, some CO_2 remains, for example, from making lime (ibid., p. 740). My own answer was right that the reduction with hydrogen produces water, and it said openly that it did not know where the hydrogen comes from – which turns out to be decisive. The AI answer came to a similar result but named no sources, and some of its figures were not confirmed.

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Example poster for FTS-03
Prof. Dr. Thorsten Jungmann

Overview of tools used

Product name	Access source	Software functions used	Scope of use
Claude	Claude app for macOS	Claude Opus 5.5 with effort xhigh (answer); Claude Opus 5.5 (layout)	Answer examined in step 3; layout of the poster
DeepL Write	https://www.deepl.com/write	Spelling and grammar correction	Spelling and grammar check; own answer and quotation left unchanged

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5 Your poster in a nutshell

- What your elevator talk contains
- From the poster to the spoken word

WHAT YOUR ELEVATOR TALK CONTAINS

- Named after the short ride in an elevator: a complex idea in a few words – the elevator pitch in Caromile et al. (2024, p. 1)
- In FTS-04: 60 to 90 seconds, your poster on the projector

1. Your question
2. Your own answer
3. The scientific answer
4. The AI answer: how it fits in
5. Your insight: your balanced, reflective answer

- Introduction – research – conclusion with a follow-up (ibid., p. 4)



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FROM THE POSTER TO THE SPOKEN WORD

- Guide your listeners through your poster – do not read it off (Gundogan et al. 2016, p. 71)
- Short: one or two sentences for each part (Caromile et al. 2024, p. 5)
- Simple: plain language without jargon (ibid., p. 5)
- Practised: rehearse and ask others for feedback (ibid., p. 6)
- Name your sources in words: ‘a study by Vogl and colleagues from 2018 shows …’
- Example ending: ‘So my answer today is: almost, but not entirely.’

6 What have you learnt today?

- The building blocks of knowledge
- Answers to the guiding questions

WHAT YOU HAVE LEARNT

- Weighing up: claim, evidence, conclusion
- The balanced, reflective answer
- Posters in science
- What makes a good scientific poster
- Layout, content and template of your poster
- Citing statements, AI output, figures and pictures
- Bibliography and overview of tools used on the poster
- The structure of the elevator talk

ANSWERS TO THE GUIDING QUESTIONS

- Weighing up? Claims with evidence, a conclusion that says no more than the evidence – and what you have learnt
- A good poster? A snapshot around a decisive question, few words, white space – your question, three answers, your balanced, reflective answer, bibliography and overview of tools used
- Citing? Short reference with page, the AI answer with long reference and note, figures with caption and source
- Elevator talk? Question, your own answer, scientific answer, AI answer, insight – short, simple, practised



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Your turn: weigh up your three answers and design your poster.

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