Introducing A.I.-skills in Bioeconomy education.

A case study at WUR

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Contents

- Artificial Intellingence - Generative A.I.
- WUR policy on A.I.
- Case study: Biobased and Circular Business course
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What is Artificial Intelligence?

- Artificial intelligence (AI) encompasses techniques such as machine learning, deep learning, and natural language and image processing, enabling systems to learn, reason, and make decisions independently based on data. AI is applied across various sectors, including research and education.
- Artificial intelligence is essential for WUR's research and education in the field of healthy food in a healthy environment. E.g., we use AI for image recognitionto assess food quality, localized autonomous land cultivation, remotely monitor livestock health, and determine traits for disease-resistant breeds. …The list of applications is nearly endless.

WUR: Gen.AI is any tool that can do the following with minimal user input:

- (Re)write text
- Summarize
- Code
- Find literature
- Generate images
- Analyse data
- Create graphs
- Perform advanced spell / grammar checks

Common terminology:

- **Token**: A single word or punctuation mark.
- **Prompt**: A question or instruction given to a generative AI model, typically written in natural language. E.g. *Write a four-paragraph essay about [add query]*
- **Prompt engineering**: The practice of precisely formulating your prompt to most effectively provide a task or question to an AI model.
- **Inference**: The process where a trained AI model applies its learned knowledge to new situations to make predictions, decisions, or to generate content.

https://digitalcommons.uri.edu/cba_facpubs/548

What does WUR allow?

- Asking AI to help find relevant scientific papers:
  - Semantic Scholar (https://www.semanticscholar.org/)
  - ResearchRabbit (https://researchrabbit.ai/)

  Note: Only use the output as suggestion, not truth. Scan articles yourself to verify claims, statements, methodologies, and sources.

- Using AI to write simple scripts to speed up (not replace!) data processing:
  - ChatGPT (https://chat.openai.com/)

  Note: Verify the methodologies. You should be able to conduct the data processing yourself if asked to.

Do not use tools such as ChatGPT, Gemini or Copilot to look for literature, as the sources listed may not exist or may be wholly irrelevant.

for spelling / grammar?

- Grammarly (https://app.grammarly.com/)
- Quillbot (https://quillbot.com/grammar-check)

Note: Only use AI to improve spelling or grammar, NOT CONTENT!

What is not allowed at WUR?

- In final text ready-made content (fully written texts or paragraphs) [1]
- Writing hypotheses, experimental setups, or text outlines.
- Using AI for extensive data processing ~~and visualisation~~
- Generating images

Consequences:

There is no way that ChatGPT can verify the information it provides nor to assess its reliability. Therefore, you must verify its output with other sources of information (data triangulation).

We try out AI. Thus, we put trust in your ethical behaviour, until you breach academic rules of conduct. Such breach may be reported to the Exam Committee as suspicion of fraud and may cause that you will not pass the course.

[1] Explicitly forbidden for all WUR courses

WUR: A.I. issues

- A.I. tools are black boxes: you may repeatedly get a different text.
- ChatGPT does not provide clear academic sources for statements.
- A.I. is poor on providing systematic data and numerical derivations
- High energy usage
    - Three Miles Island nuclear reactor may restart to power MS AI operations.
    - AI query emits 8x CO2 Google search.
- Privacy/data security - GDPR-code difficult to enforce
- I.P. issues

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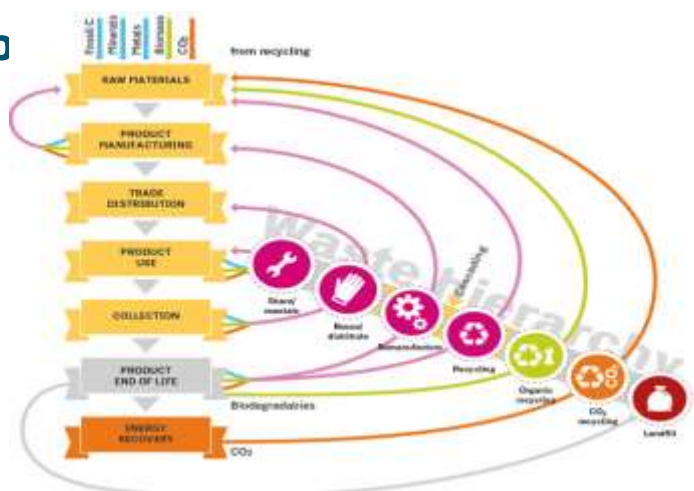
Biobased and Circular Business-course

- BBCB is a Restricted Optional (6 ECTS), in Mr Biobased Sciences: Specialisation C: Period 2, Oct-Dec. 8 weeks: 2024 17 students. Aim:Familiarize the student with principles, practices and potential of realizing biobased and circular business.
- Aim: By this course you can really strengthen your competencies, develop yourself as an expert on a specific biobased or circular topic.
- Covers commercial, biochemical and transitional aspects. Some focus on building materials and textiles.
- Activities: Lectures, self-study, guest lectures, realise factpod (5-7.min) (cf Rosling's *Factfulness*)
- Assessment: mid-term exam(45%); **Factpod incl.files (45%** intro/discussion, participation (10%).
- Plenary updates and 3x in person meetings (wk.3,5,7)



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What factpods? E.g. 2024 I

- Christel van Bommel Battle of the Bioplastics https://youtu.be/PDgsOWBp3-I 5.31min
- Fabian Ziegler The Negative Impacts of Plastic Recycling https://youtu.be/RrW8kE7jVZ0 6.55min.
- Tristan Gommeren Bridging Innovation and Inclusivity in biotechnology: Red and white biotechnology. https://youtu.be/s0-kkt06oDk 4.45min
- Julian van Ommeren, Wood in Construction, https://www.youtube.com/guLU6eWP6I0 7.36min
- Chenchen Huang, Hempcrete as a promised biobased https://www.youtube.com/watch?v=4V2kCJBqi2A 8.13min.
- Karsten Meuwissen Clothing as a new isolation method? https://www.youtube.com/watch?v=ddR-47cZ9OY&ab_channel=KarstenMeuwissen 5.28min
- Daniel Panigori Simanjuntak Seaweed from Asia https://youtu.be/yZyqIkGEEII 6.21min
- Wildan Hakim, How can palm oil sector contribute to meet the demand for Sustainable Aviation Fuel? https://www.youtube.com/watch?v=Q8n9bFZg8qc 6.24m

BB&CB: What skills considered important?

Linking the dots: recognize more than others due to alertness, by changing theories, perspectives/views, or system levels.

That makes you standing out of the crowd, adding more value to society, and worth higher salaries!

- Knowledge gap identification and hypothesis formulation
- Structural / Procedural thinking
- Contextualizing
- Data analysis and presentation
- Overriding: Critical reflection!

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For BB&CB you are invited to use AI …

- as brainstorming tool. You cand use AI to provide inspiration to develop a research topic or question (weeks 3-4)
- in literature research. You can use literature-focussed AI tools to orientate yourself on relevant academic literature on your chosen topic (weeks 3-5)
- to improve your own writing. While you cannot use AI tools to generate your written assignments, you can use them to improve your own writing by asking for personalised feedback on it (weeks 5-7)
- to generate images. You can create images for cover pages of reports or to help create supporting images for presentations. For the Factpod you may generate the video by AI. Use your own voice over (week 7)

ResultsI: A.I. usage esp in early stages

- Used ChatGPT exclusively to find initial inspiration (Fabian Ziegler)
- AI is very useful for gathering inspiration .. Research Rabbit, but didn’t find it very helpful… used Google Scholar instead. (Julian van Ommeren)
- I used AI mostly to explore the topic… ChatGPT provided me with a lot of options…. (Thom de Gelder)
- ChatGPT - Brainstoming the idea about SAF and its current development. (W. Hakim)
- I want to find articles about the recycling rate of clothing in Scopus; I asked ChatCPT to give me a good query. Next copied the query into Scopus. E.g. Query to Scopus AI ‘..why is it good to incorporate polyester in the thermic isolation panels made from old clothing/metisse?’ (Karsten Meuwissen)

Results II: A.I. usage esp in early stages

- Research Rabbit: to find papers with similar topics (Angela Sierra)
- Semantic Scholar: I used it to review how much had been said about Public-Private Partnerships. For this reason, I ..delve into the importance of [PPPs] (Angela Sierra)
- .. I tried to avoid working with AI, besides the source inputs and case study companies recommendations, to ensure that I would not break any rules. (T.Gommeren)
- I try to use it the least possible. I believe that using it for everything and very often will diminish my abilities for critical thinking…it's environmental impact is high and I don't want to be a part of it. (Miguel Quintero)

Results III: A.I. in developing Factpod

- ChatGPT: To understand Uruguay's transition to renewable energies, compare it with other Latin American countries and the world. (Angela Sierra)
- …ChatGPT to find specific facts and data on a subject,.. but [I] soon realized that it didn’t provide sourcing which I was happy with. I also tried out …AI programs that were mentioned ..I encountered the same problems. ..Scientific articles …were really strong to use in my Factpod. (Thom de Gelder)
- ChatGPT and Perplexity have been used for text content and sourcing. However, .. the results were not helpful. .. The need to check every provided website does not save time. E.g. it returned ‘Stricter regulation would ensure....’ However, the source only mentioned that the current regulations work properly … In the end, I did not incorporate much of the provided content. .. Asking ChatGPT to explain it like you’re 10 [years old] helps (Christel van Bommel)

Results IV: A.I. for texts

- use a citation manager to synchronise our work. We used Zotero .. (Anna Velebová &Tomáš Ducháček)
- AI is… huge help in polishing and improving my writing. (Ch.Huang)
- Grammarly: I need to check my grammar (Angela Sierra)
- QuillBot to rephrase sentences and paragraphs (Victoria Alabi)
- For some grammar issues .. For citing (Miguel Quintero)
- DeepL Translator [used] a few times to translate sentences from Dutch. (Julian van Ommeren)

Results V: A.I. for pict. & video

- AI to generate a picture (Victoria Alabi)
- Capcut – Text to speech (Wildan Hakim)
- I used a written summarized version of the report, which is translated from text-to-speech in Clipchamp... stock videos .. voice-over functions (Tristan Gommeren)
- Canva [paid version], mainly because of large library of stock videos, graphics,... (Tomáš Ducháček Anna Velebová)
- Pictory AI. However, after creating the video, I noticed it had a watermark .. Additionally, some visuals didn’t match ..ultimately made video with powerpoint.(Julian van Ommeren)
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Learnings

- A.I. is evolving rapidly; impacts research and education
- Hyped or multi-facetted?
- Impacts knowledge workers. So, what remains the academic added value?
- A.I. finds difficulties in linking qualitative and quantitative elements, e.g. interpreting a piechart.
- While a crucial competency, A.I. tools seem incapable of logical reasoning, making inferences.
- Major justice and equality problems: require formal declaration by the student of A.I. usage required
- Adaptive approach in teaching; more oral chats and tests, and more internet restricted tests.

Thanks for your attention.

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Extra: WUR Examining Board

- Students may use AI only to support essential academic skills like critical reflection, literature research, and scientific writing, not to replace those skills.
- Students are always held accountable for the correctness, completeness, and coherence of their (written) assignments.
- When using AI in an assignment, students should explicitly acknowledge this usage and reflect on how it impacts the assignment.

Extra A.I.-seminar 04-2025 Recommendations:

- Literature: Elicit, consensus, ASRview, Perplexity similar to Google scholar ; Litmaps, Researchrabbit,…
- Language models: Gemini allows more ‘uncertainty’; ClaudeB more suited on coding, LeChatMistral.
- Grammar: better Grammerly than Quilbot.
- Image creation: Adobe Firefly, DallE, Ideogram.
- Other: Suno, noteboLM, MS copilot (>10 versions), HeyGen (creates deep fake issues). All not supported.