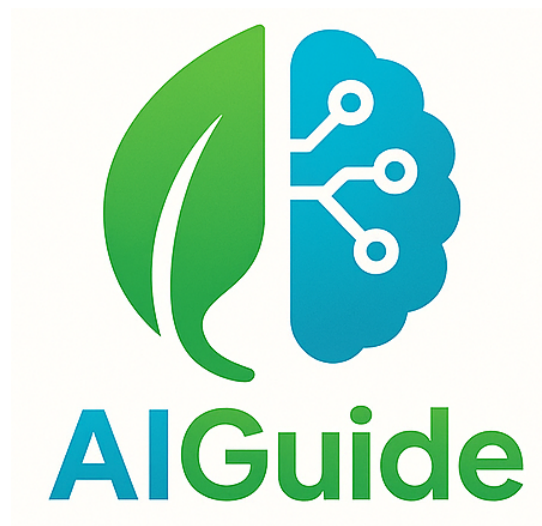




ONLINE COURSE CONTENT

MODULE 5: CRITICAL, ETHICAL AND SUSTAINABLE OF AI IN EDUCATION

2025-1-LT01-KA220-HED-000354784

Artificial Intelligence for Green Understanding, Insights & Decision Empowerment



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A. General Information

Module No.	Module 5 – AI-Supported Green Decision-Making (AIGUIDE)
Subtopic 5.4	Critical, Ethical and Sustainable Use of AI in Education
Artificial Intelligence Literacy Component	AI ethics; data privacy; transparency; fairness; sustainability and environmental implications of AI use.
Decision-Making Skills	Ethical reasoning; evaluating consequences; responsible educational decision-making.
Teacher Learning Outcome	Identifies critical, ethical and sustainability-related issues in AI-enhanced teaching and classroom implementation.
Student Learning Outcome	Makes ethically justified decisions about the use of AI in learning.
Possible Tools	Chatbots; image AI tools; AI policy templates.
AI Literacy Level	Medium
Estimated Time	90 minutes in total: a 30-minute faculty development session (Section B) and a 60-minute student activity (Section D), plus optional independent preparation

B. Content for STEM Higher Education Faculty

Highlights

- Regulatory insight precedes regulatory oversight: rules about AI use presuppose understanding of what the technology does.
- Algorithms mirror the biases of their training data and can amplify discrimination at scale.
- Privacy rests on informational self-determination: the individual takes an active role in how AI systems handle their data.
- AI can enable 134 SDG targets but inhibit 59 – sustainability review of every AI use is part of responsible adoption.
- The use of AI in education is itself a socioscientific issue, and reasoning about it is a teachable competence.

Introduction

This subtopic gives teachers the map needed to identify critical, ethical and sustainability-related issues in AI-enhanced teaching. The ethical framework (IEEE Ethically Aligned Design; EU ethics guidelines for trustworthy AI) demands transparency, accountability, fairness and privacy (Vinuesa et al., 2020). Because a single ethical rule-set is not advisable in complex contexts (Vinuesa et al., 2020), the aim is reasoned deliberation on cases, not a list of prohibitions.

Each classroom AI use is audited through five lenses – ethics, privacy, transparency, fairness, sustainability – and the reasoning is recorded in a working AI policy. This section equips the teacher to run that audit and to teach it.



Activity: Observe—Notice | Spotting the ethical issue (3 min)

Task: Consider a real classroom AI use (e.g., uploading student work to a public chatbot). Which issue appears first – privacy, transparency, fairness or sustainability? Expected focus: student data leaving institutional control raises privacy and informational self-determination (Vinuesa et al., 2020).

Resource: Sasha Luccioni, “AI is dangerous, but not for the reasons you think” (TED) · https://www.ted.com/talks/sasha_luccioni_ai_is_dangerous_but_not_for_the_reasons_you_think

Concepts to Define at the Start

AI ethics is the set of principles encompassing transparency, accountability, fairness, privacy and human oversight, formulated internationally by the IEEE Ethically Aligned Design and the EU guidelines for trustworthy AI (Vinuesa et al., 2020). Informational self-determination is the principle that the individual takes an active role in how AI systems handle their data (Vinuesa et al., 2020). A socioscientific issue (SSI) is a controversial societal matter intertwined with science and technology, lacking straightforward solutions and requiring moral, ethical, cultural, economic, political and environmental considerations (Kumar et al., 2024) – a definition the use of AI in education itself satisfies.

The Ethical Framework

Vinuesa et al. (2020) argue it is imperative to develop legislation on the transparency and accountability of AI and to decide the ethical standards to which AI technology should be subjected. Two principles structure the session: regulatory insight precedes regulatory oversight – policy without understanding is ineffective at best and counterproductive at worst – so identifying issues comes before regulating them; and no single ethical theory holds in all situations, so deliberation on cases is required (Vinuesa et al., 2020).

Activity: Research and Learn | Bias probe (30 min, independent preparation)

Task: Test a chatbot or image tool with systematically varied prompts (names, genders, countries) and document differential outputs. Discuss what this implies for classroom use – algorithms mirror the biases in their training data (Vinuesa et al., 2020; Krist & Kubsch, 2023, as cited in Cheung, 2026).

Resource: MIT Moral Machine · <https://www.moralmachine.net/> · Google Teachable Machine · <https://teachablemachine.withgoogle.com/>

Key Concepts

Concept	Key Focus	Key Components	Evidence of Learning
AI ethics	Transparency, accountability, fairness, privacy	IEEE/EU frameworks; insight before oversight (Vinuesa et al., 2020)	The teacher identifies issues before proposing rules
AI as a socioscientific issue	A value-laden problem with no single answer	SSI route: issue → stakeholders → consequences → principles → decision (Kumar et al., 2024)	The teacher reasons a case to a justified decision

Data Privacy

There is a stark friction between data-driven AI applications and the protection of individual privacy; unregulated personal data can even be used to manipulate opinion through computational propaganda – “big nudging” by autonomous agents (Vinuesa et al., 2020). Classroom translations: student work is anonymised before AI processing; personal or sensitive data is never entered into public chatbots or image AI tools; requiring a specific commercial data-collecting tool without an alternative violates informational self-



determination; analytics data about students is used transparently. Ethics and privacy controversies are documented as a constraint on classroom AI experimentation (Chiu, 2024, as cited in Cheung, 2026).

Transparency

Transparency has a technical layer – the interpretability problem, where the unexplainability of AI complicates oversight, so consequential decisions should not rest on unexplainable outputs – and a practical layer: openness about design choices and data provenance, and mutual disclosure of AI use (Vinuesa et al., 2020). AI policy templates operationalise this: a one-page course document recording permitted uses, disclosure format, data rules and appeal routes.

Key control question:

For this AI use, which issues arise across the five lenses – ethics, privacy, transparency, fairness, sustainability – and can the use be justified, restricted or refused with conditions?

Fairness

Algorithms trained on data of previous decisions act as a “mirror” of the biases and unfair practices in that data; data-driven approaches can hinder equal access, particularly for minorities, and biases can be amplified at scale – though the same mirror effect can also help identify and correct existing errors (Vinuesa et al., 2020). In education, fairness issues appear in generated content (which examples, contexts and languages dominate) and in automated assessment, where machine-learning scoring provoked the “bias, bias everywhere” debate (Krist & Kubsch, 2023, as cited in Cheung, 2026). Access inequality belongs here too: an English-only agent left unused because of language barriers created unequal learning conditions without any algorithmic bias (Cheung, 2026).

Sustainability and Environmental Implications

A consensus-based expert elicitation assessed all 169 SDG targets and found AI can enable 134 (79%) but may inhibit 59 (35%) (Vinuesa et al., 2020). Quality education (SDG 4) can benefit, but three inhibiting mechanisms are relevant to adoption: inequality (AI-generated wealth accrues to the already well-off; educational and computing resources are unevenly distributed within and between countries); research-agenda bias towards wealthy nations, so solutions transferred without local understanding can exacerbate problems; and the assessment gap – impacts should be evaluated for efficiency, ethics and sustainability before large-scale deployment, yet such methodologies are lacking (Vinuesa et al., 2020). The classroom principle that follows is proportionality: every routine use of a chatbot or image AI tool should have an educational justification outweighing its wider costs, including its resource footprint.

Teaching Ethical Reasoning: the SSI Method

The use of AI in education is itself a socioscientific issue, and SSI research shows this reasoning is teachable: engaging learners with such issues develops decision-making skills, scientific literacy, intellectual growth, moral development and community engagement, through structured argumentation rather than rule transmission (Kumar et al., 2024). With roughly a third of socioscientific issues being environmental, the link to the SDGs is direct (Kumar et al., 2024). The reasoning route for every case: issue → stakeholders → consequences → principles (transparency, accountability, fairness, privacy, proportionality) → justified decision with conditions and a review date.

Evidence-Based Decision-Making Cycle (Discipline-Specific)

The evidence-based decision-making cycle is applied here in a discipline-specific manner using the 5E workflow (Bybee et al., 2006), in the form adopted across AIGUIDE Module 3, Subtopic 3.7. AI supports



the evidence, comparison and communication stages; verification, the final choice and professional responsibility remain with the human.

Stage	Key Question	Appropriate AI Support	Human Responsibility
Engage	Which use of AI in your own studies is being decided, and what are its limits?	Reframes the case; identifies what the description leaves out	States the use, the data submitted and the purpose in one sentence
Explore	a. What evidence, terms of use and regulation apply? b. What are the criteria for acceptable use?	a. Locates the terms, policies and documented cases. b. Organises the five lenses	a. Verifies the sources against the originals. b. Decides which criteria bind this use
Explain	How does the use perform under each lens?	Produces the lens-by-lens comparison and counterarguments	Names who is affected, who benefits and who decides
Elaborate	Which position is ethically defensible?	Drafts the commitment and supports its wording	Reaches the decision with explicit conditions and trade-offs
Evaluate	What was verified, rejected or left uncertain?	Flags inconsistencies and missing evidence	Sets the review date and states the uncertainty that remains

Tools That Can Be Used in This Subtopic

- Chatbots – as objects of analysis (bias probes, privacy scenarios) and as reasoning aids for drafting policy wording.
- Image AI tools – as objects of analysis for content bias and for the sustainability/footprint discussion.
- AI policy templates – to record the outcome of a five-lens audit as a working classroom document.

Critical and Responsible Use

- Only publicly available material is used; no personal or sensitive data is entered into public tools (Vinuesa et al., 2020).
- AI use is disclosed; the basis of any AI-influenced grade is explainable (Vinuesa et al., 2020).
- Generated content and automated scoring are checked for bias across groups and languages (Krist & Kubsch, 2023, as cited in Cheung, 2026).
- Routine AI use is justified against its footprint and its equity effects (proportionality – Vinuesa et al., 2020).
- The outcome of ethical reasoning is recorded in a course AI policy with a review date.

Videos and Interactive Resources (Additional Sources for the Lecturer)

Additional resources for the lecturer. Items marked [S] are recommended during the 30-minute faculty development session and take about 5 minutes in total; items marked [I] are for independent preparation and are not counted in the session time. Links were checked and are stable; if a link changes, search the resource title.

- **[I] Sasha Luccioni – “AI is dangerous, but not for the reasons you think” (TED) (10 min):** the climate footprint of AI and the case for small, task-specific models – a direct sustainability link.

https://www.ted.com/talks/sasha_luccioni_ai_is_dangerous_but_not_for_the_reasons_you_think



- **[S] TED-Ed – “Can you outsmart a troll (by thinking like one)?” (~5 min, animated, interactive lesson):** a discussion starter on disinformation, bias and responsible AI use, with built-in questions.
<https://ed.ted.com/lessons/can-you-outsmart-a-troll-by-thinking-like-one-claire-wardle>
- **[I] “Ethics of AI” (University of Helsinki, free online course):** non-maleficence, accountability, transparency, human rights and fairness – aligned with this subtopic’s components.
<https://www.classcentral.com/course/helsinki-ethics-of-ai-98596>
- **[I] MIT Moral Machine (interactive):** an experiment on algorithmic ethical decisions; a strong classroom discussion starter. <https://www.moralmachine.net/>
- **[I] UNESCO – AI Competency Framework for Teachers (ethics and human-agency aspects):**
<https://www.unesco.org/en/articles/ai-competency-framework-teachers>

Guidance Flowchart for Professional Development

Stage	Activity
Ethics frameworks	Review the IEEE/EU principles and the insight-before-oversight rule (Vinuesa et al., 2020).
Privacy	Identify where student data flows and apply informational self-determination (Vinuesa et al., 2020).
Fairness	Run a bias probe on generated content and automated scoring (Krist & Kubsch, 2023, as cited in Cheung, 2026).
Sustainability	Weigh a use with the enabler/inhibitor and proportionality frame (Vinuesa et al., 2020).
Reasoning method	Practise the SSI route on a real case (Kumar et al., 2024).
Creating your own example	Draft a one-page course AI policy from a template.



C. Real-Life Example

Best Practices Report Case: Government of Catalonia – GenAI for Environmental Impact Report Automation

The AIGUIDE Best Practices Report documents the Government of Catalonia’s GenAI system that automates environmental impact reports as an operational, environmental, public-sector case (AIGUIDE Best Practices Report, 2026, Industry Applications). The report records that it is EU AI Act, GDPR and Web Accessibility Directive compliant, supports the Catalan language, is integrated with secure government IT systems, was built through agile user-centred development, and won the EU Best Cases Award (SEMIC 2025) – a concrete, well-governed example of AI in environmental decision-making.

Crucially, the report also documents its limitations, which are exactly the material for a five-lens ethical audit: it is a pilot limited to specific activity types; GenAI outputs require mandatory human review; complex multi-criteria assessments still require full human expertise; and there is a risk of over-reliance on AI in legally sensitive contexts (AIGUIDE Best Practices Report, 2026). The report explicitly notes it is applicable to STEM HE in environmental governance, engineering or public administration, where students can evaluate GenAI in regulatory decision-making and explore human–AI oversight.

Students audit this case through the five lenses – ethics, privacy, transparency, fairness, sustainability – and reason it as a socioscientific issue to a justified decision with conditions (Vinuesa et al., 2020; Kumar et al., 2024). Contrasting cases from the report, such as Google DeepMind’s data-centre cooling optimisation or Climate TRACE’s emissions monitoring, provide further authentic material for the same audit.

If the main tool is not available:

If the Catalonia case is not suitable: the teacher selects another documented environmental AI case from the report (e.g., DeepMind cooling, Climate TRACE, Too Good To Go) and students run the five-lens audit and draft the policy from its recorded strengths and limitations.

Preparing Your Own Real-Life Example

- Choose one documented environmental AI case from the Best Practices Report (Catalonia GenAI, DeepMind, Climate TRACE, Too Good To Go, Pachama, or similar).
- State the use, its data and its purpose in one sentence, using the report’s description.
- Run the five-lens audit (ethics, privacy, transparency, fairness, sustainability) using the report’s recorded strengths and limitations.
- Reason the case with the SSI route to a justified decision with conditions.
- Record the outcome in a one-page course AI policy with a review date.



D. Interactive Learning Activity

Student Learning Activity Card

For STEM university students

Project	Artificial Intelligence for Green Understanding, Insights & Decision Empowerment (AIGUIDE)
Module / Subtopic	Module 5 / Subtopic 5.4 – Critical, Ethical and Sustainable Use of AI in Education
Activity Code	M5-A3.5-S4
Event Title	Five-Lens Ethical Audit of Your Own AI Use
Developing Partner	VMU / AIGUIDE Consortium
STEM Context / Discipline	Interdisciplinary STEM; environment, energy, bioengineering, biology.

1. Activity Description

Recommended Duration	60 minutes + optional preparation
Delivery Format	☒ In-class ☐ Synchronous online ☐ Asynchronous online
Student Grouping	☐ Individual ☒ Pairs ☒ Small groups (3–4 students)
Summary	Students run a five-lens ethical audit of an AI tool they themselves use for coursework, reason the case as a socioscientific issue, and write a personal AI-use commitment with conditions and a review date.

2. Pedagogical Design

Learning Objectives	By the end, students will: (1) identify issues across five lenses in their own AI use; (2) apply informational self-determination to the data they themselves submit; (3) run a bias probe; (4) weigh the sustainability cost of their own use; (5) reach a justified personal decision via the SSI route.
Goal: AI Literacy	☒ Understanding AI concepts ☒ Using AI tools critically ☒ Evaluating AI outputs ☐ Building AI systems
Focus on Green Decision-Making	☒ Climate change ☒ Energy ☒ Materials/resources ☒ Biodiversity
Prerequisite Knowledge	Awareness of AI ethics terms and one chatbot or image AI tool.
Key Concepts	AI ethics; privacy/informational self-determination; transparency; fairness/bias; sustainability; SSI reasoning. The five steps of this activity follow the 5E workflow: Engage → Explore → Explain → Elaborate → Evaluate (Bybee et al., 2006).

3. Design of the Student Assignment

Student Scenario / Assignment	Goal: to decide, with justification, whether and how you will keep using a specific AI tool in your own environmental studies. Context: take one tool
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	you already use for coursework, open its privacy and data-processing page, and use the documented Government of Catalonia GenAI case as the worked comparison. Produce a personal AI-use commitment stating what you will use it for, what you will not, on what conditions, and when you will review the decision.
Student Guidelines	Step 1 (Engage) – State your own use, the data you submit and your purpose. Step 2 (Explore) – Gather the terms of use, the documented case and the five lenses. Step 3 (Explain) – Run the audit lens by lens and reason it as a socioscientific issue. Step 4 (Elaborate) – Decide with explicit conditions and trade-offs. Step 5 (Evaluate) – Write your personal AI-use commitment with a review date and name what stays uncertain.
Input Materials	☐ Dataset ☒ Case study text ☒ Article ☒ Image/video ☒ AI policy template
Expected Student Output	☒ Audit sheet ☒ One-page AI policy ☒ Presentation ☐ Working prototype
Submission Format	A completed five-lens audit sheet and a one-page course AI policy, or a short presentation of both.

4. Use of Artificial Intelligence and Sustainable Decision-Making

Recommended AI Tools	• Chatbots – as objects of analysis and to draft policy wording. • Image AI tools – for content-bias and footprint analysis. • AI policy templates – to record the decision.
AI Prompt / Interaction Guide	Sample prompt: “Draft a one-page course AI-use policy covering permitted uses, disclosure, data rules and an appeal route for [module]. I will edit and approve it.” The team edits and owns the final text.
Critical Evaluation	Students check their commitment against the five lenses and the SSI reasoning; unjustified permissions are removed.
Human Decision Component	Students make the ethical judgements and the final decision about their own use; the AI assists drafting only.
Responsible AI / Ethics Note	Only public material is used; the exercise itself models transparency, informational self-determination and proportionality (Vinuesa et al., 2020).
AI Usage Log	A brief, four-part log: (1) How did AI contribute? (2) Which outputs were independently verified? (3) Which outputs were corrected or rejected? (4) What is the final decision and on what evidence does it rest?

5. Evaluation and Evidence

Evaluation Method	☒ Checklist ☒ Graded rubric ☒ Peer feedback ☒ Teacher assessment
Assessment Criteria	1. Disciplinary accuracy; 2. Evidence-based reasoning; 3. Critical and transparent use of AI; 4. Sustainability trade-offs; 5. Clear and human-driven final decision; 6. Coverage of all five lenses with a concrete issue named in each.
Evidence to Be Collected	☒ Audit sheet ☒ AI policy ☒ Bias-probe notes ☒ Peer-feedback form
Success Criteria	Sufficient performance on at least five of the six criteria; the final decision is made under human responsibility and supported by evidence-based justification.



Feedback Questions	1. Which lens raised the most serious issue? 2. How did the SSI route change your decision? 3. What conditions did your policy attach, and why?
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6. Application Notes

Teacher Preparation	Review Subtopic 5.4; prepare an AI policy template and two public reports on one environmental AI application.
Time Schedule	Ethics framing: 10 min Audit & reasoning: 30 min Policy drafting & presentation: 15 min Reflection: 5 min.
Accessibility / Inclusion	Allow the most proficient language; provide the template and cases in writing; avoid sensitive personal cases.
Potential Risks	Treating ethics as a checklist rather than reasoning; uploading sensitive data during the exercise.
Precautions / Contingency Plan	Use only public reports; if tools are unavailable, run the audit and policy on paper.

Step-by-step implementation. The screenshots named below are captured by the teacher from the tool actually used and inserted before delivery.

Step	What the teacher does	What to capture as evidence
1. Prepare	Bring the documented Government of Catalonia GenAI case and print the five-lens sheet.	Case extract and audit sheet
2. Demonstrate	Walk the class through the five lenses on the documented case, capturing a screenshot of the tool's data page.	Screenshot of the data page
3. Run	Each student audits one tool they already use for coursework, lens by lens.	Completed five-lens audit sheet
4. Review	Pairs run a bias probe on each other's tool and record the result.	Bias probe record
5. Close	Each student writes the personal AI-use commitment and completes the AI Usage Log.	Commitment with review date and AI Usage Log

Joint Completion Checklist

No.	Checkpoint	Completed
1	The AI use, its data and purpose are stated precisely.	☐
2	Privacy and informational self-determination are checked.	☐
3	Transparency (disclosure, explainability) is addressed.	☐
4	Fairness/bias is probed in content and scoring.	☐
5	Sustainability and proportionality are weighed.	☐
6	The case is reasoned via the SSI route to a decision.	☐
7	Conditions and a review date are attached.	☐



8	The outcome is recorded in a course AI policy.	☐
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