Author responses to editor.

We thank the Technical Editor, Dr Melanie Braun, for her remarks. We revised the manuscript exactly as we indicated in our responses to the reviewers. They are below in blue text and preceded by **Authors:**.

Reviewer 1 remarks and our responses and revision.

R1: The manuscript is well-written, based on recent experience and offers many insights. I especially like the mature discussion on strengths and weaknesses of AI and how is availability should change the way soil science is taught.

Authors: Thank you.

R1: If space allows, it may be good to start at an earlier stage of 'curriculum design' rather then 'course design within established curriculum', as the current text appears to be. Curriculum design typically includes an analysis of the type of professional careers and jobs that are available/expected-to-become-attractive and what that means for Knowledge/understanding, Skills, Values.

Authors: Thank you. The paper concerns the design of one second-year unit, so it does not claim to present a full degree-level curriculum review. We agree that its professional purpose should be clearer. We will add a short passage near the end of Section 1 linking the graduate roles already named in the paper to the knowledge, skills and values needed for place-specific systems reasoning. We will also state the unit-level scope more clearly.

R1: Your current text starts from existing Soil Science teaching traditions; it may help readers if the changes in soil science careers for example: In an expanding phase of agriculture soil mapping and land suitability for targeted crops employed many graduates with a profile of fieldwork, soil classification, mapping and targeted soil analysis; 'reading a landscape' became intuition, validated theories of place the signs

of success. Where intensification on existing agricultural lands became the focus, soil management, precision farming and quantified environmental impacts increased the need for 'system thinking' and 'process-based models'. In an era of climate change adaptation, regenerative agriculture and re-discovered circularity, the expectations once again shift.

Authors: Thank you for the comment. We agree that changes in professional work would strengthen the reason for teaching systems thinking. The submitted paper describes curriculum fragmentation, but it does not follow the shift from survey and classification towards process modelling, precision management and climate adaptation. We will add a concise account in Section 1 only where it can be supported by published evidence. We will keep the focus on why current graduates need to reason across soil, water, vegetation and management.

R1: For Indonesia a brief historical overview of topics along with a dramatic gender shift in soil science student bodies was provided in Hairiah, K. et al. 2022. Hundred fifty years of soil security research in Indonesia: Shifting topics, modes of research and gender balance. Soil Security, 6, p.100049. For other countries similar analyses may be available and could add further depth to your manuscript.

Authors: Thank you for the useful reference. We will assess Hairiah et al. (2022) and use it if it supports the revised account of changing disciplinary needs. Any addition will be brief because the paper develops a unit design, not a comparative history of soil-science education.

Reviewer 2 remarks, our responses and revisions.

R2: The manuscript is well written, clearly structured and accessible. The pedagogical concept is sound and directly repsonds to a real challenge in soil education: conveying systemic understanding with multidisciplinary programs with limited study hours. The integration offers a transferable framework that could be

valuable to other educators. Providing a concrete implementation strengthes the practical relevance of the paper.

Authors: Thank you.

R2: The terms plural knowledge/two-way science are central to the proposed design, but the manuscript does not introduce them for readers who may not share this background. I recommend a short introductory passage defining what plural knowledge/two-way science is.

Authors: We agree. We will define plural knowledge when the term first appears. In this paper, it means recognising more than one knowledge tradition while respecting their different epistemologies, responsibilities and authority. We will also define Two-Way Science as the careful weaving of Indigenous and Western scientific knowledge. The revision will retain the safeguards already stated in the paper: Indigenous knowledge is local, governed and place-specific, and not all knowledge is available for unrestricted interpretation.

R2: The manuscript speaks of AI in general terms, but the teaching scenario actually involves a chatbot/LLM. Please specify: i) which LLMs the students use, and whether all students use the same system; ii) how and if the model is grounded in the lecture content, either via RAG or long-context, or is it relying on its pre-existing training data only, and iii) whether the model has web acces. These details are important, as the design of the "AI discernment" activities and their transferability depends on the capabilities and grounding of the system used.

Authors: We thank the reviewer for highlighting the need for clarity regarding the specific AI infrastructure. Regarding LLM specifications, the learning design is intentionally LLM-agnostic. Students are not restricted to a single system; instead, they use publicly available, foundational large language models of their choice (such as ChatGPT, Claude). This choice supports equitable access and reflects the diverse ecosystem students can access. The models rely entirely on their pre-existing training

data. We did not implement specialised Retrieval-Augmented Generation (RAG), fine-tuning, or custom long-context windows. Students have full web access during the workshops, allowing them to cross-reference and verify AI-generated outputs in real time. Because the unit focuses on foundational 'AI discernment' rather than system-specific mechanics, this agnostic environment is a deliberate pedagogical choice. The activities teach students to prompt critically, evaluate outputs rigorously, and identify hallucinations or bias regardless of the underlying platform. We believe that this approach significantly enhances the transferability of their discernment skills as the AI landscape evolves. We will revise the manuscript to explicitly state these technical parameters and their pedagogical rationale.

R2: The lecture is only referred to as ENST2007. Please include the full course name and sufficient context for readers unfamiliar with this institution.
Authors: We agree. The submitted paper gives too little institutional context. It states only that ENST2007 is a second-year undergraduate unit in soil and landscape science. We will add its formal name, institution, degree context and place within the relevant programs.

R2: It is not clear what background the students in this course already know about soil at this point in their degree. This is essential, as the design, as the proposed deisgn depends heavily on the learners prior knowledge.
Authors: We agree. Prior knowledge determines how readily students can use the interactive models and explain coupled processes. We will add some detail on prerequisites for the unit.

R2: Although tab.1 lists some content, the reader does not get a clear picture of the full scope, learning outcomes and objectives of the entire lecture. Please makte the consctructive alignment explicit: learning outcomes, the instructional activity described, and the intended assessment.
Authors: We agree. The paper explains the two assessments and their common

purpose, but not the full scope. We will briefly add the unit learning outcome (or maybe the syllabus) and the relevant activities. Together with Table 1, this will clarify the full scope of the unit.

R2: The overall workload of the lecture (contact hours, ECTS, independent study time, e.g.) is not stated. This matters for judghing whether the proposed design is feasible in other programs with limited hours for soil science.
Authors: We will briefly outline the overall workload as suggested.

R2: I would remove fig.1, as in my opinion it does not add to the manuscript. Instead, a figure would be welcome that shows concrete examples from the lecture content for each of the four design elements. Such a figure would make the framework tangible and help readers transfer it to their own teaching.
Authors: We think Figure 1 is useful, giving readers an overall look at the unit design. We are not sure that static screenshots of lecture content would be particularly useful in this FORUM article.

R2: Line 25: To my knowledge, at least in Europe, soil science has traditionally been embeeded within broader curricular (e.g., agricutulural science, biology, geography) rather than offered as a standalone discipline. Could the authors clarify what situation they are referring to here: is the trend of limited soil science courses specific to their region? If so, this would be worth stating explicitly, as it affects how readers interpret the motivation of the paper.
Authors: Thank you. We did not intend to claim that soil science is taught as a standalone discipline everywhere. We will clarify our argument on contraction and fragmentation, and state that the pattern varies among regions and institutions. The paper is motivated by the challenge of teaching systems reasoning within a single unit when specialist content is distributed across broader degrees.

R2: Line 29: The sentence "several strands of curriculum literature document this.."

does not add content. I would recommend removing it as filler.

Authors: OK. The sentence adds no evidence and is unnecessary. We will remove it so that the paragraph begins directly with the finding from Villa et al. (2025).

R2: Line 30: How can modelling be not part in 96-98% of lectures? I suggest to note that 96% of bachelor-level and 98% of master-level lectures do not include computer works and modelling.

Authors: Thank you for the comment. our wording may have been too strong. Villa et al. (2025) did not report that modelling was wholly absent from 96–98% of teaching. It reported that computer or modelling activities were either absent or occupied only a small part of courses in 96% of surveyed BSc institutions and 98% of surveyed MSc institutions. We will revise the sentence to accurately reflect this result and identify the European survey population.

R2: Line 47: The abbreviation InTeGrate is used but never expanded.

Authors: We will identify InTeGrate at first use as 'Interdisciplinary Teaching about Earth for a Sustainable Future' and retain the citation to Kastens and Manduca (2017).

R2: Line 104: Typo in "development

Authors: Thank you. We will correct it.