APPENDIX

Table 1
Learner-Centered Feedback Framework developed in Ryan, Henderson, Ryan and Kennedy (2023).

Dimension	Component	Definition
Future Impact	Upcoming Similar Tasks	Feedback that provides specific advice for improving similar tasks students may encounter later. *(e.g. "In your next report, try using subheadings to better organize your key points.")*
	Meeting Learning Objective	Feedback that helps students make progress toward achieving the intended learning outcomes. *(e.g. "Make sure to include model evaluation to meet the outcome on assessing model performance.")*
		Feedback that supports students in building strategies, processes, or skills that can be applied across different subjects or contexts. *(e.g. "Planning your structure before writing can help improve clarity across future assignments.")*
Sensemaking	Strengths and Weaknesses	Feedback that explains specific strengths and areas for development in relation to particular elements of the task. *(e.g. "Your discussion is well developed, but the data analysis section needs more explanation.")*
	Performance Summary	Feedback that summarises the student's overall performance against assessment criteria or expectations. *(e.g. "This report meets most requirements but would benefit from deeper critical reflection.")*
Agency	Active Role	Feedback that encourages students to take responsibility for their learning by initiating dialogue, reviewing feedback, or seeking additional resources. *(e.g. "You're welcome to ask about your draft in the next lab if you'd like more input.")*
	Affirmation and Encouragement	Feedback that acknowledges student effort or achievement and motivates them to continue developing. *(e.g. "You've made good progress with your argument structure this time.")*
	Student-Teacher Relationship	Feedback that conveys care, interest, or positive regard, helping to build a productive teacher-student relationship. *(e.g. "It's been great to see how your thinking has developed over the semester.")*

Table 2
Prompting strategies for GPT feedback generation: without learner-centered framing (Prompt 1) vs with learner-centered framing (Prompt 2), with key differences highlighted in red.

Prompt Condition	Prompt Strategy	Prompt Text
Prompt 1 (without learner-centered feedback framing)	Role-prompting	You are an expert in providing feedback for students in higher education.
	Context of feedback	You will be provided with textual content of a data science project proposal in a postgraduate course in higher education.
	Instruction	Your task is to analyze this proposal and provide feedback based on the following five criteria: """(1). A clear description of the goals of the project, (2). Appropriateness of the topic to data science, (3). A clear description of the business benefits, (4). Novelty/creativity, and (5). Overall clarity of the report""".
Prompt 2 (with learner-centered feedback framing)	Role-prompting	You are an expert in providing learner-centered feedback for students in higher education.
	Context of learner-centered feedback	Learner-centered feedback is structured around three key dimensions: Future Impact, Sensemaking, and Agency, each playing a crucial role in supporting student learning. Future Impact ensures that feedback provides actionable guidance to help students improve their future performance. Sensemaking helps students understand their strengths and weaknesses through clear explanations. Agency encourages active engagement, fostering self-regulation and ownership of learning. These dimensions are often characterised by feedback of different characteristics, as detailed below. """The dimension of future impact is often characterised by (i) comments which provide actionable information to help the student improve aspects of similar tasks they may undertake in the future; (ii) comments which provide actionable information to help the student achieve the learning outcomes for the subject; and (iii) comments which provide actionable information to help the student develop learning skills, processes, or strategies that could be useful across and beyond their degree. The dimension of sensemaking is often characterised by (i) comments which highlight strengths and weaknesses in terms of specific aspects of the student's task, such as grammar, content, structure, etc. and (ii) comments which summarize the overall strengths and weaknesses of the student's performance in relation to the learning outcomes/assessment criteria. The dimension of agency is often characterised by (i) comments which encourage the student to take an active role by discussing their work with the teacher or tutor, engaging in further study, or seeking help from sources other than the teacher; (ii) comments which affirm the student's achievement on the completed performance and/or encourage them in future work, and (iii) comments which help build a supportive teacher-student relationship, making students more receptive to feedback""".
	Context of feedback	You will be provided with textual content of a data science project proposal in a postgraduate course in higher education.
	Instruction	Your task is to analyze this proposal and provide learner-centered feedback based on the following five criteria: """(1). A clear description of the goals of the project, (2). Appropriateness of the topic to data science, (3). A clear description of the business benefits, (4). Novelty/creativity, and (5). Overall clarity of the report""".

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