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Formative Assessment and Technology-Mediated Feedback in Higher Education: An Exploratory Study[1]

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Abstract: Digital technologies and generative artificial intelligence (AI) expand opportunities for feedback, but their formative value depends on how evidence of learning is interpreted and used to inform subsequent teaching and learning decisions. This article develops a human-centred framework for technology-mediated formative assessment that conceptualises formative assessment as a regulatory process and connects it with assessment as learning student feedback literacy, and evaluative judgement in the context of generative AI. Rather than replacing the teacher or acting as an autonomous pedagogical mediator, generative AI is here regarded as a fallible resource, whose contribution depends on its integration into deliberately designed assessment processes in which human mediation precedes and follows its use. The article also presents the VAFET study, which adopts a quantitative, non-experimental, cross-sectional survey design with descriptive and exploratory aims. Participants were a convenience sample of 181 third-year students enrolled in the bachelor's degree programme in Educational Sciences at the University of Catania. A structured online questionnaire of 66 closed-ended items examines: 1) students' digital profiles, 2) their experiences and perceptions of traditional and technology-mediated formative assessment, 3) the perceived contribution of technology-mediated feedback to cognitive, emotional and behavioural engagement, 4) their autonomous study practices, and 5) the perceived contribution of evaluative exchanges with peers and lecturers Findings are interpreted as context-specific accounts of self-reported experiences and perceptions, not as direct evidence of learning gains or causal effects. The framework locates the formative value of technology in its contribution to students' interpretation of evidence, exercise of judgement, purposeful revision and progressive regulation of learning.

Keywords: formative assessment; generative artificial intelligence; student engagement

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1. Introduction

In recent decades, formative assessment has evolved from a relatively limited area of educational measurement to become a key framework for understanding how teaching and learning can be managed as they progress. The distinction

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between formative and summative functions, first proposed by Scriven (1967) and subsequently applied in the classroom by Bloom et al. (1971), established the idea that assessment could support learning rather than merely certify achievement. This conceptual shift remains central to current understandings of formative assessment: assessment is not formative simply because it is informal, digitally delivered or administered prior to a final examination.

Black and Wiliam (2009) identify the defining feature of formative assessment as the elicitation, interpretation and use of evidence by lecturers, learners or peers to make better-informed decisions about subsequent instructional steps. This definition distinguishes formative from summative assessment without reducing the distinction to timing or instrument type; the same task may serve a summative function when used to certify achievement, or a formative function when its evidence informs revision, reteaching, strategic adjustment, or further practice. From this perspective, assessment is integral to pedagogy rather than an external procedure appended to teaching. However, making learning visible is only one part of the process: evidence must also be interpreted in relation to the intended learning outcomes, quality criteria, and learners' current understanding. It must then be translated into opportunities for improvement. In the Italian debate, Trinchero (2023) and Grion and Serbati (2019) have also linked formative assessment to self-assessment, learner autonomy, and students' active participation in assessment processes.

Digital technologies expand the possibilities for collecting and communicating evidence of learning. Online quizzes, digital rubrics, e-portfolios, learning analytics dashboards, automated writing evaluation and intelligent tutoring systems can provide such evidence more quickly and across a wider range of activities. However, greater availability of data and feedback does not necessarily lead to improved learning. A platform may display performance information without offering pedagogical guidance on how to interpret it, and an automated system may produce extensive comments without ensuring learners understand, evaluate or use them.

This gap becomes more pronounced with generative artificial intelligence. Unlike systems limited to scoring predefined responses, generative AI can produce explanations, suggest revisions, generate examples, and engage in iterative dialogue about open-ended work. These capabilities may help address persistent challenges in formative assessment, such as delayed feedback and the difficulty of providing personalised support to large groups of students. Nevertheless, generative systems may also produce inaccurate explanations, biased responses, or recommendations that are misaligned with disciplinary expectations and local assessment criteria. Therefore, their educational value cannot be inferred from the fluency, immediacy or apparent personalisation of their outputs.

The debate consequently involves competing expectations. On the one hand, AI-supported feedback is valued for its potential to provide timely assistance and to support revision; on the other hand, readily available guidance may encourage uncritical acceptance of, and dependence on, automated responses, or even substitute for students' own reasoning. These possibilities are not mutually exclusive: their relevance depends on how technologies are embedded in assessment activities and the forms of participation those activities require.

The central question, then, is not whether digital technologies are inherently beneficial or harmful, but rather under what pedagogical, organisational and ethical

conditions they can support formative assessment while preserving human mediation and learner agency.

Distinguishing information delivery from formative feedback processes, personalisation from pedagogical responsiveness, and efficient task completion from the development of understanding and self-regulation is key to addressing this question.

Based on these distinctions, the present article brings formative assessment theory into dialogue with the concepts of assessment as learning, feedback literacy (Carless and Boud, 2018), self-regulated learning (Panadero, 2017; Nicol & Macfarlane Dick, 2006) evaluative judgement, and research on generative AI. It argues that the formative contribution of generative AI depends on how lecturers and students frame, interpret and follow up its use. The article then presents the VAFET exploratory study, which was conducted with third-year students enrolled in the Bachelor's degree programme in Educational Sciences at the University of Catania.

2. Formative Assessment as a Regulatory Process: Learner Agency, Evaluative Judgement, and Technology-Mediated Feedback

The process of formative assessment can be understood as a recursive form of educational regulation. It involves clarifying learning goals and assessment criteria, gathering evidence of current understanding, interpreting that evidence, identifying appropriate next steps, enabling learners to act on them, and examining the consequences

The Organisation for Economic Co-operation and Development (OECD, 2025) describes formative assessment and feedback as a continuous loop or spiral, whereby information about progress leads to action, generating new evidence in the process. Within this cycle, lecturers' contextual judgement and students' agency remain essential.

This regulatory perspective distinguishes formative assessment from related practices, such as frequent testing or merely providing comments, by focusing on the continuous improvement of learning and performance. Similarly, adaptation is not necessarily formative. A digital system may allocate different activities to different learners without providing an explanation for these decisions or allowing learners to develop greater control over their learning. In line with this view, the OECD (2025) associates' formative assessment with responsiveness to students' thinking and their use of assessment information.

Learner participation is key to distinguishing between assessment for learning and assessment as learning. The former emphasises using evidence to guide teaching and learning, while the latter foregrounds learners' metacognitive participation in interpreting evidence and regulating their own actions. These approaches are complementary rather than mutually exclusive and integrating them extends assessment beyond correcting an immediate product to developing capabilities that learners can apply to future tasks. In this respect, Grion and Serbati (2019) emphasise the importance of partnering with students to develop assessment and self-assessment capabilities that extend beyond individual tasks. Meanwhile, Trinchero (2023) situates self-assessment within the learning process, connecting it to the examination of reasoning, strategies, and possibilities for improvement.

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Within this framework, feedback is better understood as an educational process than as a standalone message. Its effectiveness depends not only on the accuracy of the information provided, but also on learners' ability to interpret and apply it. For instance, an accurate comment could be ineffective if it lacks intelligible criteria, arrives after the opportunity for revision has passed, or requires actions that learners are unable to undertake. Conversely, concise feedback can be productive when embedded in dialogue, comparison, and further practice. The OECD (2025) consistently emphasises the importance of enabling students to reflect on and act upon feedback.

Participating in the feedback process requires learners to seek information, formulate questions, negotiate meaning and manage the emotional implications of evaluation. In their longitudinal investigation of feedback-seeking experiences, Carless and Young (2024) link feedback literacy to reflection on interactions, enabling students and lecturers to develop an understanding of work in progress. Their account of reflective feedback literacy shows that learners are not passive recipients of corrective information; rather, they can use previous experiences to improve how they seek, interpret, and respond to feedback.

Lecturers, in turn, act as designers and mediators of feedback processes, rather than solely as producers of comments. Their responsibilities include selecting appropriate tasks, communicating criteria, organising comparisons, supporting dialogue and ensuring that learners can act on feedback before the end of an assessment sequence. Lecturers must also interpret evidence in relation to disciplinary expectations, learner characteristics and the purpose of the activity. Assessment literacy involves more than collecting information; it also involves making defensible decisions about its meaning and educational use. Yan and Pastore's (2022) development and validation of the Teacher Formative Assessment Literacy Scale contribute to this discussion by focusing on the professional capabilities associated with assessment that supports learning. Read alongside Pastore's (2023) systematic review of teacher assessment literacy, this work supports the idea that technology-mediated assessment requires professional judgement as well as technological design. Access to a platform, dashboard, or automated feedback function does not replace the expertise required to align evidence, interpretation, and action with educational purposes.

Generative AI introduces an additional evaluative demand: learners must assess not only their own work, but also the quality of the guidance generated by the system. Bearman et al. (2024) identify three interconnected areas of evaluative judgement: evaluating AI-generated outputs, evaluating the processes through which learners interact with generative AI, and considering how AI might contribute to assessing students' evaluative judgements. Their analysis emphasises the importance of students examining the credibility, relevance and adequacy of generated information in relation to disciplinary standards and task requirements.

In this context, the distinction between assessment for learning and assessment as learning (Earl, 2003; 2013) becomes particularly relevant. While generative AI can contribute to assessment for learning by providing provisional explanations and feedback, its contribution to assessment as learning hinges on students critically examining, justifying and monitoring their use of that information. Simply incorporating an AI recommendation without considering its basis may improve a product without strengthening the learner's understanding of quality. Conversely,

requiring students to compare recommendations with assessment criteria, identify weaknesses, and justify acceptance or rejection can foster the development of evaluative judgement. However, as Bearman et al. (2024) caution, exercising judgement through AI use does not necessarily lead to the development of good judgement. Hence, the quality of that judgement must become an explicit educational concern.

This also applies to the ways in which students obtain feedback. The formulation of prompts, the selection of contextual information, the interpretation of responses and the decision to seek additional evidence all shape the interaction and should be regarded as part of the learning process rather than purely technical preliminaries. As a result, evaluating an AI response involves scrutinising not only its content, but also how it was elicited.

For the purposes of this article, technology-mediated formative feedback is defined as a deliberately designed process in which digital systems assist in eliciting, representing, generating, or circulating information relevant to learning. Teachers, students, and peers then interpret and use such evidence to regulate further activity. This definition distinguishes between the technological functionality and the pedagogical purpose of digital annotations, automated corrections and adaptive dialogues, recognising that they may involve substantially different forms of learner participation. The central analytical question is not simply what information a technology can produce, but how its use shapes learners' relationships with criteria, judgement, and action.

3. Materials and Methods

The VAFET study (Formative Assessment and Technology-Mediated Feedback in University Education: Students' Perceptions and Experiences), which was conducted by the Department of Educational Sciences at the University of Catania, adopted a quantitative, non-experimental, cross-sectional survey design with descriptive and exploratory objectives. A non-probabilistic convenience sample of 181 third-year students was recruited during Experimental Pedagogy lecturers. Data were collected between 1 and 13 October 2026 via a structured online questionnaire on Google Forms. The 66 closed-ended items in the questionnaire were organised into 16 thematic sections, and the questionnaire was preceded by a participant information sheet and a consent request. The background section collected information on age, gender, degree programme and year of study, academic progression status, employment status, and self-reported special educational needs certification. Students' digital profiles were described through IT certification status, self-rated digital competence, and frequency of technology use for university studies. Subsequent sections addressed students' experiences of traditional and technology-mediated formative assessment and their perceptions of digital assessment practices, as well as the contribution of technology-mediated feedback to cognitive, emotional, and behavioural engagement. Further sections focused on autonomous study practices, including planning, managing study environments and resources, and monitoring progress, as well as the perceived contribution of evaluative exchanges with peers and lecturers to identifying weaknesses, critically appraising academic work and revising it, and applying feedback to subsequent tasks. Response formats included categorical options and five-point scales measuring perceived competence, frequency, and agreement.

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The questionnaire included some filter questions that directed respondents to experience-specific sections according to their previous answers. Students who reported that their lecturers had not used technology-mediated formative assessment were directed to section 10, as were those who reported not having received technology-mediated feedback. Consequently, sections 5–6 concerning technology-mediated assessment as learning were completed by 173 students, while sections 7–9 concerning technology-mediated feedback were completed by 160 students. Sections 14 and 16 were completed by 173 and 122 students, respectively. For these conditional sections, percentages were calculated based on the number of eligible respondents, and missing responses resulting from questionnaire branching were distinguished from non-response to applicable items. Participation was voluntary and anonymous. Students completed the questionnaire after reading the information sheet and providing informed consent. The findings are reported in aggregate form.

Data were analysed using Jamovi (version 28.7; 2026), an open-source statistical software package. Due to the sample size and the ordinal nature of most variables, the analysis was limited to describing participant characteristics and response distributions using frequencies and percentages. The findings should be interpreted as context-specific accounts of self-reported experiences, practices, and perceived educational contributions within the participating group. They should not be taken as direct evidence of learning gains or the causal effects of technology-mediated assessment and feedback.

4. Results

4.1. Participants

The sample comprised 181 third-year students enrolled in the bachelor's degree programme in Educational Sciences at the University of Catania, Italy. Participants were recruited through non-probabilistic convenience sampling on a voluntary and anonymous basis. All respondents gave informed consent, and there were no missing data on the socio-demographic items.

Item 1 - How old are you?

Responses	Frequency	% of the total	% Cumulative
<21 years	33	18.2%	18.2%
21 years	85	47.0%	65.2%
22 years	28	15.5%	80.7%
23 years	10	5.5%	86.2%
>23 years	25	13.8%	100.0%

Table 1. Age frequency distribution

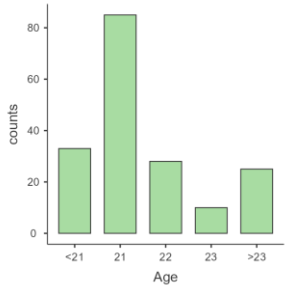


Figure 1. Age distribution chart

Age was collected through a closed-ended item with five predefined categories; consequently, raw age values are not available, and age is treated as an ordinal variable. Of the 181 participants, 33 students (18.2%) were under 21, 85 (47.0%) were 21, 28 (15.5%) were 22, 10 (5.5%) were 23 and 25 (13.8%) were over 23.

Item 2 - How would you describe your gender identity?

Responses	Frequency	% of the total
Female	176	97.2%
Male	5	2.8%

Table 2. Gender identity frequency distribution

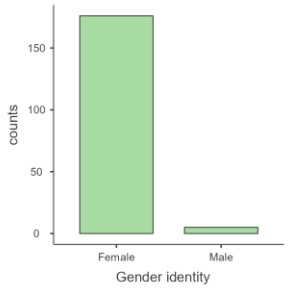


Figure 2. Gender identity distribution chart

Gender identity was assessed through an item offering five answers options (female, male, non-binary, other identity, prefer not to answer). The sample was predominantly female (n=176; 97.2%), with 5 participants identifying as male (2.8%); no participant selected the remaining options.

Item 3 - What is your enrollment status?

Responses	Frequency	% of the total
Delayed	4	2.2%
On track	177	97.8%

Table 3. Academic progress regularity frequency distribution

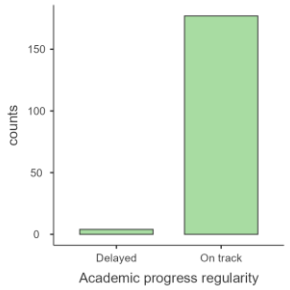


Figure 3. Academic progress regularity distribution chart

Most students reported being enrolled within the normal duration of the programme n=177 (97.8%), while 4 (2.2%) reported being enrolled beyond it.

Item 4 - Are you a working student?

Responses	Frequency	% of the total
No	139	77.2%
Yes	41	22.8%

Table 4. Working student status frequency distribution

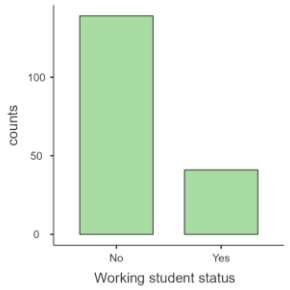


Figure 4. Working student status distribution chart

In addition, 41 participants (22.7%) described themselves as working students, indicating that just under a quarter of the sample combined university study with work.

Item 5 - Are you a student with certified Special Educational Needs?

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Responses	Frequency	% of the total
No	165	91.2%
Yes	16	8.8%

Table 5. Special educational needs frequency distribution

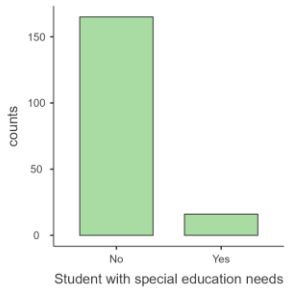


Figure 5. Special educational needs distribution chart

Finally, 16 students (8.8%) reported having certified Special Educational Needs.

4.2. Students' digital profile

The analysis of self-reported technological skills and the frequency of use of digital tools and artificial intelligence provide a detailed picture of the strengths and weaknesses of the student group.

Item 6 - How would you rate your level of competence in basic technical problem-solving and IT skills (e.g., software installation, managing updates, troubleshooting minor issues)?

Responses	Frequency	% of the total	% Cumulative
Inadequate	14	7.7%	7.7%
Basic	85	47.0%	54.7%
Intermediate	63	34.8%	89.5%
Advanced	16	8.8%	98.3%
Expert	3	1.7%	100.0%

Table 6. Self-assessed IT skills frequency distribution

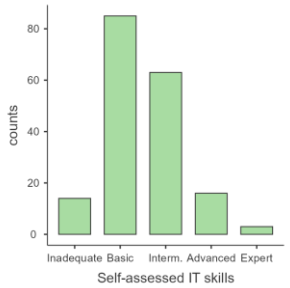


Figure 6. Self-assessed IT skills distribution chart

These data were self-reported on five-point ordinal scales and should therefore be interpreted as perceptions rather than as direct measures of skills. When asked to self-assess their general IT competence and their ability to solve basic technical problems, 14 students (7.7%) placed themselves at the *inadequate* level, 85 (47.0%) at the *basic* level, 63 (34.8%) at the *intermediate* level, 16 (8.8%) at the *advanced* level and only 3 (1.7%) at the *expert* level. More than half of the sample (54.7%) placed themselves at the inadequate or basic level.

Item 7 - How would you rate your level of competence in using digital tools safely, consciously, and responsibly (privacy, data security, copyright compliance)?

Responses	Frequency	% of the total	% Cumulative
Inadequate	9	5.0%	5.0%
Basic	71	39.2%	44.2%
Intermediate	68	37.6%	81.8%
Advanced	30	16.6%	98.3%
Expert	3	1.7%	100.0%

Table 7. Safe and responsible IT skills frequency distribution

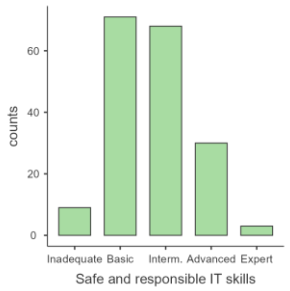


Figure 7. Safe and responsible IT skills distribution chart

A similar distribution, though slightly shifted towards the higher levels, emerges for the safe and responsible use of digital tools (privacy, data security and compliance with copyright regulations): 9 students (5.0%) placed themselves at the *inadequate* level, 71 (39.2%) at the *basic* level, 68 (37.6%) at the *intermediate* level, 30 (16.6%) at the *advanced* level and 3 (1.7%) at the *expert* level. In this case, the two lowest levels accounted for 44.2% of the sample.

Item 8 - With reference to the channels provided by the University (email, forums, institutional learning platforms), how would you rate your level of competence in online academic communication?

Responses	Frequency	% of the total	% Cumulative
Inadequate	5	2.8%	2.8%
Basic	48	26.5%	29.3%
Intermediate	77	42.5%	71.8%
Advanced	47	26.0%	97.8%
Expert	4	2.2%	100.0%

Table 8. Communication skills frequency distribution

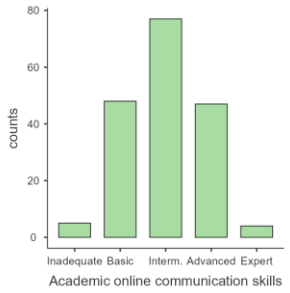


Figure 8. Communication skills distribution chart

Regarding online communication in an academic context via the university's institutional channels (email, forums and learning platforms), responses were mainly distributed across the *intermediate* (n=77; 42.5%), *basic* (n=48; 26.5%) and *advanced* (n=47; 26.0%) levels, while 5 students (2.8%) reported an *inadequate* level and 4 (2.2%) an *expert* level. Overall, more than a quarter of the sample (28.2%) placed themselves at the advanced or expert levels, the highest proportion among the competence areas examined; this is therefore the area in which students perceived themselves as most competent.

Item 9 - How would you rate your level of competence in evaluating the reliability of information generated by artificial intelligence systems?

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Responses	Frequency	% of the total	% Cumulative
Inadequate	5	2.8%	2.8%
Basic	64	35.4%	38.1%
Intermediate	86	47.5%	85.6%
Advanced	25	13.8%	99.4%
Expert	1	0.6%	100.0%

Table 9. AI information reliability skills frequency distribution

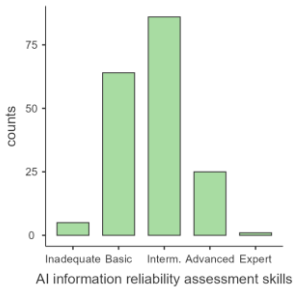


Figure 9. AI information reliability skills distribution chart

A critical issue for the informed adoption of artificial intelligence is the ability to assess the reliability of information generated by AI systems. In this regard, the sample predominantly falls within the *intermediate* 86 students (47.5%) and *basic* 64; (35.4%) levels, compared to 25 students (13.8%) at the *advanced* level and 1 student (0.6%) at the *expert* level. Finally, 5 students (2.8%) rated themselves as having an *inadequate* level. More than a third of the sample (38.1%) rated their competence in this area as basic or inadequate; however, as this is a self-assessment, actual competence may differ.

Item 10 - How frequently do you use digital tools for university study?

Responses	Frequency	% of the total	% Cumulative
Never	3	1.7%	1.7%
<1/week	8	4.4%	6.1%
1/week	15	8.3%	14.4%
2-3/week	58	32.0%	46.4%
Daily	97	53.6%	100.0%

Table 10. Digital tool usage frequency distribution

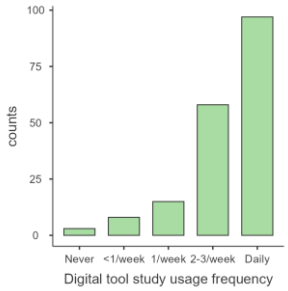


Figure 10. Digital tool usage frequency distribution chart

The results also show that digital tools are widely integrated into everyday study practices. In fact, 97 students (53.6%) state that they use digital tools for their studies *every day or almost every day*; 58 students (32.0%) use them *two or three times a week*; 15 students (8.3%) use them *once a week*; 8 students (4.4%) use them *less than once a week* and 3 students (1.7%) *never* use them.

Item 11 - How frequently do you use artificial intelligence-based technologies for university study?

Responses	Frequency	% of the total	% Cumulative
Never	8	4.4%	4.4%
<1/week	35	19.3%	23.8%
1/week	34	18.8%	42.5%
2-3/week	65	35.9%	78.5%
Daily	39	21.5%	100.0%

Table 11. AI tool usage frequency distribution

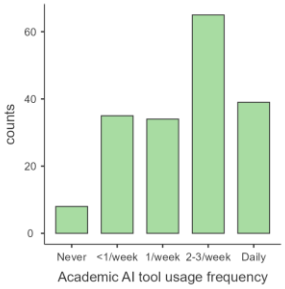


Figure 11. AI tool usage frequency distribution chart

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Regarding artificial intelligence-based technologies specifically, usage appears frequent but uneven: 39 students (21.5%) use them *every day or almost every day*, and 65 students (35.9%) use them *two or three times a week*. This totals 57.5% of the sample who use them at least twice a week. However, a significant proportion of the sample use them less frequently: 34 students (18.8%) use them *once a week*, 35 students (19.3%) use them *less than once a week*, and 8 students (4.4%) state that they *never* use them.

4.3. Perceived contributions of technology-mediated feedback and self-reported strategy monitoring

This section examines students' perceptions of the potential of technology-mediated feedback to support self-regulation, the understanding of assessment criteria and constructive dialogue with lecturers and peers. Because of the *filter questions* included in the questionnaire, the items on technology-mediated feedback were answered only by the 160 students who reported having received this form of feedback; the item on the self-assessment of study strategies, by contrast, was administered to the entire sample (N=181).

Item 12 - Technology-mediated feedback helped me better understand how to improve my assignments.

Responses	Frequency	% of the total	% Cumulative
Not at all	2	1.3%	1.3%
Slightly	25	15.6%	16.9%
Fairly	91	56.9%	73.8%
Very much	33	20.6%	94.4%
Fully	9	5.6%	100.0%

Table 12. Tech-mediated feedback for improvement frequency distribution

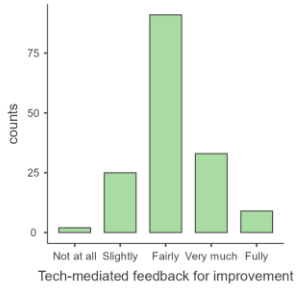


Figure 12. Tech-mediated feedback for improvement frequency distribution chart

Most respondents (n=160) reported that technology-mediated feedback had helped them understand how to improve their work. Specifically, 9 students (5.6%) *fully agreed*, 33 (20.6%) *very much agreed* and 91 (56.9%) fairly agreed with the statement, so that responses at or above the *fairly agree* level accounted for 83.1% (n=133). A further 25 students (15.6%) *slightly agreed*, while 2 (1.3%) did *not agree at all*.

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Item 13 - Technology-mediated feedback prompted me to reflect on the criteria used to evaluate my assignments.

Responses	Frequency	% of the total	% Cumulative
Not at all	2	1.3%	1.3%
Slightly	28	17.5%	18.8%
Fairly	91	56.9%	75.6%
Very much	31	19.4%	95.0%
Fully	8	5.0%	100.0%

Table 13. Tech-mediated feedback for evaluation criteria frequency distribution

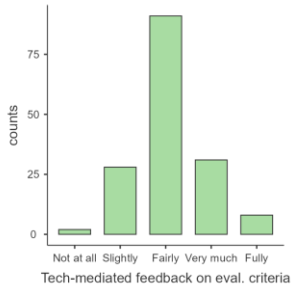


Figure 13. Tech-mediated feedback for evaluation criteria frequency distribution chart

A similar pattern emerges for the capacity of technology-mediated feedback to stimulate reflection on the criteria used to assess students' work. In this case, 91 students (56.9%) *fairly agreed*, 31 (19.4%) *very much agreed* and 8 (5.0%) *fully agreed* with the statement, for an overall positive response rate of 81.3%, closely in line with the previous item. Conversely, 28 students (17.5%) *slightly agreed* and 2 (1.3%) did *not agree at all*.

Item 14 - Technology-mediated feedback fostered constructive dialogue with instructors and peers.

Responses	Frequency	% of the total	% Cumulative
Not at all	5	3.1%	3.1%
Slightly	32	20.0%	23.1%
Fairly	93	58.1%	81.3%
Very much	23	14.4%	95.6%
Fully	7	4.4%	100.0%

Table 14. Tech-mediated feedback for dialogue frequency distribution

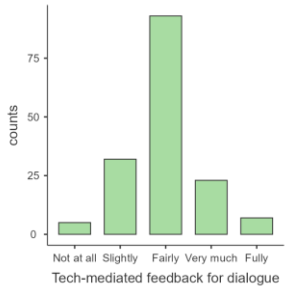


Figure 14. Tech-mediated feedback for dialogue frequency distribution chart

Turning to the relational and dialogical dimension of engagement, the statement that technology-mediated feedback fosters constructive dialogue with teachers and peers received somewhat less support. While 93 students (58.1%) *fairly agreed*, 23 (14.4%) *very much agreed* and 7 (4.4%) *fully agreed* (76.9% overall), the share of less favourable responses was higher than for the cognitive items: 32 students (20.0%) *slightly agreed* and 5 (3.1%) did *not agree at all*, for a total of 23.1%. The two highest levels of agreement together accounted for only 18.8% of responses, suggesting that technology-mediated feedback is perceived as less effective in supporting the relational and dialogic dimension of learning than in fostering reflection on one's own work.

Item 15 - I evaluate the effectiveness of the strategies I use, recognizing when they are not working.

Responses	Frequency	% of the total	% Cumulative
Never	5	2.8%	2.8%
Rarely	7	3.9%	6.6%
Sometimes	41	22.7%	29.3%
Often	90	49.7%	79.0%
Always	38	21.0%	100.0%

Table 15. Self-evaluation of strategy effectiveness frequency distribution

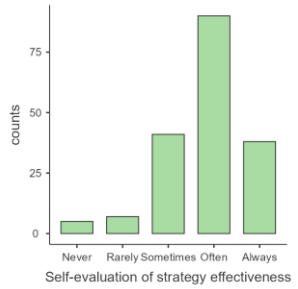


Figure 15. Self-evaluation of strategy effectiveness frequency distribution chart

The students' ability to assess the effectiveness of their own study strategies, and recognise when they are not working, was investigated across the entire sample (N=181). The results showed that 90 students (49.7%) do this *often*, 38 (21.0%) *always*, and 41 (22.7%) *sometimes*. Only a small minority stated that they do so *rarely* 7 (3.9%) or *never* 5 (2.8%).

5. Discussion

The findings are discussed considering the theoretical framework, bearing in mind the exploratory nature of the study and the fact that the data collected are descriptive, cross-sectional and self-reported.

5.1. Digital technologies and the teacher's mediating role

Digital technologies are widely integrated into students' study practices: over half of the sample (53.6%) use digital tools for study every day or almost every day, and a similar proportion (57.5%) use AI-based tools at least twice a week. Alongside this widespread use, self-perceived competence in assessing the reliability of AI-generated information is mostly intermediate or basic, with only about one student in seven rating it as advanced or expert. Considered separately, these two findings suggest that, at the sample level, frequent AI use is accompanied by a predominantly intermediate or basic perception of critical competence. However, the relationship between the two dimensions at the individual level was not analysed in the present study and will be examined in the next phase of the research using a larger sample. These findings echo Bearman et al.'s (2024) view that evaluative judgement of generative AI outputs must be intentionally developed through formative assessment practices and underline the need for instructional design in which teachers play an explicit mediating role, guiding and structuring students' use of AI (OECD, 2026).

5.2. Perceived effectiveness of technology-mediated feedback

Among the students who had experienced, at least in part, both technology-mediated formative assessment and technology-mediated feedback (n=160), agreement was broad but predominantly moderate: "fairly agree" was the most frequent response on all items, while the two highest levels of agreement were selected by a minority of respondents. More than four in five students reported that the feedback had helped them understand how to improve their work and had

prompted them to reflect on the assessment criteria, whereas agreement was lower, at about three in four, for its contribution to constructive dialogue with lecturers and peers. Technology-mediated feedback thus appears to be perceived as supporting, above all, the understanding and regulation of one's own work and participation in course activities, while its contribution to the emotional dimension, including its dialogic and relational aspects, appears less pronounced. Given the small size of these differences, this interpretation should be regarded as tentative. It is nonetheless consistent with the view that feedback fulfils a formative function when it is used to modify teaching and learning processes (Black & Wiliam, 1998), and with studies highlighting the role of dialogic and relational interactions in students' processing and use of feedback (Carless & Young, 2024).

5.3. Towards an educational ecology geared towards autonomy

Regarding the self-monitoring of learning, more than two thirds of students (70.7%) reported that they often or always evaluate the effectiveness of their study strategies and recognise when these are not working, while only a small minority stated that they rarely or never do so. As these are self-reported behaviours, the data cannot be taken as a direct measure of metacognitive skills; rather, they may reflect a disposition favourable to monitoring one's own learning, which could provide a basis for the development of evaluative judgement. Together with the positive perceptions of technology-mediated feedback discussed above, this suggests a favourable starting point for assessment practices oriented towards autonomy. However, the data also highlight room for improvement: agreement with the feedback items was mostly moderate, between one in six and almost one in four students, and almost three in ten students evaluate the effectiveness of their strategies only sometimes, rarely or never. These findings suggest that the challenge for university teaching lies in designing assessment practices, including hybrid ones that combine face-to-face and technology-mediated feedback, which support the progressive development of independent judgement among prospective educators (Trinchero, 2023), guiding them in interpreting quality criteria, calibrating their self-assessments and critically scrutinising AI outputs. Bearman et al. (2024) argue that practices of this kind can help counteract the uncritical use of generative AI tools; however, this risk was not directly investigated in the present study and represents a direction for the next phase of the research.

5.4. Limits of the study

The findings should be interpreted considering the exploratory nature of the study and its limitations. The non-probabilistic convenience sample is limited to students from a single degree programme at a single university, and participation was voluntary, which may have introduced self-selection bias. The sample also shows a marked prevalence of female participants; as its correspondence with the composition of the reference population has not been verified, the generalisability of the findings beyond the group examined is limited. The analyses were descriptive and univariate, and the data, entirely self-reported, capture perceptions that may differ from actual competences and behaviours, particularly about self-assessed digital and AI-related competences, which may be overestimated. Furthermore, the items on technology-mediated feedback were administered only to the subgroup of

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respondents (N=160) who, according to the filter questions, had experienced this form of feedback at least in part.

6. Conclusions

This exploratory study described the use of digital technologies and artificial intelligence systems, and the perceptions of technology-mediated feedback, among third-year students enrolled in the Bachelor's degree programme in Educational Sciences at the University of Catania, as a first step towards examining the relationship between these dimensions in the next phase of the research.

Regarding students' digital profiles, digital tools emerged as a stable component of study practices, used every day or almost every day by more than half of the participants, while self-rated digital competence was mostly basic or intermediate. Self-assessed competence in evaluating the reliability of AI-generated information was likewise predominantly basic or intermediate, and more than a third of students placed themselves at the basic or inadequate level. Although based on self-reports, these findings point to the importance of developing the critical skills required to evaluate digital and AI-generated content, which are particularly relevant for students preparing for careers in education.

Most students who had received technology-mediated feedback reported that it had helped them understand how to improve their work and prompted them to reflect on the criteria used to assess it. Agreement was lower, and less often strong, for its contribution to constructive dialogue with lecturers and peers, suggesting that the dialogic and relational dimension of feedback is perceived as less supported.

These findings are consistent with the view that the availability of technology-mediated feedback does not in itself ensure its formative use: to support learning, it needs to be integrated within a pedagogical framework that promotes feedback literacy and the development of evaluative judgement.

From a pedagogical perspective, the findings point to the importance of designing university assessment practices that build on the self-monitoring reported by most students, while supporting the substantial minority who evaluate their study strategies only occasionally or not at all. Such practices could combine face-to-face and technology-mediated feedback and use generative AI as a fallible resource, whose outputs students are guided to compare with assessment criteria, question and justify, with lecturers' mediation gradually giving way to students' independent judgement. Further research involving lecturers would be needed to identify the professional development required to design such practices.

References

Bearman, M., Tai, J., Dawson, P., Boud, D., & Ajjawi, R. (2024). Developing evaluative judgement for a time of generative artificial intelligence. *Assessment & Evaluation in Higher Education*, *49*(6), 893-905. https://doi.org/10.1080/02602938.2024.2335321

Black, P., & Wiliam, D. (1998). Assessment and Classroom Learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7-74. https://doi.org/10.1080/0969595980050102

Black, P., Wiliam, D. Developing the theory of formative assessment. *Educ Asse Eval Acc* 21, 5-31 (2009). https://doi.org/10.1007/s11092-008-9068-5

Bloom, B. S., Hastings, J. T., & Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning*. New York: McGraw-Hill.

Carless, D., & Boud, D. (2018). The development of student feedback literacy: Enabling uptake of feedback. *Assessment & Evaluation in Higher Education*, 43(8), 1315–1325. https://doi.org/10.1080/02602938.2018.1463354

Carless, D., & Young, S. (2024). Feedback seeking and student reflective feedback literacy: A sociocultural discourse analysis. *Higher Education*, 88, 857–873. https://doi.org/10.1007/s10734-023-01146-1

Earl, L. M. (2003). *Assessment as learning: Using classroom assessment to maximize student learning*. Corwin Press.

Grion, V., & Serbati, A. (2019). *Valutazione sostenibile e feedback nei contesti universitari: Prospettive emergenti, ricerche e pratiche*. Lecce: Pensa Multi Media.

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. Studies in Higher Education, 31(2), 199–218. https://doi.org/10.1080/03075070600572090

OECD (2025), *Unlocking High-Quality Teaching*, OECD Publishing, Paris, https://doi.org/10.1787/f5b82176-en

OECD (2026), *Digital Education Outlook 2026: Exploring Effective Uses of Generative AI in Education*, OECD Publishing, Paris, https://doi.org/10.1787/062a7394-en

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. Frontiers in Psychology, 8, Article 422. https://doi.org/10.3389/fpsyg.2017.00422

Pastore, S. (2023). Teacher assessment literacy: A systematic review. *Frontiers in Education*, *8*, Article 1217167. https://doi.org/10.3389/feduc.2023.1217167

Scriven, M. (1967). The methodology of evaluation. In R. W. Tyler, R. M. Gagné, & M. Scriven (Eds.), *Perspectives of curriculum evaluation* (AERA Monograph Series on Curriculum Evaluation, No. 1, pp. 39-83). Rand McNally.

The jamovi project (2026). *jamovi* (Version 2.7) [Computer Software]. https://www.jamovi.org

Trinchero, R. (2023). Assessment as learning in università. Costruire le capacità autovalutative degli studenti. *Pedagogia Oggi*, *21*(1), 108–117. https://doi.org/10.7346/PO-012023-12

Yan, Z., & Pastore, S. (2022). Are teachers literate in formative assessment? The development and validation of the Teacher Formative Assessment Literacy Scale. *Studies in Educational Evaluation*, *74*, Article 101183. https://doi.org/10.1016/j.stueduc.2022.101183