

Feedback in Technical Higher Education

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Abstract

Feedback is an important tool in all activities, used to improve communication, relationships, and performance. In educational environments, its role is to facilitate interaction between students and teachers, helping clarify expectations, correct misunderstandings, and guide learning processes. Its effectiveness depends not only on its presence but also on how it is perceived by students in terms of clarity, relevance, and usefulness. This paper investigates student perspective of feedback based on a custom-designed questionnaire applied among 125 students from different domains of a technical faculty, focusing on the aforementioned aspects. The results indicate that feedback is relatively clear, but less effective in supporting learning, and it is not provided frequently. Despite this, students express a relatively strong desire for more feedback. We also made a cluster analysis, which reveals three distinct student profiles. The largest group consists of engaged students who receive frequent, clear, and effective feedback. A second group includes students who receive limited and low-quality feedback but express a strong desire for improvement. The third group is characterized by disengaged students who perceive feedback as ineffective and show little interest in receiving more.

Keywords: cluster analyses, feedback, higher education, student perspective, technical faculty

1. Introduction

In professional, social, and educational environments, feedback is important because it helps people to identify strengths and weaknesses, adjust their behaviors, and improve their relations or performances. Using effective feedback, the actors who are involved in different activities have

more positive experiences because collaboration is facilitated, and thus the innovative side can be increased (Lee et al., 2021). In educational contexts, feedback represents an essential element influencing both the teaching and the learning processes, contributing to academic development, motivation, and student engagement (Williams, 2024). In higher education, it helps students better understand both their strong points and the aspects that require improvement. Through constructive feedback, teachers can guide students toward enhanced academic achievement (Simonsmeier et al., 2020), supporting also the development of knowledge, skills, and critical thinking abilities. Practically, it is an important component of the educational process (Ilie, 2024). Ideally, feedback should encourage reflection, motivation, and continuous progress, helping students improve the quality of their work and learning strategies (Sanchez-Gil-Machín et al., 2025).

Unfortunately, in some situations, feedback is not perceived positively by students, and in this case, they might not use the received information (Jonsson, 2013). Since feedback often focuses on mistakes, weaknesses, or areas that need correction, it may sometimes be interpreted as criticism rather than support, and it can affect their self-esteem (Nemt-allah et al., 2026). This perception can generate anxiety, discomfort, or resistance, particularly when feedback is delivered in a vague or excessively evaluative manner.

In educational environments, another significant factor is the relationship between teachers and students (Wongvorachan et al., 2022), where instructors are frequently associated with authority and evaluation. As a result, some students may perceive feedback more as a judgment process than as a constructive learning opportunity, or they ignore it and look only to the grades (Paterson et al., 2020). These aspects highlight the importance of understanding how students perceive feedback and what factors influence their effectiveness within the educational process. Modern educational approaches increasingly view feedback as an interactive process in which students actively use and apply feedback to improve future learning, rather than simply receiving information (Winstone & Boud, 2022).

The effectiveness of feedback does not depend only on its frequency. The quality, clarity, relevance, and applicability of feedback are equally important (Haughney et al., 2020) in determining its educational impact. Students may receive feedback frequently, but if it is too general or unclear, its influence on learning may remain limited. On the other hand, well-structured and meaningful feedback can significantly improve student understanding, confidence, and

academic performance. Therefore, it is important to analyze not only how often feedback is provided, but also how students perceive its usefulness and contribution to their learning process.

In higher education, particularly in engineering and technical programs, feedback is also crucial due to the complexity of the learning tasks and the practical nature of many activities. Students are required not only to assimilate theoretical concepts, but also to develop problem-solving abilities, analytical thinking, and practical skills. In this context, feedback can help students identify misunderstandings, correct errors, and improve their learning strategies.

The rapid development of digital and blended learning environments has also transformed the way feedback is delivered in higher education. Besides traditional oral feedback provided during face-to-face interactions, students increasingly receive written or online feedback through educational platforms, e-learning systems, and digital communication tools. These modern approaches offer flexibility and accessibility, but they also raise important questions regarding the effectiveness of different feedback forms and the way students perceive them (Kerman et al., 2024).

Starting from these considerations, the present paper investigates students' perspectives on feedback in technical higher education. The research is based on a custom-designed questionnaire applied to 125 students from different programs and years of study and analyzes several dimensions related to feedback, including frequency, perceived clarity, impact on learning, and students' desire to receive further feedback. In addition, we made a cluster analysis to identify distinct student profiles based on their feedback-related perceptions and attitudes.

2. Feedback Types

Feedback is widely recognized as one of the most important elements of the learning process, particularly in writing instruction and formative assessment. Feedback is no longer understood only as correction or evaluation, but increasingly as a dialogic and developmental process that supports students' learning, motivation, and self-regulation (Svanes et al., 2023). In contemporary educational literature, feedback can be classified according to both its function and its mode of delivery, and the most common categories include evaluative, descriptive, and prescriptive feedback, as well as oral, written, and online feedback.

Evaluative feedback can be defined as information that includes evaluations, comments, and recommendations for improvement delivered by a teacher, peer, oneself, or automated feedback systems (Quinlan & Pitt, 2025). It can be argued that higher education research has traditionally concentrated heavily on evaluative feedback and on how students interpret and use such comments. Although evaluative feedback can help students understand performance standards, it also has its limitations (Quinlan & Pitt, 2025). Evaluative feedback alone is often insufficient because it may focus more on judgment than on helping students understand the practical consequences of their actions and decisions.

Descriptive feedback provides students with information about what they did well, what problems exist in their work, and how specific aspects of performance can be improved. Unlike evaluative feedback, descriptive feedback focuses less on judgment and more on information and explanation. Positive reinforcement acknowledges successful aspects of a student's writing, while problem statements summarize the main issues that need improvement (Yoon et al., 2023). Explicit examples are particularly valuable because they identify concrete problematic sections in the text and illustrate them directly for students.

Prescriptive feedback, sometimes referred to as direct feedback, provides explicit suggestions or instructions about how students should improve their work. Rather than merely identifying strengths or weaknesses, prescriptive feedback tells learners what actions to take next. It can also be described as feedback that provides explicit instructions for revising the text, while indirect feedback encourages students to identify and correct mistakes themselves, and it may include questioning, informative comments, or concrete recommendations for revision (Baz & Aksoy, n.d.). Recent research therefore suggests that prescriptive feedback is most effective when it combines clear direction with specific examples and practical guidance that students can immediately apply during revision.

Oral feedback refers to spoken interactions between teachers and students during classroom activities, discussions, conferences, or collaborative work. Written and online feedback have become increasingly important due to the expansion of digital learning environments, automated writing evaluation systems, and AI-based educational tools. Because of the transition to online learning, it has significantly transformed feedback practices; written feedback became less formalized because communication increasingly occurred through chats, text messages, and digital

platforms (Svanes et al., 2023). The distinction between oral and written feedback also became less clear, as digital communication often combined features of both immediacy and textual interaction. Research further shows that online feedback can support flexibility and rapid communication, but it may also create challenges related to clarity, emotional connection, and student engagement (Svanes et al., 2023). Digital feedback practices are also increasing teachers' workload and requiring them to adapt quickly to new technological environments.

3. Methodology

We used a quantitative descriptive research design to investigate students' perspectives on feedback in technical higher education. This explored several dimensions related to feedback, including its frequency, perceived clarity and usefulness, impact on learning and improvement, preferred forms of feedback, and students' desire to receive further feedback. By analyzing these aspects, the purpose was to identify patterns in feedback-related attitudes and to highlight possible differences between student profiles.

The research instrument was a structured questionnaire designed for students from four technical higher education programs: electronics, telecommunications and information technologies (named IETTI), electrical engineering (named IE), electrical engineering and computers (IEC), and systems engineering (AIA), from Faculty of Automation, Computers Science, Electrical and Electronics Engineering, at "Dunarea de Jos" University of Galati, Romania. Participants were distributed across three years: I, II, and III. The questionnaire included both demographic questions and feedback-related items, combining Likert-scale and single-choice questions. Its structure has two main sections:

- Section 1 – Demographics: included questions regarding gender, year of study, and field of specialization/program.
- Section 2 – Feedback in the educational process: investigated several dimensions associated with feedback, including: frequency of feedback received from teachers; perceived clarity and usefulness of feedback; the extent to which feedback helps students understand mistakes and improve; students' desire to receive further feedback; preferred forms of feedback (oral, written/online); preferred feedback types (evaluative, prescriptive, descriptive).

For the questions regarding feedback frequency, responses ranged from “Never” to “Very frequently,” while agreement-based items ranged from “Strongly disagree” to “Strongly agree.” The Likert-type items were coded using ordinal scales ranging from 1 to 5, where higher values reflected more positive perceptions regarding feedback. The question regarding students’ desire to receive further feedback was coded on a 3-point ordinal scale. The questions related to preferred feedback forms were transformed into binary variables (0 = not selected, 1 = selected) for each feedback format.

The questionnaire was administered online using Google Forms in November 2025. Participation was completely voluntary, and all responses were anonymous. No personal data allowing participant identification was collected. A total of 125 valid responses were obtained and prepared for statistical analysis using IBM SPSS Statistics software.

The hypotheses formulated for this study are:

H1. Students who perceive feedback as more useful are more likely to express a stronger desire for further feedback.

H2. Feedback frequency is not significantly associated with the perceived impact of feedback on learning outcomes.

H3. Students can be grouped into distinct profiles based on their feedback-related perceptions and attitudes.

H4. Different student profiles exhibit different preferences regarding feedback forms and feedback types.

4. Results

This section presents the statistical analysis of the data collected through the applied questionnaire, used for testing the hypotheses formulated in the previous paragraph. This was realized with IBM SPSS Statistics. Descriptive statistics were first used to evaluate the overall distribution of responses and the average levels of feedback frequency, perceived usefulness, and learning impact. Spearman correlation analysis was applied to investigate relationships between the analyzed variables. K-means cluster analysis identifies distinct student profiles related to feedback perception and usefulness. The clustering process can group students according to similarities in their responses and to reveal potential differences in feedback-related attitudes and expectations.

In addition, ANOVA analysis was used to evaluate the statistical significance of the differences between clusters. First, we present basic demographic information collected, such as gender, year of study, and field of specialization. Their distributions are represented in **Figure 1**.

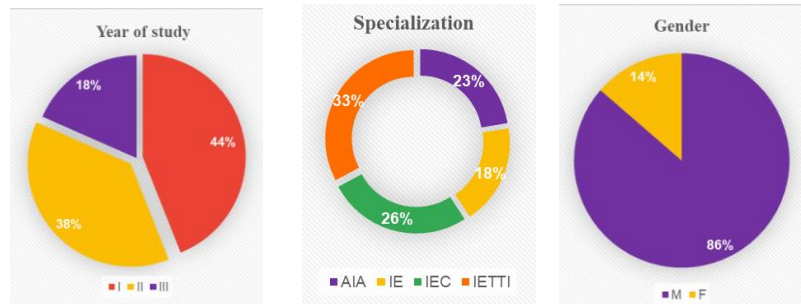


Figure 1. Participants' distributions

4.1. Descriptive analysis

Descriptive statistics were used to evaluate the general distribution of students responses regarding feedback frequency, perceived usefulness, learning impact, and students desire to receive further feedback. The results are summarized in **Table 1**. The analysis indicates that feedback is not provided very frequently within the educational process, with an average value of 2.88 on a 5-point scale. Students generally perceive feedback as relatively clear and useful, with an average value of 3.92. In addition, the statement regarding the contribution of feedback to understanding mistakes and improving learning obtained a mean value of 3.76, suggesting a moderately positive perception of feedback effectiveness. For the rest of the paper, we coded the items with V1, V2, V3, and V4, as can be seen in **Table 1**.

	N	Min.	Max.	Mean	Std. Deviation
How often do you receive feedback from teachers? (V1)	125	1	5	2,88	,885
The feedback received is clear and useful. (V2)	125	1	5	3,92	,714
Feedback helps me understand what I did wrong and evolve. (V3)	125	1	5	3,76	1,167
Would you like to receive feedback more often? (V4)	125	1	3	2,70	,571
Valid N (listwise)	125				

Table 1. Descriptive Statistics

At the same time, students expressed a relatively strong desire to receive further feedback, with an average value of 2.70 on a 3-point scale. These results suggest that, although feedback is generally appreciated by students, there is still a perceived need for more frequent and more effective feedback within technical higher education.

An interesting aspect revealed by the descriptive analysis is the difference between the perceived clarity of feedback and its actual contribution to learning improvement. Although students tend to perceive feedback as relatively clear, its educational impact appears to be slightly lower. This observation suggests that clear feedback does not always guarantee meaningful learning outcomes or improved academic performance.

4.2. Correlation analysis

Spearman correlation analysis was performed to investigate the relationships between feedback frequency, perceived usefulness, learning impact, and students' desire to receive additional feedback. The results are presented in **Table 2**.

			V1	V2	V3	V4
Spearman's rho	V1	Correlation Coefficient	1,000	,274**	,142	,088
		Sig. (2-tailed)	.	,002	,115	,328
		N	125	125	125	125
	V2	Correlation Coefficient	,274**	1,000	,210*	,070
		Sig. (2-tailed)	,002	.	,019	,441
		N	125	125	125	125
	V3	Correlation Coefficient	,142	,210*	1,000	,294**
		Sig. (2-tailed)	,115	,019	.	,001
		N	125	125	125	125
	V4	Correlation Coefficient	,088	,070	,294**	1,000
		Sig. (2-tailed)	,328	,441	,001	.
		N	125	125	125	125
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Table 2. Spearman correlations

The analysis revealed a statistically significant positive correlation between perceived usefulness and the impact of feedback on learning ($\rho = 0.210$, $p < 0.05$). In addition, the strongest relationship was observed between the perceived learning impact of feedback and students' desire to receive further feedback ($\rho = 0.294$, $p < 0.01$). This indicates that students are more likely to request additional feedback when they perceive it as genuinely helpful for their academic development. In this case, H1 was confirmed.

A weak but statistically significant positive correlation was identified between feedback frequency and perceived clarity and usefulness ($\rho = 0.274$, $p < 0.01$). At the same time, feedback frequency was not significantly associated with the perceived impact of feedback on learning and improvement ($\rho = 0.142$, $p > 0.05$). This result suggests that receiving feedback more often does not necessarily guarantee a stronger educational impact. Therefore, H2 was confirmed. Overall, the correlation analysis highlights that the effectiveness of feedback depends more on its perceived quality and usefulness than on its frequency alone.

4.3. Cluster analysis

In order to identify distinct student profiles based on feedback-related perceptions and attitudes, a K-means cluster analysis was performed using standardized variables associated with feedback frequency, usefulness, learning impact, and demand for additional feedback. Three clusters were selected to obtain an interpretable classification of participants. The students' distributions on these are represented in **Figure 2**.

The first one has students characterized by relatively low feedback frequency and low perceived usefulness, but who nevertheless expressed a strong desire to receive additional feedback. This category may be interpreted as a group of students who feel insufficiently supported within the educational process, despite being motivated to receive more guidance and feedback. This cluster included 41 participants.

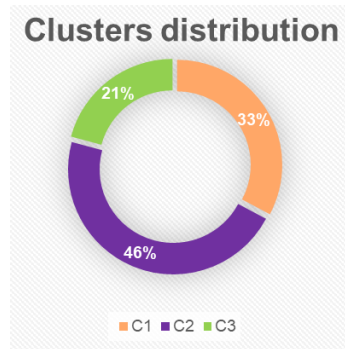


Figure 2. Clusters distribution

The second cluster is the largest group of participants, including 58 students. These reported frequent, clear, and useful feedback, together with a positive perception of its contribution to learning and improvement. Students belonging to this cluster also expressed interest in receiving further feedback, suggesting a generally positive and engaged attitude toward feedback processes. The third cluster includes 26 students characterized by low perceived learning impact and a very limited interest in receiving additional feedback. This group may reflect disengaged students who perceive feedback as less effective or less relevant for their educational development.

The distances between final cluster centers indicate a good separation between the identified groups, suggesting that the clustering procedure successfully distinguished different student profiles. Furthermore, ANOVA analysis revealed statistically significant differences between clusters for all analyzed variables ($p < 0.001$). Therefore, H3 was confirmed, demonstrating that students can indeed be grouped into distinct categories according to their feedback-related perceptions and attitudes.

These are illustrated in **Table 3** through the standardized values associated with the identified student clusters. Positive values indicate above-average perceptions regarding the analyzed feedback dimensions, while negative values reflect below-average evaluations. The heatmap highlights significant differences between the identified student profiles. Cluster 2 is characterized by positive values across all analyzed variables, suggesting that these students receive relatively frequent, clear, and useful feedback and perceive feedback as beneficial for learning improvement. In contrast, Cluster 1 presents negative values for feedback frequency and usefulness, but a positive value regarding the desire to receive further feedback, indicating a group of students who feel insufficiently supported but remain motivated to receive additional guidance. Cluster 3 is

characterized by strongly negative values regarding learning impact and demand for additional feedback, suggesting a more disengaged student profile.

Variable	Cluster 1	Cluster 2	Cluster 3
V1	-0,61	0,54	-0,26
V2	-0,81	0,66	-0,21
V3	-0,05	0,37	-0,75
V4	0,49	0,41	-1,69

Table 3. Heatmap representation of the standardized cluster centers for the analyzed feedback-related variables

A correspondence analysis was performed to explore the relationship between the identified student clusters and the preferred feedback types. The obtained representation is illustrated in **Figure 3**. The graphical representation suggests that different student profiles are associated with different feedback preferences. Cluster 1 appears to be more closely associated with descriptive feedback, indicating that these students prefer detailed and explanatory forms of feedback. Cluster 2 is positioned closer to evaluative feedback, suggesting a preference for general assessments regarding performance. In contrast, Cluster 3 is more strongly associated with prescriptive feedback, indicating a preference for guidance-oriented feedback focused on improvement recommendations.

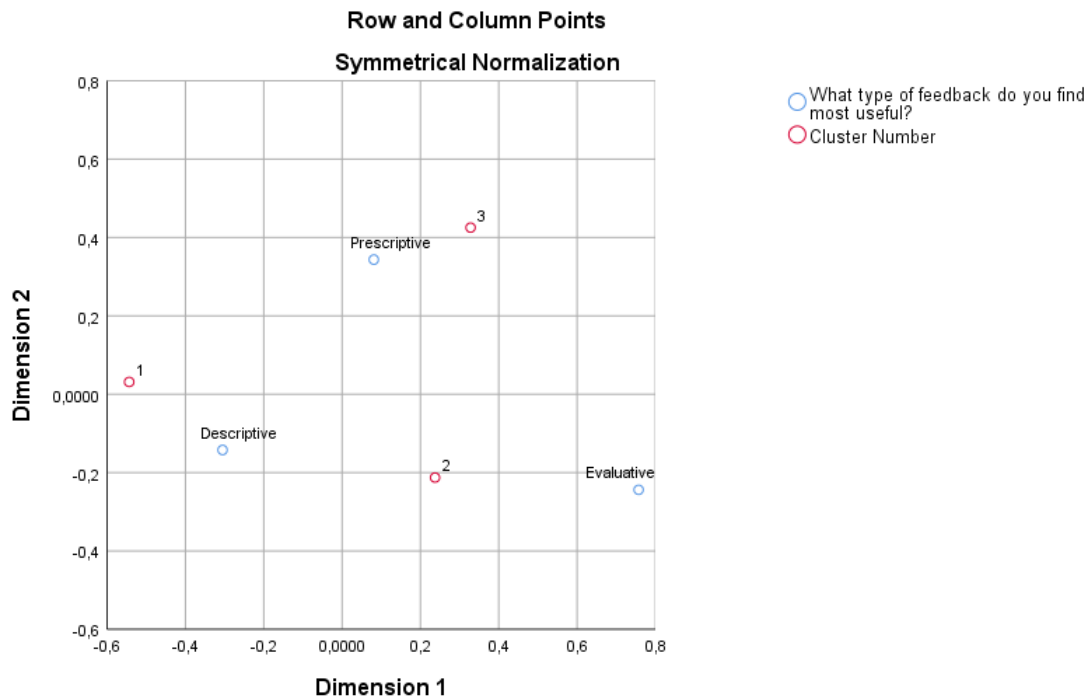


Figure 3. Correspondence analysis of student clusters and preferred feedback types

These results highlight that feedback preferences differ across student profiles, highlighting the importance of adapting feedback strategies according to students' expectations and learning needs. Therefore, H4 was confirmed.

The distribution of preferred feedback forms across the identified student clusters is illustrated in **Figure 4**. The results indicate that oral feedback is generally preferred over written feedback across all student profiles. The highest preference for oral feedback was observed within Cluster 2, which also corresponds to the group characterized by higher perceived usefulness and learning impact of feedback.

In contrast, written feedback was selected less frequently across all clusters, although it remained relatively relevant for students belonging to Cluster 1 and Cluster 3. These findings suggest that students in technical higher education tend to value direct and immediate interaction during feedback processes, particularly when feedback is perceived as meaningful and supportive for learning improvement. The observed differences between clusters further support H4, indicating that student profiles are associated with different preferences regarding feedback forms.

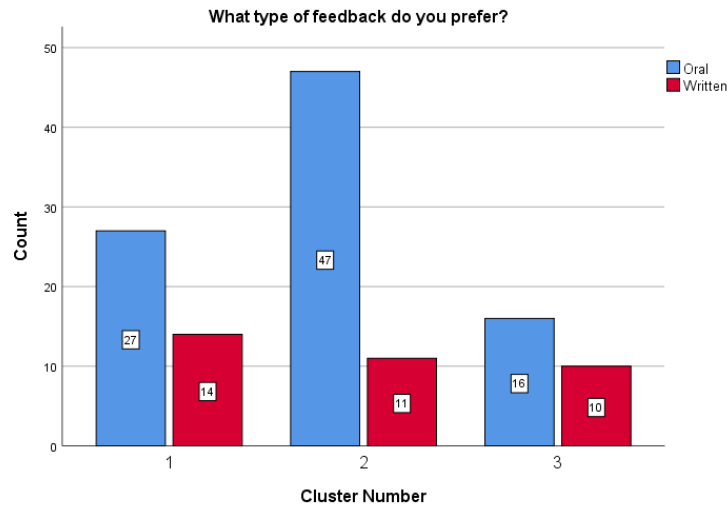


Figure 4. Distribution of preferred feedback forms across the identified student clusters

5. Conclusions

This paper investigated students' perspectives on feedback in technical higher education, focusing on several dimensions associated with feedback frequency, perceived usefulness, learning impact, and preferred feedback forms and types. The descriptive analysis revealed that, although students generally perceive feedback as relatively clear and useful, feedback is not received very frequently during the educational process.

Correlation analysis demonstrated that feedback frequency is not significantly associated with the perceived impact of feedback on learning outcomes. In contrast, the perceived usefulness of feedback was positively associated with students' desire to receive additional feedback.

The cluster analysis identified three distinct student profiles characterized by different attitudes and expectations regarding feedback. While one cluster included engaged students who perceived feedback positively, another group is characterized by low perceived usefulness but a strong desire for additional feedback, suggesting the existence of students who feel insufficiently supported despite remaining motivated to improve. A third cluster reflected more disengaged students with low perceived learning impact and limited interest in receiving further feedback.

The correspondence analysis and the analysis of preferred feedback forms further revealed differences between clusters regarding feedback preferences. Oral feedback was generally

preferred across all student groups, highlighting the importance of direct interaction and immediate clarification within the educational process.

Overall, the results highlight the need for more adaptive and student-centered feedback strategies in technical higher education. Rather than focusing exclusively on increasing feedback frequency, educational practices should prioritize meaningful, clear, and actionable feedback tailored to different student profiles and learning needs.

The present study has several limitations. First, the research was conducted on a relatively small sample consisting of 125 students enrolled in technical higher education programs within a single educational context. Consequently, the results may not fully reflect the perspectives of students from other universities, academic fields, or cultural environments.

Another limitation is related to the use of self-reported questionnaire data. Students' responses may be influenced by subjective perceptions, temporary emotional states, or social desirability bias. In addition, the study focused mainly on students' perspectives regarding feedback and did not include the viewpoints of teachers or objective indicators of academic performance.

Future research could extend the present study to comparisons between technical and non-technical faculties. Additional research directions may include the investigation of teachers' perspectives or the relationship between feedback and academic performance.

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