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**DETERMINANTS, PERCEIVED EFFECTIVENESS, AND  
CONTEXTUAL BARRIERS OF EDUCATIONAL FEEDBACK  
AMONG UNDERGRADUATE MEDICAL STUDENTS: A  
MIXED-METHODS STUDY**

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**Background:** A regular evaluation of students' academic needs is essential for refining pedagogical strategies. In skill-intensive fields like medicine, feedback is a cornerstone of competency-based education. However, a gap often exists between the feedback delivery and student internalization, necessitating a robust investigation into how these processes are perceived and utilized.

**Purpose:** This study investigated undergraduate medical students' perceptions of feedback, the factors influencing their engagement, and the subsequent impact on their learning outcomes.

**Methods:** A mixed-methods design was utilized. A total of 200 MBBS students across all academic years completed a validated questionnaire assessing feedback timeliness, constructiveness, clarity, and instructor approachability. Concurrently, semi-structured interviews were conducted until thematic saturation was achieved. Quantitative data were analyzed via descriptive statistics, while qualitative data underwent thematic coding.

**Results:** Participants (57% female; 43% male) strongly recognized feedback as a vital learning tool (70%), with a marked preference for verbal delivery (69%). Quantitative analysis identified clarity (72%), constructiveness (70%), and timeliness (68%) as the primary drivers of positive perception. While most students reported that feedback enhanced learning (78%) and academic achievement (79%), only 56% felt an increase in motivation. Qualitative insights supported these findings but expanded on critical barriers, including perceived instructor bias, hierarchical distance, and curriculum overload, which hindered clarification and reflection.

**Conclusion:** Effective feedback in medical education requires more than just high-quality content; it demands a supportive, student-centered environment that minimizes hierarchical barriers. To maximize educational impact, institutions should prioritize faculty training in delivering timely, specific, and actionable feedback. Moreover, Artificial Intelligence-driven feedback systems may offer a promising approach to enhance timeliness, personalization, and consistency of feedback while reducing hierarchical barriers. Their integration may foster greater student engagement and support the development of feedback literacy in medical education.

**Keywords:** Medical education; Feedback perception; Artificial Intelligence; Academic performance; Student-centered approach

### Authors Contributions

**Sadia Qureshi** contributed to conceptualization, methodology, study design, supervision, data interpretation, original manuscript drafting, and critical revision. **Muhammad Tahir Aziz** contributed to methodology, formal analysis, interpretation of findings, literature review, and manuscript review and editing. **Muhammad Faizan Tahir** contributed to data collection, literature review, data organization, and preparation of the initial draft. **Muhammad Tayyab Amer Ch.** contributed to data collection. All authors reviewed and approved the final manuscript and agreed to be accountable for the accuracy and integrity of the work.

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### Introduction

Recent shifts in medical education emphasize a transition from feedback as a "transmission" (teacher-to-student) to a "process" (dialogue). Central to this shift is Learner Feedback Literacy, the capacity to appreciate, judge, and manage emotions within the feedback loop (1). Despite its importance, the hierarchical nature of medical training often strangles this dialogue, making it imperative to investigate how students navigate these inherent power dynamics. The evaluation of educational programs in the health professions has increased in recent years, and feedback is one of the essential components of program evaluation (2,3).

It is important to evaluate the academic needs of the students at frequent and regular intervals to make adequate changes in the teaching methodologies to cater for the needs of the students. Feedback is one of the essential components in determining the needs of the learning process, especially in medical education where practical skills and knowledge are critical (4). Understanding how feedback is perceived by the learners can provide realistic support about its intended purpose and effectiveness. However, the effectiveness of feedback depends on both the quality of the feedback and the students' perceptions of its value.

Recent reviews of research on student perceptions of feedback in different learning environments have revealed the need to research feedback as a process by using a more solid methodological approach (5, 6). It has also been proven that learning can be improved by providing effective feedback (7, 8). This study explores the perceptions of feedback among undergraduate medical

students, factors that enhance or hinder the effectiveness of feedback and the relationship between feedback perception and academic performance.

## Methodology

### Study Design and Setting

A mixed-methods convergent study design was employed to gain a multi-dimensional understanding of feedback perceptions among medical students (9, 10). By combining quantitative breadth with qualitative depth, the study sought to triangulate survey data with the lived experiences of the participants. The study was conducted at Rashid Latif Medical College, Lahore, Pakistan, following approval from the Institutional Review Board.

### Participants and Sampling

The study population consisted of undergraduate medical (MBBS) students across all five academic years. A total of 200 students were recruited using a purposive sampling technique to ensure representation from both pre-clinical (Years 1–2) and clinical (Years 3–5) phases. Participation was entirely voluntary, and written informed consent was obtained from all respondents before data collection.

### Data Collection Instruments

Data was gathered using two primary instruments:

**Quantitative Survey:** A structured, validated questionnaire was administered to all 200 participants. The survey employed a 5-point Likert scale to evaluate five key dimensions of the feedback process, which included the timeliness, constructiveness, clarity, approachability of the feedback provider and perceived impact of feedback on academic and clinical performance.

**Qualitative Interviews:** To supplement the survey findings, semi-structured interviews were conducted with a subset of students. These sessions used an open-ended interview guide designed to explore nuanced experiences, such as the emotional impact of feedback and institutional barriers to engagement. Interviews continued until saturation of data was reached.

### Data Analysis

A side-by-side integration approach was used to analyze the data from the questionnaires, which were cleaned and entered into SPSS Version 26. Descriptive statistics, including frequencies and percentages, were calculated to summarize student perceptions and preferences. Interview recordings were transcribed verbatim and analyzed using inductive thematic analysis. This involved iterative rounds of open coding, sub-theming, and the final identification of overarching themes that explained the "why" behind the quantitative trends.

## Results

### Quantitative Findings

A total of 200 undergraduate MBBS students participated in the study, including 86 males (43%) and 114 females (57%). Most participants were from the first year (53%), followed by the second year (23%), third year (16%), and smaller proportions from fourth and final years (4%).

each). Most students were aged 18–20 years (60%), with fewer in the 21–23 (36%) and older age groups (please see Table 1).

Regarding factors influencing feedback perception (Table 2), most students agreed that feedback was clear (72%), constructive (70%), and timely (68%). Additionally, 63% perceived feedback as specific, while 61% acknowledged the role of a supportive academic environment. In terms of impact (Table 3), 78% of students agreed that feedback improved their learning, and 79% reported an enhancement in academic outcomes. Furthermore, 70% believed feedback improved performance, while 56% reported increased motivation.

With respect to feedback modalities (Table 4), most of the students preferred verbal feedback (69%), followed by a combination of verbal and written feedback (16%), and written feedback alone (15%). Most of them (69%) reported receiving regular feedback on assessments and practical work.

### Qualitative Findings

Thematic analysis of the qualitative responses generated four overarching themes and associated codes, reflecting students' perceptions of the role of feedback in learning, its emotional and motivational consequences, their expectations regarding effective feedback, and barriers that limited its effectiveness.

The results showed that students did not see feedback as just an evaluative process; rather, they considered it a key component of learning, performance advancement, and motivation. However, its impact on learning and performance was affected by the timing, personalization, consistency, and the way in which feedback was delivered.

The thematic map of students' perceptions demonstrates the relationship between different themes as follows:

#### 1. Feedback enables students to take ownership of their learning:

Students primarily perceived feedback as a process for enhancing their learning and academic performance. It was used to recognize mistakes, know areas requiring improvement, redesign study methods, and plan successive learning. Participants found it useful as it enabled them to translate information about their performance into specific changes in their learning strategies to improve self-directed and continuous learning.

*“Feedback helps improve performance as it shows me what areas of mine are weak and what I need to work on.”*

*“I use it to better my learning process and make my studying more effective.”*

### Thematic Analysis:

| <b>Theme 1:<br/>Feedback enables students to take ownership of their learning</b>                                                                                                                                                        | <b>Theme 2:<br/>The emotional impact of feedback shapes students' motivation to improve</b>                                                                                                                                                         | <b>Theme 3:<br/>Effective feedback is perceived as timely, individualized, specific, and dialogic</b>                                                                                                                                                                                                 | <b>Theme 4:<br/>Variability, bias, and inadequate personalization limit the effectiveness of feedback</b>                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Codes:</b><br>Identifying learning gaps<br>Correcting mistakes<br>Preventing recurrence of errors<br>Modifying study strategies<br>Planning subsequent learning<br>Improving academic performance<br>Enhancing learning effectiveness | <b>Codes:</b><br>Emotional distress<br>Embarrassment<br>Positive reinforcement<br>Motivation to improve<br>Acceptance of constructive criticism<br>Preference for useful criticism<br>Emotional adaptation to feedback<br>Feedback as encouragement | <b>Codes:</b><br>Timely feedback<br>Early feedback<br>Detailed feedback<br>Specific examples<br>Actionable feedback<br>Individualized feedback<br>Recognition of strengths<br>Identification of weaknesses<br>One-to-one discussion<br>Verbal feedback<br>Interactive feedback<br>Consistent feedback | <b>Codes:</b><br>Instructor variability<br>Inconsistent feedback<br>Perceived bias<br>Teacher–student relationship<br>Generalized assumptions<br>Comparison with instructor expectations<br>Lack of individualized assessment<br>Minimal comments<br>Delayed feedback<br>Lecture-based feedback<br>Limited opportunity for clarification |

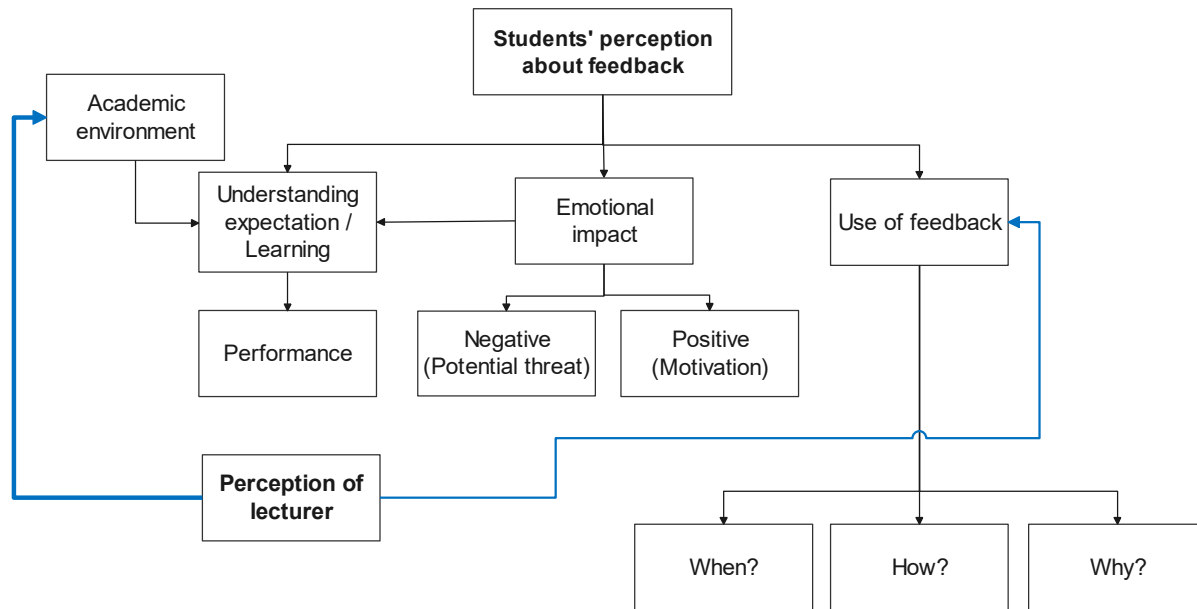
## 2. The emotional impact of feedback shapes students' motivation to improve:

The perceived usefulness of feedback was closely connected with students' emotional responses. Negative feedback could lead to disappointment or emotional discomfort. However, students did not equivalently perceive negative feedback as undesirable. When criticism was perceived as constructive and directed toward correcting errors, it was considered useful and could motivate students to improve. Conversely, positive feedback was associated with encouragement and increased motivation. So the emotional impact was dependent upon how feedback was perceived.

*“Positive feedback motivates and encourages me... negative feedback initially feels disheartening but later helps improve.”*

*“Hearing teachers say that they believe in us is incredibly motivating.”*

## Thematic map of students' perceptions and experiences of feedback



3. Effective feedback is perceived as timely, individualized, specific, and dialogic: Students communicated specific characteristics which were important for effective perception. Timeliness appeared to be the most important. Timely, detailed, specific, and supported by examples, feedback proved helpful for modifying subsequent learning. Moreover, individualized feedback was particularly valued as participants perceived that their strengths and weaknesses differed from those of their peers. Participants further accentuated interactive approaches, including verbal and one-to-one discussions, which allowed clarification and facilitated a two-way exchange between students and instructors.

*"Constructive criticism works best in my case."*

*"Feedback where you go over mistakes with the instructor is most helpful."*

*"Delayed feedback causes disconnection from the learning moment."*

This elaborates the When? How? Why? section of the thematic map.

4. Variability, bias, and inadequate personalization limit the effectiveness of feedback:

Despite identifying the importance of feedback, students highlighted several challenges, including vague, generalized, or inconsistent feedback, and perceived biases limiting its effectiveness. Feedback practices were perceived to vary considerably between instructors, with some providing detailed and actionable comments while others provided minimal or generalized feedback. Students also mentioned situations where feedback was influenced by the instructor's perception of the student or by comparisons with expected performance. Delayed feedback and insufficient understanding of individual student performance were additional concerns. These findings suggest that the effectiveness of feedback was influenced not only by its content but also by the interpersonal and contextual environment in which it was delivered. Thus connecting

directly “Perception of lecturer” with “Academic environment” and finally learning and performance of students.

*“Feedback varies depending on the instructor.”*  
*“Biased feedback... may not be helpful to students.”*

Students also mentioned limited prospects for reflection upon the feedback due to workload and reluctance in seeking clarity due to hierarchical dynamics:

*“Sometimes we hesitate to ask teachers about feedback.”*

Thus, the thematic map of students’ perception of feedback demonstrates how feedback contributes to understanding and learning, evokes emotional and motivational responses, and is subsequently translated into changes in learning behaviour and performance of the students. The magnitude to which this process contributes effectively depends on whether feedback is timely, specific, individualized, actionable, and interactive. Instructor-related factors, alterability in feedback practices, perceived bias, and the overall learning environment may affect this process.

### Integration of Quantitative and Qualitative Findings

The integrated qualitative and quantitative findings demonstrated strong convergence between the two. The positive impact of feedback on learning (78%) and academic performance (79%) was supported by qualitative narratives emphasizing their role in recognizing weaknesses and improving study strategies.

Quantitative findings confirming high agreement on clarity (72%) and constructiveness (70%) were found to be aligned with qualitative preferences for clear, specific, and effective feedback. However, areas of divergence and expansion were also identified. While 68% of students quantitatively approved that feedback was timely, qualitative data showed persistent concerns about delays and their negative impact on learning continuity. Similarly, although 56% reported motivational benefits, qualitative findings provided deeper insight into the emotional complexity of feedback, including initial discouragement and subsequent adaptation. Qualitative data further expanded upon quantitative findings by highlighting contextual barriers, such as perceived bias, inconsistency among instructors, and institutional hierarchy, which were not fully captured in the quantitative analysis (please see Table 5).

**Table 1: Demographic Characteristics of Participants (n = 200)**

| Variable      | Category    | n (%)    |
|---------------|-------------|----------|
| Gender        | Male        | 86 (43)  |
|               | Female      | 114 (57) |
| Year of Study | First Year  | 106 (53) |
|               | Second Year | 46 (23)  |
|               | Third Year  | 32 (16)  |
|               | Fourth Year | 8 (4)    |
|               | Final Year  | 8 (4)    |
|               |             |          |
| Age (years)   | 18–20       | 120 (60) |

|  |       |         |
|--|-------|---------|
|  | 21–23 | 72 (36) |
|  | 24–26 | 6 (3)   |
|  | 27–30 | 2 (1)   |

**Table 2: Factors Influencing Students’ Perception of Feedback (n = 200)**

| Factor               | Agree<br>n (%) | Neutral<br>n (%) | Disagree<br>n (%) |
|----------------------|----------------|------------------|-------------------|
| Timeliness           | 136 (68)       | 32 (16)          | 32 (16)           |
| Clarity              | 144 (72)       | 30 (15)          | 26 (13)           |
| Academic Environment | 122 (61)       | 44 (22)          | 34 (17)           |
| Constructiveness     | 140 (70)       | 42 (21)          | 18 (9)            |
| Specificity          | 126 (63)       | 36 (18)          | 38 (19)           |

**Table 3: Perceived Impact of Feedback on Students (n = 200)**

| Outcome              | Agree<br>n (%) | Neutral<br>n (%) | Disagree<br>n (%) |
|----------------------|----------------|------------------|-------------------|
| Learning             | 156 (78)       | 28 (14)          | 16 (8)            |
| Performance          | 140 (70)       | 42 (21)          | 18 (9)            |
| Motivation           | 108 (56)       | 48 (24)          | 40 (20)           |
| Academic Achievement | 158 (79)       | 28 (14)          | 14 (7)            |

**Table 4: Preferred Types of Feedback (n = 200)**

| Type of Feedback | n   | %  |
|------------------|-----|----|
| Verbal           | 138 | 69 |
| Written          | 30  | 15 |
| Verbal + Written | 32  | 16 |

**Table 5: The Feedback Integration Matrix (Joint Display)**

| Quantitative Finding     | Qualitative Theme                    | Integration Outcome /Interpretation                                                                         |
|--------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 79% report academic gain | Identification of specific gaps      | <b>Convergence:</b> Feedback is functionally effective for exam preparation                                 |
| 68% agree on timeliness  | "Disconnect" during delays.          | <b>Divergence:</b> While most are satisfied, the minority who experience delays find it highly detrimental. |
| 56% motivation           | Emotional “sting’ vs Growth          | <b>Expansion:</b> Motivation is fragile and highly dependent on the instructor's delivery style             |
| 72% clarity              | Need for clear, actionable feedback. | <b>Convergence:</b> Clear feedback directly satisfies the demand for actionable guidance.                   |

|                             |                                |                                                                                                                                |
|-----------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>70% constructiveness</b> | Bias, inconsistency, hierarchy | Expansion: High constructiveness ratings mask underlying concerns regarding power dynamics, inconsistency, and perceived bias. |
|-----------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------|

## Discussion

### 1. Functional effectiveness of feedback

The quantitative finding that 79% of participants reported academic gain aligns with the qualitative finding of identification of learning gaps which shows that most of the learners perceive feedback as a tool to bridge gaps in learning and performance with academic success. This finding is aligned with similar research on improved performance after formative assessment and debriefing. (11)

### 2. Delay in Feedback as a Structural and Psychological Barrier

Although 68% of respondents agreed that feedback was timely, yet qualitative interviews projected a distressing "disconnect" during delays. This elaborates that while institutional /departmental timelines for feedback might work with statistical majority, delayed feedback can be a profound structural and psychological barrier for the remaining minority.

In modern education, feedback timing is linked to the "learning moment." When feedback is delayed for weeks after a task is completed, it causes a cognitive disconnect as the learners start learning a new topic and cannot mentally reconnect the critique to their past effort. This relates to the contemporary studies, which exhibit that systemic delays force learners to completely disengage from the evaluative loop thus prematurely closing the window for self-correction (12, 13).

### 3. The Emotional "Sting" as an Affective Barrier

The quantitative data shows an average emotional response, with only 56% indicating that feedback enhanced their motivation. The qualitative findings strongly expand on this by revealing a constant psychological battle between an emotional "sting" and a desire for growth. When feedback feels punitive or harsh, the emotional sting leads to affective barrier as a response, triggering denial or disengagement. Hayat et al (14) argue, for constructive feedback to foster growth the instructor's delivery style should exhibit relational warmth and empathy or the learner's cognitive processing shuts down otherwise. The barrier isn't that the student doesn't want to improve but the emotional cost of the feedback is too high.

### 4. Ambiguity as a Cognitive Barrier to Feedback Literacy

A powerful correlation was found regarding clarity feedback literacy, 72% of respondents rated their feedback as clear, mirroring the qualitative demand for explicit, actionable guidance. This convergence highlights that when feedback is clear, it successfully dismantles a major cognitive barrier: ambiguity. Whereas the ambiguous feedback is one of the most common barriers to student feedback literacy because they perceive the feedback as a dead end rather than a pathway. By providing transparent, explicit instructions, evaluators eliminate the cognitive load, allowing students to translate perception into immediate, confident action. This finding is also aligned with the previous findings (15)

### 5. Socio-Relational Barriers and Power Dynamics

While 70% of the participants quantitatively rated their feedback as constructive, the qualitative data recontextualized these findings by highlighting hidden concerns regarding power dynamics,

systemic disparity, and perceived instructor bias. This expansion proves that a high metric score can easily mask severe socio-relational barriers.

Learners often rate feedback as "constructive" out of institutional compliance, technically accurate according to the rubrics provided. However, the qualitative data reveals a hidden barrier: the hierarchy gap between the student and the assessor. When students perceive an evaluation as biased or inconsistent across different instructors, trust is broken. Because assessment is inherently tied to institutional authority, these perceived power asymmetries prevent students from engaging in an open dialogue about their work rejecting it internally due to a lack of relational trust. Previous studies showed the same results (16, 17).

### Conclusion

Improving feedback quality in medical education requires attention to its timing, structure, and delivery within an open, supportive environment that drives student engagement and clinical performance.

### Study Limitations

A **significant** limitation of this study is the sampling bias, with over 50% of participants being in their first year of medical school. Their experiences are largely based on pre-clinical, classroom-based feedback, which may differ significantly from the bedside, clinical feedback experienced by final-year students. Future research should employ longitudinal tracking to see how perceptions evolve as students enter clinical rotations.

### Recommendations

1. **Faculty Training:** Implement workshops and training for faculty members to standardize feedback delivery methods.
2. **Student Reflection:** Encourage students to reflect on feedback and create action plans to address areas of improvement.
3. **Feedback Integration:** Incorporate structured, regular feedback sessions within the curriculum to ensure consistent engagement.

This study underscores the pivotal role feedback plays in medical education and highlights the need for strategies to improve both the delivery and reception of feedback for better educational outcomes.

### Future perspectives:

AI-driven feedback systems may offer scalable solutions by providing immediate, personalized, and objective feedback while reducing hierarchical barriers. Beyond easing faculty workload, AI-driven feedback may foster learner feedback literacy through adaptive guidance. Ultimately, integrating AI may transform medical feedback from a static exchange into a dynamic, data-informed learning dialogue.

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