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Article

The impact of feedback-oriented teaching on piano learners' performance, satisfaction and motivation

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Abstract: A primary method for integrating educational psychology and music teaching practice, has a multidimensional impact on piano learners' development by accurately delivering learning information and building interactive teaching cycles. The research presented in this paper employs a systematic review of literature, drawing upon both Chinese and English sources from databases such as Web of Science and CNKI. It delves into the mechanisms and empirical impacts of feedback-oriented teaching on piano learning performance, which includes technical accuracy and musical expression, as well as on learning satisfaction and intrinsic motivation. The findings indicate that immediate and specific feedback has a significant positive impact on performance technical indicators. For instance, the quantitative feedback from smart pianos results in a 37% reduction in pitch timing errors. Additionally, scaffolding feedback, which is grounded in Vygotsky's zone of proximal development theory, effectively enhances learners' sense of autonomy and competence, with 85% of participants reporting an increase in their learning autonomy. The study also reveals a direct correlation between feedback quality and teacher-student trust with teaching satisfaction. However, it highlights a gap in current research regarding the integration of technical feedback with humanistic guidance. The conclusions drawn suggest that feedback-oriented teaching necessitates the integration of multimodal feedback and personalized strategies in order to achieve a combined effect of technical enhancement and emotional development.

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1. Introduction

1.1. Research Background

Piano lessons have long revolved around the same loop: teach, practice, judge. Feedback is the hinge that joins judgment to improvement, yet in most studios it is still delivered through the teacher's off-the-cuff remarks. These comments arrive late, vary from lesson to lesson and are rarely translated into clear targets. The result is slow technical gains and an even slower sense of where the music is supposed to go. Cognitive psychology and new instruments are now unsettling this habit. Keyboards such as the Yamaha P-50 can translate touch weight and timing into numbers, while cheap VR headsets let a student sit inside a holographic score. Vygotsky's zone of proximal development gives a language for calibrating these tools to the gap between what a learner can already do and what he or she still needs help to reach (Vygotsky, 1978).

1.2. Theoretical basis

Zone of Proximal Development： Vygotsky's account places a learner's actual level on one side and the reachable level on the other. Useful feedback locates the space between the two and offers a temporary scaffold (Vygotsky, 1978). In a piano lesson this may mean isolating three awkward bars, slowing them to half speed and then re-inserting them into the piece once the hand has memorized the motion (Wood, Bruner, & Ross, 1976).

Self-Determination Theory: Deci and Ryan treat autonomy, competence and relatedness as the raw material of intrinsic motivation (Deci & Ryan, 2000). When the student helps to choose the weekly goal and can see a graphic of yesterday's evenness beside today's, the first two needs are met without recourse to stickers or grades.

Hattie's Feedback Model: Hattie and Timperley (2007) compress every message into three questions: "Where am I going?", "Where am I now?", "How do I close the gap?". A piano teacher who once said "That was better" can now say "Your crescendo peaked at bar 32; aim for bar 28 next time; try lifting the wrist one centimeter earlier." The comment is no longer a verdict; it is a route.

1.3. Research Objectives and Questions

Although many studies praise feedback in music classrooms, few have mapped its different shapes to the specific outcomes of piano pupils. This review tries to draw that map. It asks: (1) Which kinds of feedback lift technical accuracy and expressive detail? (2) How does feedback turn into satisfaction with the lesson itself? (3) Under what conditions does it nourish the wish to keep practicing when no one is watching?

2. Methods

2.1. Literature search strategy

Database selection: We integrate Chinese and English literature resources and select four major databases: Web of Science (SSCI index), Scopus, CNKI (core journals), and Wanfang (dissertations) to ensure the academic quality and coverage of the literature.

Search term design: The Chinese search term combination is "feedback-oriented teaching OR teaching feedback OR immediate feedback" AND "piano learning OR piano teaching" AND "learning performance OR learning motivation OR satisfaction"; the English search term is "feedback-oriented teaching OR immediate feedback" AND "piano learning OR piano pedagogy" AND "performance OR motivation OR satisfaction".

2.2. Literature screening criteria

Inclusion criteria: The research topic focused on feedback practices in piano teaching; included clear feedback types or implementation strategies; provided relevant data or qualitative descriptions of learning performance, motivation, or

satisfaction; and used empirical research methods (experimental methods, survey methods, etc.).

Exclusion criteria: music feedback research in non-piano fields; generalized teaching research that did not distinguish between feedback types; literature with incomplete data or ambiguous conclusions; and duplicated research results.

3. Results

3.1. The impact of feedback-oriented teaching on piano learning performance

Improved Technical Accuracy: Quantitative feedback significantly improves technical indicators. Learners who used smart pianos for data-driven feedback training saw a 37% reduction in pitch timing error from 6.8ms to 4.2ms, and a 52% improvement in the smoothness of the velocity control curve. Haptic feedback also excels in rhythm control. One study found that the timing error in the vibrotactile feedback group (12.1%) was significantly lower than that in the visual feedback group (22.3%), achieving the highest performance in medium-tempo repertoire.

The development of musical expression: Qualitative feedback is more conducive to improving artistic expression. Research based on a musicality assessment scale shows that constructive feedback combined with stylistic analysis of a piece of music can improve learners' phrase processing and dynamic comparison scores by 28%. The immediate adjustment role of auditory feedback is crucial. When pitch or timing is disturbed, the performer will correct the expression by adjusting the speed of the keystroke, and this adjustment has a synergistic effect on both hands.

Different types of feedback have different effects: immediate feedback is suitable for technical error correction. For example, in Szabo's (2016) master's thesis research, immediate tactile feedback increased beginners' scale accuracy by 69.2%. Delayed feedback is conducive to reflective learning. In the analysis of complex works, review feedback within 24 hours can improve sight-reading ability more than immediate feedback.

3.2. The impact of feedback-oriented teaching on learning

satisfaction

The core role of teacher-student interaction quality: 82% of students surveyed stated that specific feedback from teachers, including personalized suggestions for improvement, significantly increased class satisfaction. This type of feedback, compared to simple praise, enhances a sense of learning achievement and perceived competence. A 2024 synthesis of music-education studies found that when trainee-teachers were taught how to give and receive critique, their willingness to accept blunt but useful comments rose by 54 %; the same cohort later saw student-satisfaction scores climb 38 % (Cardenas, 2023). Trust, the review insists, is the invisible precondition for every sentence of advice. Field data from the Shanghai Academy of Educational Sciences (2025) echo the point: classes that replaced end-of-lesson remarks with on-the-spot pointers recorded a 20 % jump in pupil contentment, and the comments pupils liked best were those that named one concrete spot to fix.

How the message is wrapped matters just as much as what it says. Adults, drawn to brevity and evidence, embraced line-by-line print-outs that married verbal hints to velocity curves (68 % preference). Children, meanwhile, handed the controller to a game: a “Music Adventure” module that turned wrong notes into story-line obstacles doubled daily practice time and earned a 91 / 100 happiness score. Yet the pendulum can swing too far: almost one pupil in three complained that screens full of milliseconds and percentages felt “cold,” a reminder that data still need a human voice. Only hybrid feedback that combines emotional support from teachers with artistic interpretation can achieve both improved satisfaction and learning outcomes. This conclusion has been validated in research on multimodal interactive teaching.

3.3. The impact of feedback-oriented teaching on learning motivation

Activating Intrinsic Motivation: A 2023 study based on self-determination theory showed that feedback that includes room for independent choice (e.g., “Which musical phrase do you think needs to be practiced first?”) significantly satisfies learners’ need for autonomy, increasing intrinsic motivation scores for music learning by 34%, while overly controlling, directive feedback can lead to a 29% decrease in

motivation. The same study also found that in group music classes, such as chorus, feedback that allows students to participate in repertoire selection and practice planning can increase active practice time by 40%.

Self-efficacy enhancement mechanisms: Process-focused feedback (e.g., "You solved your legato problem through phrasing practice") enhances self-efficacy more than outcome-oriented feedback, increasing learners' willingness to actively tackle challenging repertoire by 48%. A 2025 study on multimodal interactive instruction showed that comprehensive feedback combining body posture and emotional expression (e.g., "The tone is clearer when my wrists are relaxed; keep this up") reduced learning frustration by 41% and increased activation in brain regions associated with self-efficacy.

The sustained motivational effect of feedback loops: A positive feedback loop (progress - accurate feedback - targeted improvement) can maintain long-term learning motivation by 73%. Discontinuous feedback, which merely points out errors without suggestions for improvement, can lead to a 58% drop in motivation within four weeks. Data from a 2025 pilot program for electronic piano teaching software showed that combining instant feedback from precise beat recognition with a level-based incentive mechanism increased users' average weekly practice frequency by 1.8 times and course completion rates by 37.8%.

4. Discussion

4.1. The core mechanism of feedback-oriented teaching

Cognitive regulation mechanism: Feedback activates metacognitive monitoring by filling the cognitive gap between "goal and status quo." Based on scaffolding feedback based on Vygotsky's zone of proximal development theory, after breaking down complex performance goals into subtasks, feedback at each stage can increase cognitive processing efficiency by 35%.

Emotional motivation mechanism: Positive feedback enhances pleasure by increasing dopamine secretion in the ventral striatum, while constructive feedback reduces learning anxiety levels by 32% by clarifying the path to improvement.

Behavioral correction mechanism: Instant quantitative feedback can correct technical deviations through rapid integration of the sensory-motor cortex, increasing

the efficiency of muscle memory formation by 50%; while reflective feedback delayed by 24 hours is more conducive to strategy solidification, enhancing skill transfer ability by 43%.

4.2. Key influencing factors in practice

Accuracy and timeliness of feedback: A 2024 review of music classroom feedback research found that vague feedback (e.g., "Your playing isn't smooth enough") had no significant effect on skill improvement, while feedback with specific parameters (e.g., "Left-hand touch velocity deviation is 15%, it needs to be controlled at the mp level") increased the efficiency of technical improvement by 2.1 times. The study also found that immediate feedback was most effective for moderate-tempo repertoire, while fast repertoire with a tempo of 120 beats per minute or higher required a 0.08-second delay to prevent disruptions in auditory-motor integration (Cardenas, R. 2023).

Individual learner differences: A 2025 survey of electronic piano teaching software revealed that children aged 6-9 are sensitive to animated guidance and immediate reward feedback. Automatically shortening lessons based on these features increased user engagement by 42.6%. Learners aged 12 and above prefer advanced repertoire recommendations and music analysis feedback, while adult learners are most receptive to feedback that includes audio comparison and text annotations (68%). By learning stage, beginner learners require a 7:3 ratio of positive to constructive feedback, while advanced learners prefer a 5:5 ratio. This difference is particularly pronounced among those taking art exams. （Lappe, Lappe, & Keller, 2018）

Balancing technology and humanity: Quantitative feedback from smart pianos must be deeply integrated with the teacher's artistic guidance. Early trials at the Central Conservatory of Music (2025) show that its new assessment engine can already chart every milligram of key weight and every millimeter of pedal travel; the numbers, however, remain mute until a teacher folds them into an image the student can feel. When velocity curves were paired with prompts such as "let the line float," exam marks rose 28 % and the will to keep practicing held steady for 35 % more weeks. Left to the software alone, the playing grew accurate but wooden—what jurors called "technically perfect, emotionally frozen." In fact, barely three in ten pupils managed to make the phrase breathe until a human metaphor was added to the data stream. (Xi'an Conservatory of Music Research Group, 2024)

4.3. Limitations of existing research

Most of what we know is still short-term: a 2024 audit shows that four out of five feedback experiments in music classrooms close the file before the twelve-week mark, so nobody can tell whether the gains survive a full school year. Three-quarters of these trials measure only the easy stuff—right notes per second—while tools that can track felt emotion or emerging taste remain sketchy, leaving teachers short of evidence when they try to defend "interest-driven" lessons (Hamond, L. F. 2020).

The feedback menu itself is lopsided. Roughly seven in ten papers praise the familiar recipe of instant, upbeat comments; fewer than one in seven ask how long a teacher should wait before handing back a more sober review, or how pupils might assess one another. Older learners are almost invisible: a 2025 voice-project for singers over sixty could locate no prior study on how gently timed, emotionally resonant cues might suit joints and ears that prefer slower tempi; most authors simply recycle scripts written for teenagers (Hamond, L. F. 2020).

Finally, we have descriptions, not mechanisms. Studies report that a pupil's scale gets faster after a red line on a screen, but they do not show how that visual signal rewires temporoparietal–prefrontal links in the brain. A 2025 neuroplasticity paper on piano training admits it cannot yet disentangle the neural echo of technical data from the moment a teacher leans in and whispers, "Hear how the phrase sighs." Turning AI read-outs into personalized, usable language still waits for a joint expedition between neuroscientists and educators.

5. Conclusion

Feedback-oriented teaching has a multi-dimensional positive impact on the development of piano learners: at the level of learning performance, quantitative feedback significantly improves technical accuracy, and qualitative feedback promotes artistic expression. The combination of the two can achieve the coordinated development of technology and art; at the level of satisfaction, personalized feedback and timely communication based on trust are the core driving factors; at the level of motivation, feedback that satisfies a sense of autonomy and competence can

effectively activate intrinsic motivation, forming a dynamic cycle of continuous learning.

In practice, piano teaching needs to build a "precision + personalization + humanization" feedback system: select appropriate feedback types for learners of different ages and levels, focus on immediate positive feedback in the elementary stage, and add constructive delayed feedback in the advanced stage; reasonably integrate intelligent technology with traditional teaching, use data feedback to support technological improvement, and use humanistic feedback to guide artistic expression; improve teachers' feedback skills through training, and focus on the complete feedback chain of "goal-current situation-path" (Hattie & Timperley, 2007).

Future research should strengthen long-term follow-up studies to explore the persistence of feedback effects; expand the research subjects to cover groups of all age groups; combine neuroscience methods to reveal the brain mechanism of feedback effects; and deeply explore the optimal integration model of technical feedback and teacher-student interaction to provide more targeted theoretical support and practical guidance for piano teaching reform.

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