

Application of Feynman's Learning Method in Music Instruction at Chongqing Vocational College of Art and Engineering

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Abstract

This study investigates the application and instructional efficacy of Feynman's Learning Method within the specialized context of vocational music education. The primary objectives were threefold: (1) to identify the instructional factors influencing the method's success,

(2) to evaluate student learning outcomes following its implementation, and (3) to analyze the predictive relationships between class design, teaching methods, teachers' knowledge, and student success. Employing a quantitative correlational research design, data were gathered from a sample of 286 first-year music students at Chongqing Vocational College of Art and Engineering, selected via simple random sampling. The research instrument was a structured 5-point Likert scale questionnaire measuring four core dimensions, with validated content validity (IOC = 0.87) and high reliability (Cronbach's Alpha = 0.93). Descriptive analysis revealed that students maintained a high perception of all instructional variables: Teaching Method ($\bar{x} = 4.38$, S.D. = 0.49), Class Design ($\bar{x} = 4.29$, S.D. = 0.52), and Teachers' Knowledge ($\bar{x} = 4.21$, S.D. = 0.55), with overall Learning Outcomes rated at a high level ($\bar{x} = 4.31$, S.D. = 0.47). Pearson's correlation analysis revealed significant positive relationships between all instructional factors and learning outcomes ($r = 0.62\text{--}0.74$, $p < .01$). Multiple regression analysis showed that the three instructional variables collectively explained 67.4% of the variance in student learning outcomes ($R^2 = 0.674$, $F(3, 282) = 194.72$, $p < .01$). Notably, Teaching Method emerged as the strongest predictor ($\beta = 0.42$, $p < .01$), followed by Class Design ($\beta = 0.31$, $p < .01$) and Teachers' Knowledge ($\beta = 0.18$, $p < .01$). The findings suggest that the Feynman Method—by requiring students to simplify and “teach” complex musical concepts bridges the divide between technical performance and deep conceptual understanding, offering a robust pedagogical alternative to traditional, teacher-centered instruction.

Keywords: Feynman's Learning Method, Music Instruction, Teaching Methods, Students' Learning Outcomes, Vocational Education

Introduction

Vocational music education requires students not only to master technical performance skills but also to develop conceptual understanding and reflective competence (Reimer, 2003). However, traditional teacher-centered instruction in many Chinese vocational colleges often emphasizes repetition and demonstration, which may lead to surface learning rather than deep conceptual change (Zhang, 2020).

Feynman's Learning Method, grounded in the principle that “teaching others enhances understanding,” aligns with several established learning theories. From a constructivist perspective, knowledge is actively constructed through explanation and restructuring of prior understanding (Piaget, 1972; Vygotsky, 1978). When students are required to articulate complex musical theories in simplified language, they engage in cognitive restructuring consistent with conceptual change theory (Posner et al., 1982).

Furthermore, experiential learning theory emphasizes that meaningful learning occurs through reflection on action (Kolb, 1984). The Feynman Method's cyclical process selecting

a concept, explaining it, identifying gaps, and revising mirrors experiential learning stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation.

Theoretical Framework

The application of Feynman's Learning Method is supported by an integrated framework of educational psychology:

Constructivism: Piaget (1972) and Vygotsky (1978) posit that knowledge is actively constructed rather than passively received. The Feynman Method promotes cognitive restructuring as students reorganize and simplify their internal knowledge to communicate it effectively to others.

Conceptual Change Theory: According to Posner et al. (1982), meaningful learning requires the accommodation of new conceptions through the restructuring of prior misunderstandings. By articulating musical theories to peers, students encounter and resolve cognitive dissonance, leading to more robust conceptual frameworks.

Experiential Learning Theory: Kolb (1984) describes learning as a cycle of reflection on action. The Feynman process—selecting a concept, teaching it, identifying gaps, and reviewing—directly mirrors Kolb's stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation.

Active Learning Theory: Bonwell and Eison (1991) emphasize that engagement and participation are essential for deep processing. The "teaching" component of the Feynman Method transforms the classroom from a site of transmission to a site of active engagement.

Instructional Variables and Grounding

Class Design: Grounded in Biggs and Tang's (2011) "constructive alignment," effective design ensures that instructional activities and assessments are aligned with intended learning outcomes. Structured peer-teaching units create the necessary environment for higher-order cognitive processing (Tang, 2024).

Teaching Method: Aligns with student-centered principles. Research (Chen, 2022; He, 2023; Hu, 2024; Sun, 2023) demonstrates that the Feynman Method's focus on simplification enhances engagement across various academic and artistic disciplines.

Teachers' Knowledge: Rooted in Social Learning Theory (Bandura, 1977), teachers act as cognitive models. Their expertise and scaffolding capacity are critical for guiding students through the complexities of peer instruction (Chen, 2024; Deng, 2024; Gao, 2024).

Therefore, the conceptual framework of this study integrates constructivist theory, experiential learning, and active learning principles to explain how Class Design, Teaching Method, and Teachers' Knowledge influence Students' Learning Outcomes in vocational music education.

Research Methodology

1) Study Design

This study utilized a quantitative correlational research design to evaluate the impact of instructional factors on student outcomes within a Feynman-based pedagogical framework.

2) Population and Sampling

The target population consisted of first-year music students at Chongqing Vocational College of Art and Engineering. A sample size of 286 participants was recruited through simple random sampling to ensure statistical representativeness.

3) Instrumentation

A structured 5-point Likert scale questionnaire was developed to measure four primary dimensions: Class Design, Teaching Method, Teachers' Knowledge, and Students' Learning Outcomes.

- 4) Data Analysis** Quantitative analysis was performed using:
- 4.1) Mean and standard deviation for descriptive statistics.
 - 4.2) Pearson’s product-moment correlation to assess the strength and direction of variable relationships.
 - 4.3) Multiple regression analysis to determine the relative predictive power of independent variables on student success.

Results

Perception of Instructional Factors

Students expressed high levels of satisfaction across all instructional dimensions, with all mean scores falling in the high range ($\bar{x} \geq 4.21$ on a 5-point scale). Teaching Method received the highest overall rating ($\bar{x} = 4.38$, S.D. = 0.49), followed by Class Design ($\bar{x} = 4.29$, S.D. = 0.52), and Teachers’ Knowledge ($\bar{x} = 4.21$, S.D. = 0.55). Overall student learning outcomes were also rated at a high level ($\bar{x} = 4.31$, S.D. = 0.47). Key findings per dimension are as follows:

1) Teacher Facilitation: Instructors were perceived as highly capable, demonstrating clarity and confidence in modeling musical concepts ($\bar{x} = 4.35$, S.D. = 0.51). Students reported that teachers effectively demonstrated the four Feynman stages—concept selection, simplified instruction, gap identification, and iterative review—providing a clear cognitive model for students to replicate in their own peer-teaching activities.

2) Scaffolding: Students highlighted the effectiveness of teachers’ strategies in guiding them through the transition from learners to “teachers” ($\bar{x} = 4.29$, S.D. = 0.53). Scaffolding strategies including guided questioning, corrective feedback, and modeled simplification were rated particularly highly, suggesting that structured support during the peer-teaching phase is a critical enabler of the Feynman Method’s success in the vocational music context.

3) Learning Outcomes The intervention resulted in high overall learning outcomes ($\bar{x} = 4.31$, S.D. = 0.47), with notable achievement across three sub-dimensions:

- 3.1) Intrinsic motivation and classroom engagement ($\bar{x} = 4.38$, SD = 0.48).
- 3.2) Deepened conceptual understanding of musical theory and history ($\bar{x} = 4.29$, S.D. = 0.51).
- 3.3) Enhanced practical application and performance-based interpretation ($\bar{x} = 4.26$, S.D. = 0.54).

Statistical Relationships Pearson’s correlation analysis demonstrated significant positive relationships ($p < .01$) between all instructional factors and student learning outcomes: Teaching Method ($r = 0.74$), Class Design ($r = 0.68$), and Teachers’ Knowledge ($r = 0.62$). Multiple regression analysis ($R^2 = 0.674$, Adjusted $R^2 = 0.670$, $F(3, 282) = 194.72$, $p < .01$) confirmed that the three variables collectively explained 67.4% of the variance in learning outcomes. The standardized regression coefficients and hierarchy of predictive influence are summarized below:

Variable	β (Beta) / Predictive Influence	Rank	Significance
Teaching Method	$\beta = 0.42$ (Strongest Predictor)	1	$p < .01$
Class Design	$\beta = 0.31$ (Secondary Predictor)	2	$p < .01$
Teachers' Knowledge	$\beta = 0.18$ (Tertiary Predictor)	3	$p < .01$

Discussion

Objective 1: Perception and Teacher Scaffolding The high perception ratings across all instructional dimensions ($\bar{x} = 4.21$ – 4.38) confirm that students at Chongqing Vocational College of Art and Engineering responded positively to the Feynman-based instructional environment.

The particularly high rating for Teacher Facilitation ($\bar{x} = 4.35$) underscores the critical role of the teacher as a “cognitive model” (Bandura, 1977). While the Feynman Method is fundamentally student-led, its effectiveness is contingent upon the quality of guided scaffolding provided before and during the peer-teaching phase (Gao, 2024; Liao, 2025). This finding aligns with Vygotsky’s (1978) Zone of Proximal Development, which posits that learners achieve higher cognitive levels when supported by a more knowledgeable guide who gradually withdraws assistance as competence grows. In the vocational music context, where students must simultaneously manage technical performance demands and abstract theoretical concepts, such scaffolding is especially consequential: teachers who provide clear conceptual frameworks, corrective feedback, and modeled simplification enable students to navigate the “teaching” phase of the Feynman cycle without falling into oversimplification or technical error (Deng, 2024). The high Scaffolding rating ($\bar{x} = 4.29$) further validates that the instructors in this study successfully fulfilled this facilitative role, creating the necessary cognitive safety net for students to take intellectual risks in their peer explanations.

Objective 2: Outcome Transformation and Metacognition The high overall learning outcomes rating ($\bar{x} = 4.31$) demonstrates that the Feynman Method produced meaningful educational gains across all three outcome sub-dimensions evaluated in this study.

The highest sub-dimension score was for intrinsic motivation and classroom engagement

($\bar{x} = 4.38$), confirming that the act of peer instruction generates strong motivational investment. This is consistent with self-determination theory (Ryan & Deci, 2000), which identifies autonomy and competence as core psychological needs: the Feynman Method satisfies both by giving students ownership over their explanations and visible evidence of their growing mastery. The transition to high learning outcomes is also largely driven by the activation of metacognitive monitoring. During the “Identifying Gaps” phase of the Feynman Method, students are required to evaluate their own understanding critically — recognizing precisely where their knowledge breaks down when they attempt to simplify it for peers. This self-regulatory process aligns with Bandura’s (1977) self-efficacy framework and facilitates the “accommodation” of difficult musical concepts (Posner et al., 1982), moving students beyond mechanical reproduction toward genuine conceptual restructuring. Notably, the deepened conceptual understanding sub-dimension ($\bar{x} = 4.29$) indicates that students particularly valued the Feynman Method’s capacity to transform abstract music theory into personally meaningful frameworks, while the practical application sub-dimension ($\bar{x} = 4.26$) confirms that these conceptual gains translated into improved performance-based interpretation — a particularly important outcome in vocational music education where theoretical knowledge must ultimately serve expressive and professional practice (Reimer, 2003; Chen, 2024; Luo, 2023).

Objective 3: Predictive Relationships The multiple regression model ($R^2 = 0.674$, $p < .01$) revealed that the three instructional variables collectively explained 67.4% of the variance in student learning outcomes, providing strong quantitative support for the study’s conceptual framework.

The finding that Teaching Method is the strongest predictor of learning outcomes ($\beta = 0.42$, $p < .01$) highlights that the active act of instruction itself — rather than just the classroom structure or the teacher’s background knowledge — is the primary engine of cognitive growth. This confirms the central theoretical proposition of the Feynman Method: it is the student’s own act of simplification and explanation that produces the deepest understanding. From a constructivist perspective (Piaget, 1972; Vygotsky, 1978), this finding is consistent with the principle that knowledge is most robustly built when the learner must externalize and restructure it for others. In the music education context, when a student must explain why a particular harmonic progression creates emotional tension, or why a composer chose a specific rhythmic motif, they are compelled to move beyond passive familiarity toward

active conceptual ownership — precisely the level of understanding that vocational music education demands (Reimer, 2003; Hu, 2024).

Class Design emerged as the second strongest predictor ($\beta = 0.31, p < .01$), affirming that the structural environment created for Feynman-based instruction is a significant independent contributor to outcomes. This aligns with Biggs and Tang's (2011) constructive alignment principle: when instructional activities are explicitly designed to create opportunities for peer explanation, gap identification, and iterative revision, students have the structural scaffolding needed to execute the Feynman cycle effectively. The correlation between Class Design and outcomes ($r = 0.68$) further suggests that thoughtfully sequenced peer-teaching units — including pre-teaching concept selection sessions, structured peer presentation formats, and post-teaching reflection activities — substantially amplify the method's impact (Tang, 2024; Yang, 2023).

While Teachers' Knowledge was the tertiary predictor ($\beta = 0.18, p < .01$), its positive and significant contribution confirms that subject-matter expertise remains a necessary foundation for Feynman-based instruction: teachers cannot effectively model conceptual simplification or identify students' knowledge gaps without deep domain knowledge (Chen, 2024; Deng, 2024). However, the relatively lower beta coefficient compared to Teaching Method and Class Design suggests that expertise alone, without active pedagogical engagement and deliberate structural design, is insufficient to produce the full benefits of the Feynman approach. This finding reinforces the primacy of active engagement (Bonwell & Eison, 1991) and the necessity of embedding peer-instruction directly into the vocational curriculum rather than relying solely on teacher transmission of content.

In conclusion, this study has addressed all three research objectives with clear empirical support. With respect to Objective 1, high perception of all instructional factors ($\bar{x} = 4.21$ – 4.38) confirms that Feynman-based instruction is well-received in the vocational music context, particularly when supported by quality teacher scaffolding. With respect to Objective 2, high learning outcome scores ($\bar{x} = 4.31$) across engagement, conceptual understanding, and practical application demonstrate that the method produces meaningful, multi-dimensional gains consistent with the goals of vocational music education. With respect to Objective 3, the regression model ($R^2 = 0.674$) confirms that Teaching Method ($\beta = 0.42$), Class Design ($\beta = 0.31$), and Teachers' Knowledge ($\beta = 0.18$) are all significant predictors of student success, with the active instructional engagement of students through the Feynman cycle identified as the most powerful driver of outcomes. Together, these findings provide a compelling, evidence-based case for the systematic institutionalization of Feynman's Learning Method in Chinese vocational music education curricula.

Suggestions

Recommendations for Educational Practice and Instructional Management:

1) Curricular Integration

It is recommended that music departments formally institutionalize "Teaching Units" within the standard syllabus. Peer-presentation assessments should be weighted significantly, requiring students to demonstrate mastery by simplifying complex technical concepts for their cohort.

2) Teacher Training

Institutions should conduct professional development workshops to transition faculty from "lecturers" to "facilitators." Training should focus on the four distinct Feynman stages: (1) Concept selection, (2) Simplified instruction, (3) Identifying knowledge gaps, and (4) Iterative review.

3) Digital Innovation

To leverage modern pedagogical tools, institutions should command the use of digital portfolios. Students can produce instructional videos or vlogs explaining specific repertoire, facilitating asynchronous peer learning and providing a permanent record of their conceptual evolution.

4) Reflective Culture

Educational management should foster a culture that prioritizes the "logic and emotion" of performance over mere mechanical accuracy. Feedback mechanisms must reward a student's ability to explain the theoretical and expressive foundations of their artistic choices.

Recommendations for Future Research:

1) Longitudinal and Comparative Studies

Future inquiries should employ longitudinal designs to track the impact of Feynman-based instruction on long-term career placement. Comparative studies across other vocational arts, such as dance or visual design, would help determine the method's cross-disciplinary efficacy.

2) Qualitative and Contextual Inquiry

Semi-structured interviews are recommended to explore the psychological barriers students may face, such as the anxiety associated with "teaching" peers. Additionally, research should investigate optimal group sizes for Feynman-based instruction to assist institutions in class-size optimization.

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