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Effectiveness of drill-based vocal technique instruction on high school students' singing ability

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ABSTRACT

Objective: This study aimed to examine the effectiveness of the drill method in improving the singing ability of Grade XI students during vocal technique instruction at SMAN 1 Situjuh Limo Nagari. **Methods:** A quantitative approach employing a quasi-experimental Nonequivalent Control Group Design was used. Forty-two students participated, comprising 21 students in the experimental group and 21 in the control group. Data were collected through pretest and posttest performance assessments and analyzed using the Wilcoxon Signed-Rank Test. **Results:** The experimental group's mean score increased from 65.4% to 83.5% (+18.1%), whereas the control group declined from 71.9% to 66.4% (-5.5%). Improvements were observed in breathing (+16.9%), intonation (+18.7%), articulation (+14.9%), and resonance (from 60.6% to 83.0%). Statistical analysis confirmed a significant improvement in the experimental group ($p = 0.000$) but not in the control group ($p = 0.640$). **Conclusions:** The drill method effectively enhances students' singing ability and vocal technique, providing an evidence-based instructional strategy for improving vocal learning in secondary school music education.



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Introduction

Music education plays an important role in developing students' cognitive, affective, and psychomotor competencies by fostering creativity, aesthetic appreciation, communication, and self-expression (Beknazarova et al., 2025; Huang, 2026). Within this context, vocal instruction is a fundamental component because singing integrates musical understanding with technical performance and artistic expression. Effective singing requires mastery of breathing, intonation, articulation, resonance, and vocal projection, which cannot be developed through theoretical instruction alone but require continuous practice and constructive feedback. Accordingly, contemporary music education emphasizes student-centered learning that engages students in authentic performance and systematic practice to strengthen long-term vocal competence, particularly in secondary school settings (Bin, 2026; Howard, 2016).

Despite its importance, vocal instruction in many secondary schools has not yet effectively developed students' singing ability. Classroom learning often prioritizes conceptual understanding over intensive vocal practice, while differences in students' initial abilities and limited opportunities for structured rehearsal further constrain skill development. Consequently, many students continue to experience difficulties in breathing control, pitch accuracy, articulation, and vocal resonance. Previous studies consistently indicate that practical

musical competence is more effectively developed through structured, repetitive, and feedback-oriented instruction than through predominantly passive learning approaches (Han, 2021; Liddell et al., 2026). These conditions highlight the need for instructional strategies that provide systematic opportunities for repeated practice and continuous improvement of vocal techniques.

Among the instructional approaches available, the drill method offers considerable potential for developing psychomotor skills through systematic repetition and continuous corrective feedback. Repetitive practice strengthens procedural memory, improves neuromuscular coordination, and gradually promotes automatic skill performance (S. Jiang, 2020; Zuxin, 2010). In vocal learning, this approach enables students to internalize correct breathing patterns, stabilize intonation, improve articulation, and develop balanced resonance. Previous studies have reported that repetitive practice effectively improves technical performance in music and other psychomotor domains (Guan, 2021; Liu, 2023). However, most of these studies were conducted in higher education, professional music training, or broader music performance contexts, leaving limited evidence regarding the effectiveness of the drill method in formal secondary school vocal instruction.

Although earlier studies have demonstrated the value of repetitive practice in music education, important gaps remain (Bai, 2022; Matiushenko-Matviichuk, 2025; Prickett & Bridges, 2000). Existing research has largely focused on overall singing achievement without comprehensively examining improvements in individual vocal technique components, such as breathing, intonation, articulation, and resonance, while few studies have investigated drill-based instruction using an experimental design in authentic secondary school classrooms. This limitation indicates the need for stronger empirical evidence regarding how structured drill activities influence different dimensions of students' vocal performance in general music education.

Based on these considerations, this study aims to examine the effectiveness of the drill method in improving the singing ability of Grade XI students at SMAN 1 Situjuah Limo Nagari using a quasi-experimental Nonequivalent Control Group Design. The study evaluates changes in overall singing performance and in four essential vocal technique components, namely breathing, intonation, articulation, and resonance. The novelty of this study lies in integrating a structured drill-based instructional approach with a multidimensional assessment of vocal performance in an authentic senior high school classroom, providing more comprehensive evidence than previous studies that primarily assessed overall singing outcomes (Suryati, 2021; Zhu et al., 2022). Therefore, the findings are expected to enrich the literature on music pedagogy while offering evidence-based recommendations for improving vocal instruction in secondary school music education.

Method

This study employed a quantitative approach using a quasi-experimental Nonequivalent Control Group Design to examine the effectiveness of the drill method in improving students' singing ability during vocal technique instruction. Since random assignment was not feasible within the existing classroom setting, two intact Grade XI classes at SMAN 1 Situjuah Limo Nagari were purposively selected based on comparable academic characteristics and enrollment in the same Music Education course. The sample consisted of 42 students, including 21 students from Class XI F.6 as the experimental group and 21 students from Class XI F.2 as the control group. Both groups completed identical pretests to establish baseline singing ability before the intervention and posttests after the instructional period using the same assessment procedures. The independent variable was the drill method, whereas the dependent variable was students' singing ability, measured through four vocal technique components: breathing, intonation, articulation, and resonance.

The experimental group received drill-based vocal instruction, while the control group was taught using conventional instructional methods. The intervention was implemented over eight instructional sessions, each consisting of vocal warm-up activities, teacher demonstration, guided practice, intensive repetitive drills, corrective feedback, complete song performance, and evaluation. Students' singing performance was assessed using a performance rubric comprising 50 indicators developed from established vocal technique criteria and scored on a five-point rating scale. Before data collection, the instrument underwent validity and reliability testing to ensure its appropriateness for measuring students' vocal performance. To maintain scoring consistency, both pretest and posttest performances were evaluated using identical assessment criteria and standardized scoring procedures.

Data were analyzed using descriptive and inferential statistics. Descriptive analysis was employed to summarize mean scores, percentages, performance categories, and percentage improvements for both groups and for each component of vocal technique. Because the data consisted of paired observations from a quasi-experimental design and did not fully satisfy the assumptions for parametric analysis, differences between pretest and posttest scores within each group were analyzed using the Wilcoxon Signed-Rank Test with a significance level of 0.05. In addition, learning outcomes between the experimental and control groups were compared

descriptively using gain percentages and posttest performance to provide a more comprehensive interpretation of the instructional effectiveness of the drill method.

Results and Discussions

This section presents the findings of the study on the effectiveness of the drill method in improving students' singing ability during vocal technique instruction. The results are organized into four parts. First, descriptive statistics are presented to compare students' singing ability before and after the intervention in the experimental group. Second, the performance of the experimental group is compared with that of the control group to examine differences in learning outcomes. Third, improvements in the specific components of vocal technique, including breathing, intonation, articulation, and resonance, are reported. Finally, the Wilcoxon Signed-Rank Test is employed to determine whether the observed changes in students' singing ability are statistically significant. The findings are summarized in the following tables.

Table 1. Comparison of Pretest and Posttest Singing Ability in the Experimental Group (n = 21)

Variable	Pretest	Category	Posttest	Category	Improvement
Mean Score	163.5	Moderate	208.7	Very High	+45.2
Mean Percentage (%)	65.4	Moderate	83.5	Very High	+18.1%

The descriptive analysis revealed a substantial increase in students' singing ability following the implementation of the drill method. The average percentage score improved from 65.4% (moderate category) during the pretest to 83.5% (very high category) in the posttest, representing an overall improvement of 18.1%. Nearly all students demonstrated higher posttest scores than pretest scores, indicating that repeated and structured vocal practice contributed to better mastery of singing techniques.

Comparison Between Experimental and Control Groups

The comparison between groups showed contrasting learning outcomes. Students in the experimental group exhibited an increase of 18.1% after receiving drill-based vocal instruction, whereas the control group showed a decrease of 5.5% between the pretest and posttest. Although the control group initially obtained a higher average pretest score, the experimental group achieved substantially higher posttest performance after the intervention. These findings demonstrate a clear difference in learning progress between students who received the drill method and those who experienced conventional instruction.

Table 2. Comparison of Singing Ability Between Experimental and Control Groups

Group	Pretest (%)	Category	Posttest (%)	Category	Change
Experimental	65.4	Moderate	83.5	Very High	+18.1%
Control	71.9	High	66.4	Moderate	-5.5%

Improvement in Individual Components of Vocal Technique

All components of vocal technique demonstrated noticeable improvement after the implementation of the drill method. Intonation increased by 18.7%, breathing by 16.9%, articulation by 14.9%, and resonance improved from 60.6% to 83.0%. Following the intervention, each vocal component reached the "very high" performance category, indicating that systematic repetitive practice enhanced students' technical singing performance across multiple vocal dimensions.

Table 3. Improvement in Each Aspect of Vocal Technique

Vocal Aspect	Pretest (%)	Category	Posttest (%)	Category	Improvement
Breathing	68.7	High	85.6	Very High	+16.9%
Intonation	63.4	Moderate	82.1	Very High	+18.7%
Articulation	68.4	Moderate	83.3	Very High	+14.9%
Resonance	60.6	Moderate	83.0	Very High	+22.4%*

*Calculated from the reported pretest and posttest percentages.

Wilcoxon Signed-Rank Test

Table 4. Wilcoxon Signed-Rank Test Results

Group	Asymp. Sig. (2-tailed)	Decision	Interpretation
Experimental	0.000	Reject H_0	Significant improvement after the drill method
Control	0.640	Fail to Reject H_0	No significant improvement

The Wilcoxon Signed-Rank Test indicated a statistically significant improvement in singing ability among students in the experimental group ($p = 0.000 < 0.05$). In contrast, the control group did not demonstrate a statistically significant difference between the pretest and posttest scores ($p = 0.640 > 0.05$). These results confirm that the observed improvement in singing ability was associated with the implementation of the drill method rather than with regular classroom instruction alone.

Distribution of Score Changes

The rank distribution further supports the effectiveness of the drill method. Every student in the experimental group obtained a higher posttest score than pretest score, resulting in 21 positive ranks and no negative ranks. Conversely, the control group showed mixed results, with nine students improving, seven students declining, and five students demonstrating no change. This distribution indicates that improvement occurred consistently only among students who participated in drill-based vocal training.

Table 5. Wilcoxon Rank Distribution

Group	Negative Ranks	Positive Ranks	Ties	Total
Experimental	0	21	0	21
Control	7	9	5	21

The findings demonstrate that the drill method is more effective than conventional instruction in improving students' singing ability because systematic repetition and continuous corrective feedback facilitate the acquisition of fundamental vocal skills through progressive psychomotor learning. In contrast, the decline observed in the control group indicates that instructional approaches emphasizing explanation with limited practice opportunities are insufficient to sustain technical vocal development. This finding supports skill acquisition theory, which argues that repeated practice strengthens procedural memory, improves motor coordination, and promotes automatic performance of complex skills (Cheng et al., 2025; Hongmei, 2021; Ornoy & Cohen, 2022). Likewise, M. Jiang and Wu (2022) emphasized that deliberate practice accompanied by continuous feedback enables learners to refine technical performance more effectively. Compared with previous studies, the present findings extend existing evidence by demonstrating the effectiveness of drill-based instruction in formal secondary school vocal learning.

The inferential analysis further confirms that the improvement resulted from the instructional intervention rather than chance. The significant improvement in the experimental group, together with the consistent positive learning outcomes among all participants, indicates that structured repetition and immediate feedback promote more stable skill acquisition than conventional instruction. Conversely, the varied performance in the control group suggests that the absence of systematic practice contributes to inconsistent learning outcomes. These findings are consistent with Udakarn and Namtep (2024), who reported that repetitive practice combined with timely feedback reinforces correct motor patterns while reducing performance variability. Therefore, beyond its statistical significance, the drill method demonstrates practical educational value by producing consistent improvements in students' vocal performance.

The improvement across breathing, intonation, articulation, and resonance indicates that the drill method supports comprehensive vocal skill development, although each component improved to a different extent because of differences in physiological and motor demands. Resonance showed the greatest improvement, suggesting that voice quality responds well to repeated guided practice, whereas articulation improved more gradually because accurate pronunciation requires more complex coordination. Similar processes explain the improvements in breathing and intonation, which depend on progressive respiratory control and pitch accuracy developed through continuous practice. These findings are consistent with previous studies reporting that repetitive vocal exercises improve pitch stability, breath management, articulation, and vocal quality among novice singers (Haddon, 2016; Lim et al., 2024; L. Simones, 2024). Unlike earlier studies conducted primarily in higher education or professional music settings, this study demonstrates that comparable benefits can also be achieved in secondary school classrooms.

The effectiveness of the drill method can also be explained through cognitive and psychomotor learning theories, which emphasize that motor skills develop progressively through repeated practice and feedback. During the eight instructional sessions, students continuously practiced vocal techniques under teacher supervision, received immediate corrections, and gradually progressed from conscious execution toward more automatic performance, consistent with the stages of motor learning proposed by Han (2022) and L. L. Simones (2017). This learning process enabled students to reduce technical errors while allocating greater attention to musical expression. The findings therefore support previous studies highlighting the role of structured practice and guided feedback in improving vocal performance (Conaghan, 2024; Du & Idris, 2025; Mualem & Lavidor, 2015), while providing additional empirical evidence for their application in classroom-based secondary school music education.

From a pedagogical perspective, the findings suggest that effective vocal instruction should integrate systematic repetition with continuous formative feedback to strengthen students' technical singing competence. The drill method enables teachers to monitor students' progress while fostering balanced development across breathing, intonation, articulation, and resonance. Nevertheless, this study was limited by its relatively small sample, implementation in a single school, and quasi-experimental design without random assignment, which may restrict the generalizability of the findings. Furthermore, vocal performance was evaluated through performance-based assessment without objective acoustic analysis. Therefore, future research should involve larger and more diverse samples, adopt randomized experimental designs, and incorporate objective acoustic measurements to provide stronger evidence regarding the long-term effectiveness of drill-based vocal instruction in different educational contexts (Grigiene, 2010; Rakhmetov et al., 2026; Wang, 2013).

Conclusions

This study concludes that the implementation of the drill method is effective in improving the singing ability of Grade XI students during vocal technique instruction. Students who received drill-based learning demonstrated significantly higher singing performance than those who received conventional instruction, as evidenced by the substantial increase in overall singing ability and statistically significant differences between pretest and posttest scores. Furthermore, the drill method effectively enhanced all assessed components of vocal technique, including breathing, intonation, articulation, and resonance, indicating its contribution to comprehensive vocal skill development. These findings suggest that systematic, repetitive, and feedback-oriented practice provides an effective instructional strategy for strengthening students' technical singing competence and supports the integration of the drill method into secondary school music education to improve the quality of vocal learning.

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