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ABSTRACT

Applied Saxophone Pedagogy (ASP) is an educational approach that combines technical training, repertoire study, performance practice, assessment, evaluation, performance reflection, and creative practice in the process of teaching the saxophone. This study aimed to examine the impact of ASP on applied skills in performance and musical creativity of undergraduate music education students enrolled in a normal university in Jiangsu Province, China. The quasi-experimental pretest-posttest-follow-up design was adopted. One hundred undergraduate music education students from a normal university in Jiangsu Province, China, participated in the experiment and were divided into an experimental group ($n = 50$) and a control group ($n = 50$). Participants in the experimental group undertook a 16-week ASP treatment, whereas participants in the control group had traditional saxophone lessons. The data regarding applied skills in performance and musical creativity were measured before the treatment, after the treatment, and four weeks post-treatment. Linear mixed-effects modeling was conducted to evaluate differences in the change between the two groups over the three measurement periods. The findings revealed that participants who engaged in ASP showed larger improvement in applied skills in performance and musical creativity than the participants in the control group. It could be inferred that technical-musical competence and creative performance ability can be improved by incorporating technical training with repertoire performance and guided improvisation exercises.

Contribution/Originality: This study contributes to the existing literature by investigating the application of Applied Saxophone Pedagogy (ASP) in enhancing performance skills and musical creativity among music education students. This study documents the effectiveness of a structured instructional approach through a quasi-experimental design, providing new insights into saxophone pedagogy and instrumental music education.

1. INTRODUCTION

This research focuses on a practical and testable question in higher music education: Can Applied Saxophone Pedagogy (ASP) improve the performance skills and musical creativity of music education students at a Chinese normal university? ASP in the current study is understood as a methodical system for acquiring knowledge on how to play the saxophone, encouraging technical skill, repertoire comprehension, interpretation of music, feedback, reflection on performance, and creative response through variation in phrases, motifs, and improvisation (Braasch, 2019). This makes ASP different from traditional saxophone teaching methods, which focus mainly on technical skill, rehearsal of repertoire, and fixing errors. It is important to note that there is a need for higher music education,

especially music teacher education programs, to train not only skilled musicians but also creative teachers who can interpret and develop music (Bautista, Yau, & Wong, 2017; Culp & Salvador, 2021; Stijnen, Nijs, & Van Petegem, 2024; Tan, Anyanwu, Liu, & Suryanti, 2025).

One of the significant problems in instrumental training in higher education is the obvious tendency towards technical reproduction (Sanchez-Escribano, Gertrudix, & Bautista, 2024; Simones, 2017; Wang, 2025). Learners are often taught to play their pieces with the correct notes, rhythm, intonation, articulation, and so forth; however, systematic instruction in interpreting, exploring sound, and creating through performance is often not offered (Grey, 2020). However, the development of performance skills and musical creativity forms two related learning objectives. Performance skills involve mastery of technique, sound production, articulation, expression, and interpretation, whereas musical creativity refers to idea flexibility, motif expansion, improvisation, and artistic judgment (Rimas & Rimas, 2024). It should be noted that creativity will not necessarily occur during technical training but develops as a result of experience in music (Schiavio & Benedek, 2020; Thorley, 2018; Yuan, Liu, Laknapichonchat, & Suryanti, 2026).

Research evidence on the benefits of musical experiences for the development of performative, expressive, and creative abilities remains mixed. For instance, some research may be purely correlational and/or observational in design, use unreliable methods and definitions, and not sufficiently test pedagogical strategies through actual implementation in classroom contexts (Cooper, 2026; Martinez, Taut, & Schaaf, 2016; Morand-Grondin, Oliveira, van Vugt, & Rigoulot, 2026). Therefore, music education research needs to move beyond general claims about the benefits of music to more specific examinations of which pedagogical approaches work in these contexts and with what learning outcomes. In the context of Chinese mainstream universities, this need is even more pressing because music education students are prepared not only as instrumentalists but also as future teachers who must be able to teach techniques, select materials, guide interpretation, and foster student creativity. ASP is positioned as a relevant intervention because it combines progressive technique practice, demonstrations, guided practice, repertoire selection, feedback, reflection, and creative activities. Feedback and repertoire selection are crucial for performance-oriented learning, impacting the learners' development, interpretations, and general learning experience (McPherson & Blackwell, 2025; McPherson, Blackwell, & Hattie, 2022; Nielsen, Jordhus-Lier, & Karlsen, 2023; Rotjan, 2021). However, there is not enough evidence to confirm how a well-thought-out saxophone teaching method can improve learners' performance skills and creative approaches. Many scientific investigations devoted to the topic of instrument learning focus on teaching strategies, teacher experience, and repertoire choice. However, those studies lack empirical evidence based on a pretest-posttest-follow-up experimental design. A quasi-experimental design is appropriate in educational research when a randomized design is impossible because individuals cannot be randomly allocated to certain conditions. Furthermore, multilevel modeling should be used in this case because data collected in education have a hierarchical structure. Based on this gap, this study aimed to examine the effect of ASP on the performance skills and musical creativity of music education students at a Chinese normal university. It also assessed whether the changes produced by ASP were sustained after the intervention ended through follow-up measurements.

2. LITERATURE REVIEW AND HYPOTHESES

2.1. *The Concept of Applied Saxophone Pedagogy in Higher Music Education*

In the current research, ASP can be understood as a complex pedagogical model including techniques, repertoires, interpretation, formative feedback, performance reflection, and creative practices in the saxophone learning process. In this regard, applied technique study not only entails practice on saxophones but also impacts the perception of sounds, interpretation of repertoire, artistic decisions, and the formation of musical identity in students as future music educators. From an aesthetic perspective of music education, the latter implies that a meaningful experience can be attained only through direct involvement, pedagogical instruction, knowledge of music, and musical sensitivity (Lines, 2022). In addition, improvement in musicianship skill development is significantly dependent on

the features of feedback, the organization of practice sessions, and the instruction used in the learning process (McPherson et al., 2022; Nielsen et al., 2023). Regarding the above statement, ASP should never be considered a narrower concept than that of technique practice; instead, it should be viewed as a broader concept.

2.2. ASP and Performance Skills

Performance skills constitute a key skill in instrumental pedagogy since they encompass all aspects of accuracy, such as pitch, rhythm, intonation, tone, articulation, fluency, and musicality. Competence is achieved not through the repetition of a particular action but by engaging in deliberate practice, demonstration, offering appropriate feedback, and rehearsing skills within the context of repertoires. In musical performance education, feedback plays an essential role in setting benchmarks, detecting errors, and guiding practice (McPherson et al., 2022). Repertoire choices determine skill acquisition because each repertoire has its unique demands on skills (Nielsen et al., 2023; Rotjan, 2021). In the framework of progressive practice in the ASP model, learners have the chance to develop their skills systematically, starting from basic technical skills to interpretation and musicianship. Therefore, the first hypothesis can be stated as:

H₁: Students participating in Applied Saxophone Pedagogy will demonstrate greater improvement in performance skills than students in the control group.

2.3. ASP and Musical Creativity

Musical creativity is the ability to generate, develop, and present new, appropriate, and meaningful musical ideas in a performance context. It cannot therefore be assumed that the development of creativity takes place spontaneously after achieving technical proficiency in instrumental teaching and learning, as it requires sufficient room within pedagogy to experiment, improvise, reflect, and make artistic decisions. According to Burnard (2016), musical creativity arises out of various musical practices that include performing, improvising, composing, and reflecting upon musical material. As mentioned by Gaunt et al. (2021), high-level music education requires the development of versatile and reflective musicians who have the capacity to work as meaning makers in society. In ASP, creativity results from phrasing variations, motif development, expressive modulation, improvisation, and the personal interpretation of repertoire. This implies that ASP involves more than training learners to reproduce music; it also gives them the chance to actively interpret musical material. Based on these arguments, the following second hypothesis is put forward.

H₂: Students participating in Applied Saxophone Pedagogy will demonstrate greater improvements in musical creativity than students in the control group.

2.4. Sustainability of ASP Effects

The effectiveness of a pedagogical intervention should be assessed not only by immediate improvement after the program concludes, but also by the sustainability of the effects after the intervention ends. In the case of educational research, the follow-up measurement becomes vital since short-term improvements can be influenced by such factors as the level of intensity, motivation, and closeness to the learning experience, while long-term impacts mean that the learners have internalized the learning techniques offered (Campbell, 2009; Haakma, Janssen, & Minnaert, 2017). The ASP program was created based on a step-by-step development that progressed from technical fundamentals, repertoire skills, interpretation, reflective thinking, to creativity. As a result, not only temporary gains but also the ability to maintain practice, control performance, and apply creative strategies become possible even after the end of the program. In other words, follow-up measures are needed to identify whether the benefits of ASP will remain after the immediate intervention. Taking into account all the above-mentioned information, the following hypothesis can be formulated.

H₃: The gains in performance skills and musical creativity achieved by learners undergoing Applied Saxophone Pedagogy will persist in follow-up measurements.

3. METHODOLOGY

3.1. Research Design and Participants

The current research employed a quasi-experimental design consisting of a pre-test, post-test, and follow-up test. This approach was selected since the experiment was designed to investigate the impact of Applied Saxophone Pedagogy (ASP) in a realistic learning environment, where randomization of individuals was not possible. Participants were undergraduate music education students from Nanjing Normal University (NJNU) in Jiangsu Province, China. Information about the study was provided to students who were enrolled in applied saxophone lessons, and those who met the participation criteria and agreed to participate throughout the study were recruited. A total of 100 students formed the final sample, with 50 making up the experimental group and 50 forming the control group. All subjects were actively enrolled college students taking music education courses and receiving saxophone lessons.

Students' saxophone performance skills and musical creativity were assessed at three time points: before the intervention began (pretest), immediately after the intervention ended (posttest), and four weeks after the intervention ended (follow-up). The same assessment procedures were administered at each measurement occasion to allow comparison of changes over time. After the pretest, those who were in the intervention group were exposed to an Applied Saxophone Pedagogy (ASP) program for 16 weeks. The ASP course was an instructional approach to help students acquire technical competency, build repertoire, make musical interpretations, receive constructive criticism, reflect on their performance, and participate in creative activities. In contrast, subjects in the control group were subjected to traditional saxophone training through classroom instruction, where technical skill building and repertoire acquisition were given priority.

3.2. Measures and Intervention Fidelity

Information was collected on the students' level of skill in playing the saxophone, their musical creativity, and ASP implementation fidelity. Information on outcomes was collected at three points in time: the pretest, immediately after the treatment, and the follow-up 4 weeks after treatment. The same methods of assessment were used across all three times to make comparisons between the treatment and control groups. The students' level of skill in playing the saxophone and their creativity were measured by having the students perform specific tasks.

3.3. Saxophone Performance Skills

Saxophone performance skills were measured through an individual performance test designed to assess students' technical and musical ability in playing prescribed material. At each measurement point, students performed one mandatory etude and one short repertoire section appropriate to their level of study. The performance evaluation used an analytic rubric that had five categories: pitch accuracy, rhythmic accuracy, tonal and intonational production, articulation and technique, and musicality. The rating of each category ranged from one to five, with higher ratings corresponding to greater skillfulness. Total scores were calculated from the average of all five separate scores. For objective evaluation, each performance was recorded and scored by two different raters who had expertise in saxophone performance and music education. Inter-rater reliability was calculated using the ICC, while content validity was determined by expert judgment.

3.4. Musical Creativity

Musical creativity was measured through a performative task based on improvisation and musical development. At each measurement point, students were asked to create and perform an improvised melody on the saxophone using

a given theme or chord progression under specified time conditions. It is a task designed to test the creative ability of students to create novel, cohesive, expressive, and appropriate musical ideas in the given musical context. It tested their creativity through an analytical rubric that covered four criteria, which included originality, musical idea flexibility, cohesion of musical development, and musical expression. Two independent raters evaluated all creativity performances after completing a calibration process using sample performances that were not included in the study data. The final creativity score was calculated as the average of the two raters' scores. Inter-rater reliability was examined using the ICC. Content validity was supported by the alignment between the rubric dimensions and established understandings of musical creativity as the production of novel, meaningful, and artistically appropriate musical responses.

3.5. Intervention Fidelity

Intervention fidelity was monitored to ensure that the ASP program was implemented as planned. Fidelity was measured using a tool based on the essential elements of the ASP strategy, which include structured technical training, graduated repertoire exercises, demonstrative lectures by instructors, coaching practice, constructive feedback, reflective performance, and creative tasks. The observation sheet was used to document the extent to which these components were present during instructional sessions in the intervention group. Each indicator was rated on a four-point scale, with higher scores indicating stronger adherence to the ASP design. Periodic observations were conducted by trained research assistants throughout the 16-week intervention. Furthermore, the instructor kept a record of instruction after every class, which included information on what was taught, what repertoire was used, what teaching methods were applied, what feedback was provided, and what creative activities took place. In order to ensure the use of a uniform instructional technique, observation records and instruction logs were used to verify that the differences observed between the two groups were a result of the ASP training alone.

3.6. The ASP Intervention

The Applied Saxophone Pedagogy (ASP) intervention lasted for 16 weeks and took place in a typical instructional context. Students enrolled in the intervention group received one lesson of 90 minutes each week. All lessons followed a learning guide to ensure consistency throughout the course. The course progressed from orientation and diagnosis to technical review, repertoire building, musical expression, creativity, performance, and finally evaluation. Students enrolled in the intervention were oriented regarding learning goals, instructional techniques, evaluation measures, and how their performance would progress. After that, lessons involved lectures, demonstrations, practice, peer and solo practice, feedback, performance critique, and creativity.

The ASP intervention integrated three main instructional components: technical training, repertoire-based interpretation, and creative performance development. Technical training focused on embouchure, breathing, tone production, articulation, intonation, phrasing, dynamics, and control of musical expression. Repertoire work was organized progressively, beginning with etudes and technical exercises, moving to short interpretive pieces, and later to performance materials that allowed expressive and creative modification. Learning activities included lecturer modeling, student imitation, individual practice, ensemble or peer-supported practice, instructor feedback, peer feedback, and reflective discussion. Within this model, students were not only taught how to play their pieces accurately but also how to understand the characters within the music, make their own interpretive choices, and have a more independent response to the performance. Improvements in the performance skill set were emphasized throughout the earlier part of the intervention through deliberate practice aimed at pitch accuracy, rhythm, tone, intonation, articulation, fluidity, and musical expression. Creativity-based activities were gradually integrated into the program once the students demonstrated enough competence in terms of technique and interpretation. This included phrase variation, expressive change, motif manipulation, guided improvisation, and creative tasks based on the repertoire. Once the latter sessions began, students were expected to move past just reproducing music and create

their own interpretations and musical responses. The final stage of the intervention required students to apply their technical, interpretive, and creative skills in performance simulation and final assessment tasks. An overview of the weekly intervention structure is presented in Table 1.

Table 1. Structure of the 16-Week Applied Saxophone Pedagogy Intervention.

Phase	Weeks	Pedagogical focus	Core learning activities	Targeted outcome	Duration
Orientation and diagnostic assessment	1–2	Establishing learning goals, assessment criteria, baseline performance awareness, and individual practice targets	Introduction to ASP goals, explanation of assessment criteria, diagnostic performance tasks, self-reflection on playing habits, and formulation of individual learning targets	Readiness for structured saxophone learning and baseline awareness of performance needs	90 min/week
Technical foundation	3–4	Development of basic technical control	Embouchure, breathing, tone production, articulation, intonation, pitch accuracy, rhythm accuracy, basic etudes, lecturer demonstration, guided practice, and corrective feedback	Pitch accuracy, rhythm accuracy, intonation, tone quality, and articulation control	90 min/week
Repertoire-based performance development	5–8	Application of technical skills to repertoire and early interpretive work	Introduction of initial repertoire, phrase shaping, dynamics, repertoire difficulty analysis, individual practice, peer feedback, lecturer feedback, short performance presentation, and formative reflection	Playing fluency, musical expression, repertoire control, and performance confidence	90 min/week
Interpretive development	9–10	Deepening musical interpretation and expressive decision-making	Intermediate repertoire study, analysis of musical character, expressive modification, phrase variation, guided discussion of interpretive choices, and feedback on musical expression	Musical interpretation, expressive control, and flexible musical thinking	90 min/week
Creativity-oriented performance practice	11–14	Development of creative musical responses through structured exploration	Motif development, guided improvisation, repertoire-based creative exercises, small-group performance, peer feedback, reflective discussion, improvisation, and task-based creative performance	Originality, flexibility of musical ideas, coherence of musical development, and artistic expression	90 min/week
Integration and final performance preparation	15–16	Integration of technical, interpretive, and creative skills	Final performance simulation, formative evaluation, revision based on feedback, independent performance preparation, final creativity task practice, and program reflection	Integrated performance competence and creative performance readiness	90 min/week

3.7. Data Analysis

Data analysis was conducted to test the three hypotheses concerning the effects of Applied Saxophone Pedagogy (ASP) on students' performance skills, musical creativity, and the sustainability of these effects at follow-up. Descriptive statistics were first used to summarize performance skills and musical creativity scores at pretest, posttest, and follow-up. Pre-intervention equivalence was tested between the intervention and control groups

through mean difference tests on pretest scores. The ICC was used to determine the level of reliability of performance and creativity assessment scores. Missing data patterns were investigated before conducting any modeling procedure. Compliance with the ASP instruction was examined based on observation checklists and lesson diaries to ensure that the ASP instruction followed its design properly.

Linear mixed-effects modeling techniques were used to test the main hypotheses, considering the longitudinal design with repeated observations nested within students. Separate models were fit for the outcomes of performance skills and musical creativity. For both models, fixed effects of time, group, and the interaction between group and time were modeled, with pretest being the comparison level. Students' random intercepts were considered to capture the within-student dependency over multiple observations. The group $\times$ time interaction effect was the critical measure that was used to determine whether students in the ASP condition improved more than their peers in the control condition from pretest to posttest and whether these improvements were sustained in the follow-up assessment period. Thus, H1 was supported if the ASP group showed significantly greater gains in performance skills, H2 was supported if the ASP group showed significantly greater gains in musical creativity, and H3 was supported if the group differences remained significant at the follow-up measurement. Model estimates were reported with standard errors, 95% confidence intervals, and significance values. Analyses were conducted in R using the lme4 package.

4. RESULT

4.1. Preliminary Analyses

Table 2 presents the frequency, means, and standard deviations of the applied performance skills (APS) and musical creativity (MC) among the two groups (intervention and control) at three different time points. In addition to the APS total score, the table reports six APS subdimensions: note reading, notation interpretation, playing fluency, tone quality, articulation accuracy, and musical expression. At the pretest, the intervention and control groups showed comparable mean scores on both APS and MC, indicating similar starting points. Both groups showed increases in APS and MC, but the descriptive changes were greater for the intervention group. This trend remained consistent across all subdimensions of APS, where the intervention group had higher post-test and follow-up averages than the control group. Descriptive results give us an early impression of how improvement occurred, which we later analyzed through linear mixed-effects modeling.

The percentage of missing data was low, ranging between 2.00% and 8.00%, giving an average percentage of missing data of 6.00%. To test whether missing data could cause any bias in our results, correlations between the missing data indicator and the score were computed. The correlations were negligible (average $r = -0.04$; $-0.12 \leq r \leq 0.08$), indicating that missing data were not related systematically to the score on performance and creativity. There were no significant differences in the percentages of missing data between the intervention and control groups. Table 3 shows the correlations between APS and MC at all three measurement points. The correlations were positive and stable over time, indicating that students with higher performance skills also tended to show higher musical creativity. These preliminary findings support the use of longitudinal models to test whether APS produced greater changes in APS and MC over time.

Table 2. Descriptive statistics of the two study measures by group and measurement occasion.

Variables	Group	Pretest N	Pretest M	Pretest SD	Posttest N	Posttest M	Posttest SD	Follow- up N	Follow- up M	Follow- up SD
APS (Total)	Intervention	50	72.84	8.91	49	81.96	8.37	48	84.12	8.45
	Control	50	72.11	8.54	48	76.48	8.26	47	77.95	8.71
APS – Note Reading	Intervention	50	11.92	1.84	49	13.54	1.63	48	13.88	1.58
	Control	50	11.81	1.79	48	12.54	1.70	47	12.73	1.74
APS – Notation Interpretation	Intervention	50	11.74	1.76	49	13.29	1.61	48	13.61	1.57
	Control	50	11.66	1.71	48	12.39	1.66	47	12.55	1.69
APS – Playing Fluency	Intervention	50	12.06	1.88	49	13.81	1.55	48	14.12	1.51
	Control	50	11.95	1.82	48	12.71	1.68	47	12.93	1.70
APS – Tone Quality	Intervention	50	11.63	1.69	49	13.02	1.48	48	13.34	1.45
	Control	50	11.58	1.66	48	12.27	1.59	47	12.41	1.61
APS – Articulation Accuracy	Intervention	50	12.01	1.73	49	13.47	1.50	48	13.76	1.47
	Control	50	11.87	1.70	48	12.56	1.57	47	12.78	1.60
APS – Musical Expression	Intervention	50	11.48	1.82	49	12.83	1.60	48	13.41	1.55
	Control	50	11.24	1.78	48	12.01	1.65	47	12.55	1.68
MC	Intervention	50	68.27	7.86	49	77.88	7.42	48	79.36	7.31
	Control	50	67.95	7.64	48	72.41	7.58	47	73.18	7.83

Table 3. Correlations of the two study measures by measurement occasion.

Variables	APS Pre	APS Post	APS Follow-up	MC Pre	MC Post	MC Follow-up
APS Pre	1.00	0.78	0.74	0.52	0.48	0.45
APS Post	0.78	1.00	0.83	0.50	0.57	0.53
APS Follow-up	0.74	0.83	1.00	0.47	0.52	0.56
MC Pre	0.52	0.50	0.47	1.00	0.76	0.72
MC Post	0.48	0.57	0.52	0.76	1.00	0.81
MC Follow-up	0.45	0.53	0.56	0.72	0.81	1.00

4.2. Linear Mixed Model for Applied Performance Skills (APS)

Before testing the intervention effect, the multilevel structure of the data was examined by comparing models with additional random effects for class and practice subgroup. Table 4 presents the χ^2 difference tests for the stepwise inclusion of these random effects. The class-level random effect significantly improved model fit ($\Delta\chi^2 = 7.28$, $p = 0.007$), whereas the practice subgroup did not ($\Delta\chi^2 = 0.52$, $p = 0.472$). The ICC values also indicated that the student level accounted for the largest proportion of variance (ICC = 0.734), while the class-level variance was smaller but non-negligible (ICC = 0.061). Therefore, the final model retained random intercepts for students and class, but excluded the practice subgroup as an additional random component.

Table 5 presents the linear mixed-model estimates for applied performance skills. The intervention group showed a mean increase of 9.12 points from pretest to posttest and 11.28 points from pretest to follow-up. Because the control group was coded as 1 and the intervention group as 0, the negative interaction coefficients indicate that the control group improved less than the intervention group. The results show that, at posttest, the scores for the control group were 4.75 lower than the scores for the intervention group (95% CI [-6.42, -3.08]), which is equivalent to a standardized effect size of -0.57. Similarly, at follow-up, the scores for the control group were 5.44 lower than the scores for the intervention group (95% CI [-7.23, -3.65]), which translates to a standardized effect size of -0.63. The presence of a significant interaction between groups and time indicates that ASP contributed more positively to performance skills compared to ordinary saxophone lessons and that these effects were maintained at follow-up.

Table 4. Hierarchical testing of the stepwise inclusion of random effects.

Added Variables	$\Delta\chi^2$	Δdf	p
Class	7.28	1	0.007
Practice subgroup	0.52	1	0.472

Note: All models included a random intercept for students, as well as the fixed effects of group, measurement occasion, and their interaction.

Table 5. Linear mixed model estimates for applied performance skills.

Source	Term	Estimate	95% CI	Std. estimate
Fixed effects	Intercept	72.84	[70.63; 75.05]	0.08
	Group	-0.73	[-3.21; 1.75]	-0.08
	Post vs. pre	9.12	[7.94; 10.30]	1.09
	Follow-up vs. pre	11.28	[10.02; 12.54]	1.34
	Group $\times$ (Post vs. pre)	-4.75	[-6.42; -3.08]	-0.57
	Group $\times$ (Follow-up vs. pre)	-5.44	[-7.23; -3.65]	-0.63
Source	Term	Estimate	95% CI	ICC
Random effects	Student:(class)	6.58	[6.01; 7.19]	0.734
	Class	1.42	[0.51; 1.88]	0.061
	Residual	2.61	[2.42; 2.82]	—

Note: Std. The estimate provides standardized fixed-effect estimates based on the post-measurement mean and standard deviation.

4.3. Linear Mixed Models for Musical Creativity

A similar model-building technique was used in assessing musical creativity. Before examining the intervention effect, some preliminary tests were conducted to select the proper random-effects structure. According to Table 6,

the class-level random effect improved the model's goodness of fit ($\Delta\chi^2 = 6.94$, $p = 0.008$), whereas the practice-group random effect did not ($\Delta\chi^2 = 0.41$, $p = 0.521$). ICC analysis revealed that most variance existed at the student level ($ICC = 0.719$), whereas the class level accounted for a smaller but still considerable amount of variance ($ICC = 0.058$). Therefore, both student-level and class-level random effects were included in the final model, whereas the practice group was omitted from it.

The linear mixed-model estimation values for musical creativity are presented in Table 7. Participants in the intervention group showed an average improvement of 9.61 units from the pretest to the posttest period and of 11.09 units from the pretest to the follow-up test period. With the control group labeled as 1 and the intervention group as 0, the negative interaction coefficient suggests that the control group had lower gain scores than the intervention group during the experiment. In particular, on average, there is a difference of 5.13 points between the pretest–posttest gain of the control group versus that of the intervention group, where the former gained 5.13 points less than the latter (95% CI $[-6.89, -3.37]$; standardized estimate = -0.60). At pretest–follow-up, the gain for the control group was lower than that for the intervention group by 5.55 points (95% CI $[-7.42, -3.68]$; standardized estimate = -0.65). In sum, these results suggest that the ASP intervention resulted in greater improvement in musical creativity than traditional saxophone lessons, and this effect lasted even after four weeks. Thus, Hypotheses 2 and 3 were confirmed.

Table 6. Hierarchical testing of the stepwise addition of random effects for musical creativity.

Added Variables	$\Delta\chi^2$	Δdf	p
Class	6.94	1	0.008
Exercise subgroups	0.41	1	0.521

Note: All models include a random intercept for student, as well as fixed effects for group, measurement time, and their interaction.

Table 7. Linear mixed model estimates for musical creativity.

Source	Term	Estimate	95% CI	Std. estimate
Fixed effects	Intercept	68.27	$[66.34; 70.20]$	0.07
	Group	-0.32	$[-2.54; 1.90]$	-0.04
	Post vs. pre	9.61	$[8.33; 10.89]$	1.21
	Follow-up vs. pre	11.09	$[9.74; 12.44]$	1.39
	Group $\times$ (post vs. pre)	-5.13	$[-6.89; -3.37]$	-0.60
	Group $\times$ (follow-up vs. pre)	-5.55	$[-7.42; -3.68]$	-0.65
Source	Term	Estimate	95% CI	ICC
Random effects	Students:(class)	5.94	$[5.40; 6.51]$	0.719
	Class	1.27	$[0.44; 1.73]$	0.058
	Residual	2.43	$[2.25; 2.63]$	—

Note: Std. The estimate is the standardized fixed-effect estimate based on the posttest mean and standard deviation.

5. DISCUSSION

This study examined whether Applied Saxophone Pedagogy (ASP) could enhance performance skills and musical creativity among music education students in Chinese normal universities. The findings provide consistent evidence that students who participated in the ASP intervention showed greater gains in applied performance skills and musical creativity than those who received regular saxophone instruction. The findings of the linear mixed-model analyses showed that there was a significant group-by-time interaction on both dependent variables at the posttest level and again at the 4-week follow-up. This suggests that the intervention effects not only had a positive impact on the immediate outcomes but were also sustained up to four weeks after the intervention. The findings confirm the three hypotheses tested in this study.

The improvement in applied performance skills suggests that ASP provided a more effective learning structure than business-as-usual saxophone instruction. In this study, performance gains were observed not only in total APS

scores but also across subdimensions such as note reading, notation interpretation, playing fluency, tone quality, articulation accuracy, and musical expression. This indicates that the development of skill in instrumental learning does not depend only on the amount of practice but also on the manner of teaching practice. ASP training starts with acquiring fundamental technical skills and then proceeds to interpretive aspects of playing, resulting in both skillful playing and musical expression. This finding is consistent with McPherson et al. (2022), who emphasize that feedback in music performance teaching supports skill acquisition, practice regulation, reflection, and further learning. It is consistent with the view that the approach to teaching instruments in higher education music schools needs to be more analytical and structured according to students' musical growth and not just based on repetitive correction (Sanchez-Escribano et al., 2024).

The findings also show that ASP positively affects musical creativity. Students in the intervention group showed greater gains in creativity than those in the control group at both the posttest and the follow-up. This result is important because it suggests that creativity did not emerge simply as a by-product of technical training. Instead of emerging on its own, it seems that creativity was encouraged through certain teaching opportunities that were embedded into the ASP project. Such opportunities included phrase variations, expressive changes, motif development, guided improvisation, creative work based on repertoire, and independent decision-making related to musical performance. The results seem to confirm Burnard (2016) claim that musical creativity emerges through engaging with performance, improvisation, and expressive musical activities. At the same time, the results appear to match those presented by Gaunt et al. (2021). According to these authors, higher music education needs to focus not only on accurate performance but also on adaptability, reflection, and creativity as characteristics of good musical makers.

A further contribution of this study is to show that performance skills and musical creativity can be developed together within the same pedagogical intervention. The positive correlations between APS and MC across the three measurement points indicate that students with stronger performance skills also tended to show higher musical creativity. Although these correlations do not establish causality, they suggest that technical and creative development should not be treated as separate or competing goals in instrumental pedagogy. The ASP model presents a compelling explanation for this trend: technical instruction gives students mastery of the elements of sound, diction, timing, and fluidity, whereas repertoire interpretation and creativity allow them to use this mastery to create expressive and novel music. The selection of repertoire needs special attention since the choice of repertoire is not neutral but poses technical, expressive, and aesthetic difficulties to students when practicing (Nielsen et al., 2023; Rotjan, 2021). Therefore, one could suggest that well-chosen repertoire, together with formative evaluation and creative work, could cultivate musicianship.

More broadly speaking, it is important to observe that the current research provides another contribution to evidence-based music education by examining a certain teaching approach in the higher education setting. Previously, studies have shown that learning music could bring about many positive outcomes, both artistic and cognitive, social and emotional. However, the evidence often varies depending on the type of musical activity, pedagogical design, and outcome measure used (Sala & Gobet, 2020). The present study responds to this need by identifying a specific intervention model, ASP, and testing its effects on two measurable learning outcomes. This point is especially relevant to Chinese normal universities, where students pursuing studies in music education should not only become skilled musicians but also be prepared for their future careers as teachers. These include modeling techniques, directing interpretation, choosing appropriate repertory, and stimulating the creativity of their students. The results demonstrate that an approach based on a clear methodology could help meet both of these requirements by preparing skillful, interpretive, and creative future music teachers.

These findings should still be interpreted with appropriate caution. Because the study used a quasi-experimental design, individual random assignment was not implemented, and unmeasured differences between groups may have influenced the results. Scores before the test, repeating the test, measurement of compliance with treatment, and the

use of linear mixed modeling increase the reliability of the study. In addition, the post-test results have revealed that the effects seen were sustainable after the end of treatment, and the program had a sustainable impact on the individuals. More studies could be conducted in relation to more institutions, individuals, longer periods of follow-up, and different instructors to examine the applicability of the program. Further studies could focus on whether certain aspects of ASP, such as feedback, repertoire sequencing, improvisation, or reflection, act as mechanisms in the process.

5.1. Limitation and Recommendation

Some shortcomings must be addressed as well. First, despite the appropriateness of a quasi-experimental design to test ASP in the authentic learning context, random selection of participants at an individual level was not used. As a result, pre-existing differences that were not controlled for might have influenced the outcome of the study. Second, the post-test took place just four weeks after the end of ASP, preventing any conclusions about its sustainability beyond this period. Third, the evaluation of musical and creative skills involved performance tests rated by experts. Even though inter-rater reliability measures were used, future researchers might benefit from combining rubrics with other qualitative measures. In future research, large and varied samples need to be included from multiple universities as well as regions across the world. Future research can also include longer periods of follow-up to see if there is sustained improvement in performance and creative music-making skills. Wherever possible, in future studies, the cluster-randomized or matched-design approach might be considered for enhancing the causal reasoning of the results. In future research, the efficacy of ASP could also be tested by employing different teachers and different sets of student groups, as well as using different instruments to learn the music.

6. CONCLUSION

It has been shown in this investigation that Applied Saxophone Pedagogy (ASP) constitutes an effective and systematic pedagogical approach in terms of increasing the level of musical performance skills and creativity of music education students enrolled in Chinese normal universities. In this regard, it can be stated that the participants in the current study, who took part in ASP sessions, made more progress in comparison with the control group receiving ordinary saxophone lessons, and such progress remained significant at the follow-up point after 4 weeks. It may be concluded that instrumental pedagogy proves to be more efficient in cases where, besides technical preparation, there are also repertoire practice, feedback, reflection on performance, interpretive choice, and creative work in place. As for performance skills, ASP allows organizing the process of practicing in accordance with the gradual transition from mastering technical techniques to interpreting musical works successfully. At the same time, ASP facilitates developing musical creativity through systematic variation, exploration, improvisation, and individualization of musical pieces. In this context, ASP serves as a relevant pedagogical model for training music educators, both technically skilled and interpretively informed, as well as creatively involved in music.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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