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Integrating peer assessment based station rotation learning model to enhance cucurbit flute skills and learning motivation of Chinese undergraduates

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Abstract

This study aims to investigate the effectiveness of a peer-assessment-based station rotation model in improving students' cucurbit flute skills and learning motivation compared to traditional teaching methods. Conducted with 50 college students from a music education and performance department, the research employed a quasi-experimental design, dividing participants into experimental and control groups with pre-test and post-test assessments. The methodology included questionnaires, interviews, and performance rubrics to evaluate outcomes. Findings revealed that the experimental group significantly outperformed the control group in rhythm, articulation, and style, with notable increases in learning motivation. However, improvements in note accuracy and dynamics were not significant. The study concludes that the model enhances specific skills and motivation, offering a promising alternative for music education. Practically, it suggests educators integrate peer feedback and structured practice to boost engagement and performance in traditional instrument instruction.

Keywords: Cucurbit flute skills, Learning motivation, Peer-assessment, Station rotation.

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1. Introduction

The cucurbit flute, also known as the hulusi, is a traditional Chinese wind instrument crafted from a gourd and bamboo pipes. It is celebrated for its distinctive timbre and is widely utilized in folk music [1]. Its unique construction and sound production, requiring precise breath control and finger placement, pose specific challenges in music education, particularly within traditional teaching frameworks. [2]. Historically, music instruction, including for instruments like the cucurbit flute,

has relied on a teacher-centered approach where instructors demonstrate techniques, and students practice individually or in groups. While effective to an extent, this method often falls short in providing personalized feedback and fostering peer interaction, both of which are critical for skill development and sustaining student motivation [3]. As cultural heritage embodied in traditional instruments gains increasing recognition, there is a pressing need to explore innovative pedagogical strategies that not only enhance technical proficiency but also invigorate learners' engagement with such art forms.

In response to these limitations, alternative educational models such as peer assessment and station rotation have emerged as promising approaches. Peer assessment involves students evaluating each other's performances, offering constructive feedback that can deepen understanding and sharpen critical thinking skills [4]. Meanwhile, the station rotation model, a subset of blended learning, organizes instruction into distinct stations where students engage with diverse activities or teaching methods, promoting active learning and customization [5]. These methods align with Vygotsky's social constructivism theory, which posits that social interaction is foundational to cognitive development and learning [6]. By integrating peer assessment into a station rotation framework, educators can create a dynamic, interactive environment that contrasts with the static nature of traditional instruction, potentially yielding superior outcomes in both skill acquisition and motivation.

Despite the growing body of research on peer assessment and station rotation, their application remains largely uncharted in the context of teaching traditional musical instruments like the cucurbit flute. Existing studies have predominantly focused on academic subjects such as mathematics or language arts, with scant attention paid to the performing arts, particularly the nuanced skills required for instruments rooted in cultural traditions [7]. This research gap is significant, as music education, especially for heritage instruments, demands tailored approaches that account for technical mastery, cultural context, and learner enthusiasm. The absence of empirical evidence on how these innovative models impact music performance skills underscores the urgency of this investigation, which seeks to bridge this divide and contribute actionable insights to the field. Based on this research gap, this study is thus positioned to address two critical research questions:

RQ 1: Does using a peer assessment-based station rotation model significantly improve students' cucurbit flute skills compared to traditional teaching methods?

RQ 2: Will students' learning motivation be enhanced by using a peer assessment-based station rotation model?

These questions target both the technical and affective dimensions of learning, aiming to assess whether this hybrid approach can outperform conventional pedagogies in a music education setting. The significance of this research extends beyond immediate classroom implications; it holds the potential to inform strategies for preserving cultural heritage through education while advancing the broader discourse on effective teaching practices. By examining how peer-driven and rotational learning can enhance the mastery of the cucurbit flute, this study offers a novel contribution to music pedagogy, with possible applications to other instruments and disciplines.

2. Literature Review

2.1. Peer-assessment

Peer assessment has garnered significant attention in educational research. Topping defined peer assessment as a process where students evaluate the work of their peers using predefined standards or criteria [8]. It is a formative assessment tool that motivates students to actively engage with learning content and develop assessment skills. Some researchers also highlight that peer assessment enables students to critically review their own and others' work, promoting self-regulation and deeper learning [9]. It is noted that peer assessment encourages students to actively evaluate and improve the learning outcomes of both themselves and their peers through discussion and criticism [10].

Previous studies have shown that peer assessment can enhance students' domain-specific skills and improve academic performance [11] and develop assessment skills [12]. For instance, in higher education, peer assessment has been found to improve students' higher-order thinking skills, social skills, learning motivation, and learning outcomes [13]. However, existing research predominantly focuses on peer assessment in general education settings, with limited exploration of its application in music education, particularly in niche areas like cucurbit flute instruction. Additionally, while peer assessment can enhance students' self-regulation and reflection skills, its reliability and validity in assessing technical skills remain areas of concern [14]. For example, in highly technical fields such as music performance, peer feedback may lack precision and depth, potentially affecting its effectiveness [13]. Furthermore, it is necessary to develop more specific and practical peer assessment tools and rubrics tailored to music education, especially for instruments like the cucurbit flute, to enhance the reliability and validity of peer assessment.

2.2. Station rotation

The station rotation model, proposed by Horn and Staker, is a blended learning approach where students rotate through multiple technology-based stations in the classroom according to a predetermined schedule [15]. This model combines teacher-led instruction, collaborative group work, individual practice, and technology-enhanced learning, fostering individualized instruction and student engagement. According to the Christensen Institute, the station rotation model is an extension of the rotation model in which students alternate between classroom-based learning modes on a predetermined timetable or at the discretion of the teacher in a certain course or subject Figure 1 [16]. Aspire Public Schools, Staker and Horn, and Walne highlighted that the station rotation model allows students to work at their own pace and level, enhancing learning motivation and academic performance [17]. For example, in elementary school science education, the station rotation model has been found to improve students' higher-order thinking skills [18].

Prior research on the station rotation model has primarily focused on its application in general academic subjects, with relatively few studies in music education. Moreover, while the station rotation model emphasizes differentiated instruction and personalized learning, its implementation in music education contexts, particularly for niche instruments like the cucurbit flute, requires further exploration. For example, how to design station activities that align with the characteristics of cucurbit flute teaching and learning, and how to allocate time and resources effectively, remain unanswered questions. Additionally, existing studies tend to focus on the model's short-term effects, with insufficient attention to its long-term impact on students' skill development and sustained motivation. It could explore how to design station activities that cater to the unique features of music education and address the challenges of implementing the model in music teaching contexts.

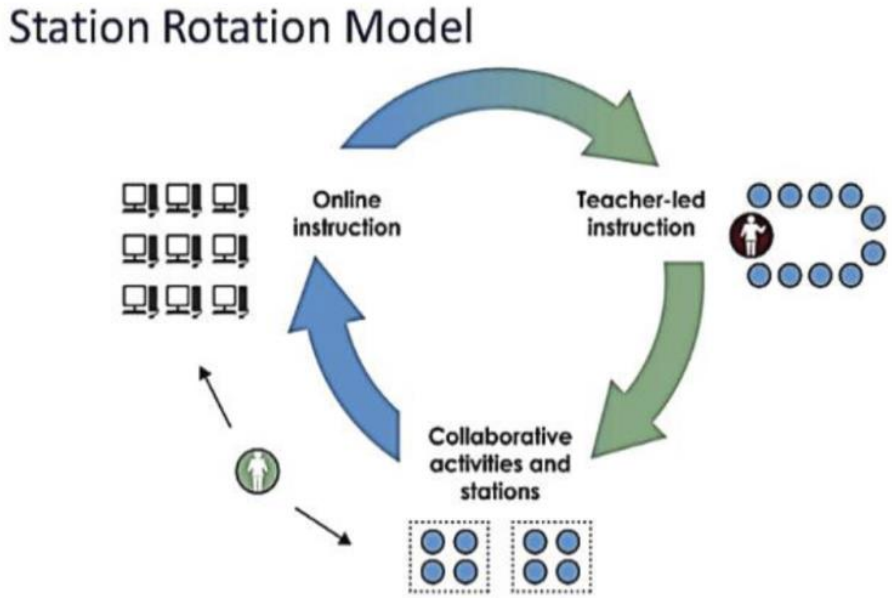

Figure 1.
Station Rotation Model(Christensen, Christensen et al. [19]).

2.3. Cucurbit Flute Skills

The cucurbit flute, also known as the hulusi, is a traditional wind instrument popular among ethnic groups such as the Yi, Dai, and Achang. Its playing techniques include breath control, finger placement, and sound modulation. Mastery of the cucurbit flute requires not only technical proficiency but also a deep understanding of its cultural context [1]. Previous studies have explored the cultural background, sound production mechanisms, and playing techniques of the cucurbit flute [1]. For example, he examined the development and evolution of cucurbit flute music among the Dai ethnic group in Yunnan, highlighting its cultural significance and artistic value [2]. Liu provided an overview of the historical development of cucurbit flute music [1].

However, research on cucurbit flute skills has primarily focused on cultural and historical aspects, with limited exploration of teaching methods and skill development [20]. While some studies have touched on playing techniques, systematic research on skill training methods and evaluation criteria remains scarce. For instance, in music education, how to break down complex cucurbit flute skills into smaller components and design targeted training activities requires further investigation. Additionally, there is a lack of standardized evaluation tools for assessing students' cucurbit flute skills, making it challenging to objectively measure learning outcomes [21].

In this paper, the cucurbit flute skills will include five key sub-skills which are notes, rhythm and timing, articulation, dynamics and style and mood see Table 1.

Table 1.
Cucurbit Flute Skills.

Skills	Explanation
Notes	Notes are the individual pitches or tones produced by a cucurbit flute as a result of regulated air vibration inside the instrument. They are the fundamental components of melody and harmony in music, serving as the foundation for musical expression on the cucurbit flute.
Rhythm and Timing	Rhythm and timing skills in cucurbit flute playing refer to the ability to maintain a steady beat and precise timing during performance. In music, rhythm involves the systematic segmentation of notes into recurring beats within a measure, typically aligned with a commonly understood tempo or time signature.
Articulation	Articulation refers to the clarity, precision, and expressiveness with which notes and phrases are performed. It is a vital skill that enables a musician to effectively and emotionally transmit musical ideas. Articulation is the ability to produce a clear, distinct sound with each note played on the cucurbit flute.
Dynamics	The term "dynamics" refers to the variation in loudness and intensity of the instrument's sound. This ability is critical for conveying the emotional content of music, creating musical phrases, and bringing contrast and intrigue to a performance.
Style and Mood	Style and Mood skill refers to the player's ability to elicit and transmit distinct stylistic and emotional elements through their performance. This talent involves understanding the intricacies of various musical genres, knowing how to interpret and convey diverse emotions and sentiments through sound, and creating a unique atmosphere or ambiance with the flute.

2.4. Learning motivation

Learning motivation is a key factor influencing students' learning behaviors and outcomes. Deci and Ryan proposed self-determination theory, which posits that intrinsic motivation, extrinsic motivation, and amotivation are the three main types of motivation [22]. Intrinsic motivation stems from internal factors such as curiosity and interest, while extrinsic motivation arises from external stimuli like rewards and recognition. Self-determination theory emphasizes that students' learning motivation is influenced by their sense of autonomy, competence, and relatedness. Jones developed the MUSIC Model of Academic Motivation, which identifies five key elements of motivation: self-efficacy, goal orientation, perceived control, interest, and value [23]. This model provides a theoretical framework for studying students' learning motivation.

Prior research has extensively explored the role of learning motivation in education, demonstrating that high levels of motivation enhance students' engagement and academic performance [24]. For example, in music education, students with higher motivation tend to invest more time and effort in practicing and performing, achieving better outcomes [25]. However, most studies on learning motivation have focused on general educational contexts, with limited research on motivation in music education, particularly for niche instruments like the cucurbit flute. Additionally, while existing studies have identified factors influencing learning motivation, they have not adequately addressed how to leverage peer assessment and station rotation models to enhance students' motivation in music learning.

3. Research Methods

3.1. Participants

The participants of this study were 50 students from Nantong Normal College, Jiangsu Province, with ages ranging from 18 to 20. These students were enrolled in the music education and music performance departments and had registered for the cucurbit flute playing course to enhance their foundational knowledge and performance skills of the cucurbit flute. The students were evenly divided into an experimental group (n = 25) and a control group (n = 25) using cluster sampling to minimize sampling errors.

3.2. Experimental Procedure

The experimental procedure outlined in the diagram aims to compare the effectiveness of blended learning technology with traditional teaching methods in enhancing students' cucurbit flute skills and learning motivation. The experiment involves two groups: the experimental group and the control group. The experimental group is exposed to blended learning technology, which incorporates peer assessment-based station rotation learning methods, while the control group follows traditional teaching methods see Figure 2.

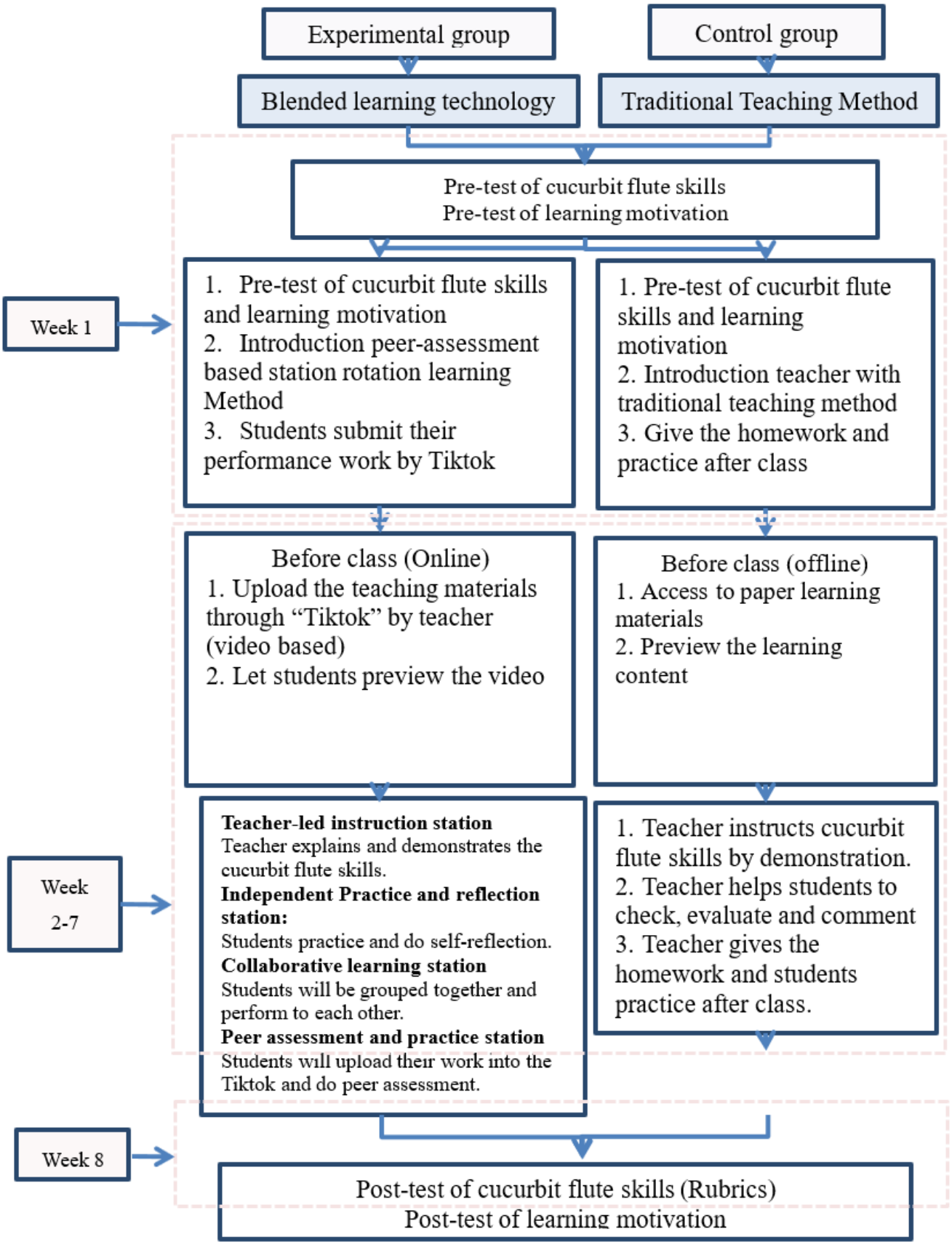

Figure 2.
Experimental Procedure.

Grounded in theory and expert feedback, the author designed a peer-assessment station-rotation model that blends motivational peer evaluation with flexible, site-based learning. Students rotate through teacher-led, collaborative, practice, and peer-review stations, systematically mastering cucurbit-flute skills while reflecting on and refining skills through

supportive peer critique. Varied contexts spark curiosity and teamwork, driving simultaneous gains in musical literacy and cooperative competence see Figure 3.

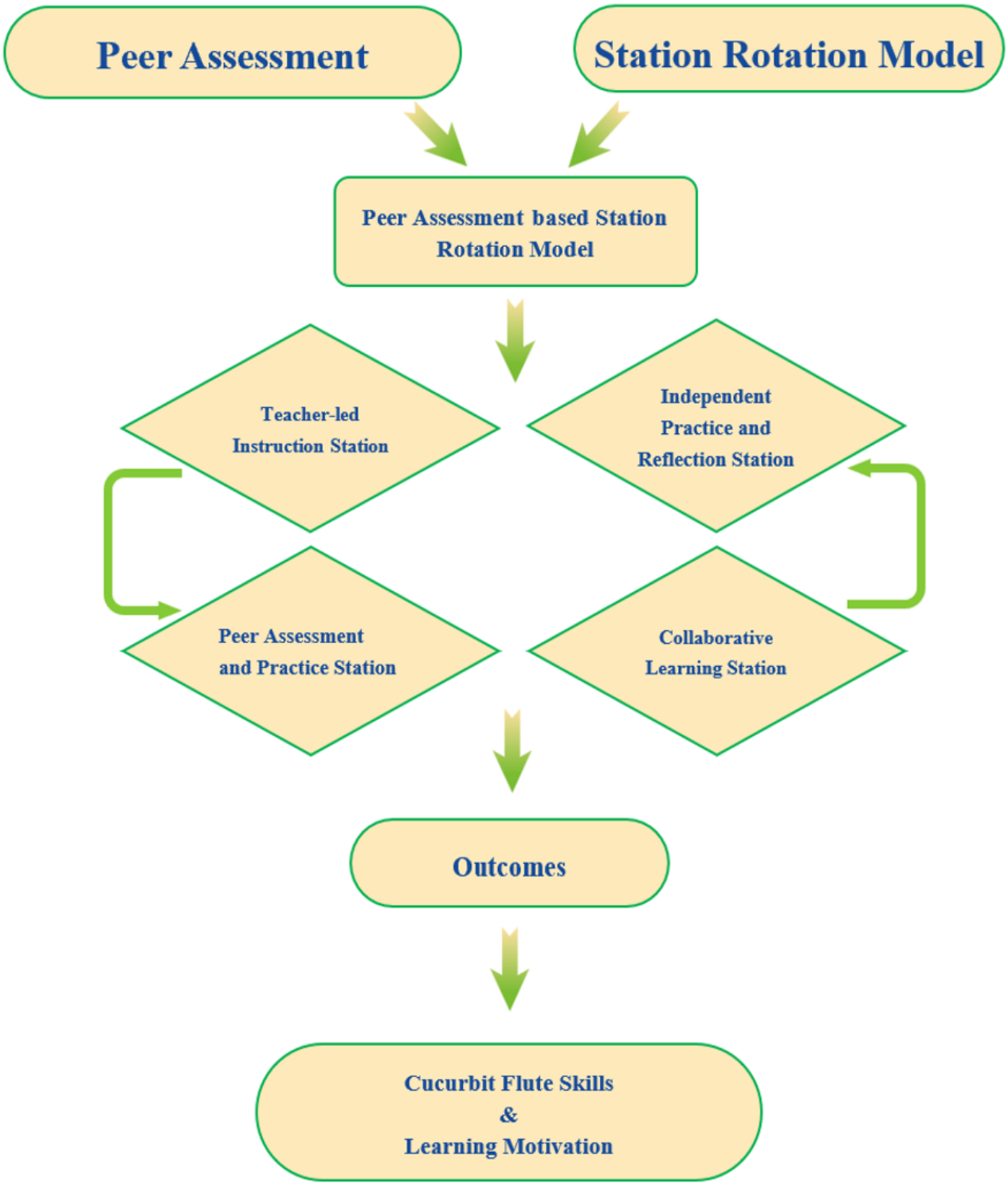

Figure 3.
Peer assessment-based station rotation model.

3.3. Instruments

3.3.1. The Rubric Score Criterion for Cucurbit Flute Skills

This rubric was developed based on the Bronson Piano Performance Achievement Rubric Student Self-Assessment Form. It assessed students' skills in five categories: notes (30%), rhythm and timing (25%), articulation (20%), dynamics (15%), and style and mood (10%). Each category was scored on a scale of "Needs Improvement," "Developing," "Adequate," "Good," and "Excellent." The rubric was developed by the researcher in collaboration with music education experts and cucurbit flute performers, ensuring its validity and reliability. It provided specific and clear criteria for evaluating students' cucurbit flute skills.

3.3.2 The questionnaire used for learning motivation

This questionnaire was based on the MUSIC Model of Academic Motivation [23] and included statements reflecting students' intrinsic motivation, extrinsic motivation, self-efficacy, goal orientation, perceived control, interest, value, attribution, affect, and learning strategies. Students were asked to rate their level of agreement or disagreement on a scale from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was developed based on the MUSIC Model of Academic Motivation, and its validity and reliability were verified through pilot studies. The results showed that the questionnaire had good validity and reliability, with a Cronbach's alpha coefficient of 0.88.

Table 2.
Rubric score criterion for cucurbit flute skills.

Category	Needs Improvement	Developing	Adequate	Good	Excellent	Score
NOTES (30%)	Correct Notes were rarely Played.	Correct Notes were sometimes played.	Correct Notes were often played.	Correct Notes were almost always played.	Correct	Excellent （27-30）
					Notes were always played.	Good（23-26）
						Adequate （18-22）
						Developing （11-17）
						Needs Improvement （0-10）
RHYTHM AND TIMING (25%)	Correct	Correct	Correct	Correct	Correct	Excellent （23-25）
	Rhythm and timing were rarely played.	Rhythm and timing were sometimes played.	Rhythm and timing were often played.	Rhythm and timing were almost always played.	Rhythm and timing were always played.	Good（19-22）
						Adequate （15-18）
						Developing （11-14）
						Needs Improvement (0-10）
ARTICULATION (20%)	Articulations were rarely played.	Articulations were sometimes played.	Articulations were often played.	Articulations were almost always played.	Articulations were always played.	Excellent （18-20）
						Good（15-17）
						Adequate （12-14）
						Developing （11-13）
						Needs Improvement (0-10）
DYNAMICS (15%)	Dynamics were rarely used.	Dynamics were sometimes used.	Dynamics were often used.	Dynamics were almost always used.	Dynamics were always used.	Excellent （14-15）
						Good（11-13）
						Adequate （9-10）
						Developing （6-8）
						Needs Improvement (0-5）
STYLE AND MOOD (10%)	The style and mood as rarely	The style and mood were	The style and mood	The style and mood were	The style and mood	Excellent （9-10）

	present in the performance.	sometimes present in the performance.	were often present in the performance.	almost always present in the performance.	were always present in the performance.	Good （7-8）
						Adequate（5-6）
						Developing （3-4）
						Needs Improvement (0-2 ）

3.4. Data Collection and Analysis

This study employed a quasi-experimental design with pre-test and post-test assessments for both experimental and control groups. Before the experiment, both groups underwent a pre-test to assess their initial level of cucurbit flute skills. The experimental group was taught using the peer-assessment-based station rotation model, while the control group followed the traditional teaching method. After the experiment, both groups underwent a post-test to evaluate their cucurbit flute skills and learning motivation. Additionally, students were asked to submit their performance videos via TikTok, and teachers provided feedback on students' learning progress. Quantitative data were analyzed using SPSS software, with the Shapiro-Wilk test confirming normality, allowing for parametric testing. A Multivariate Analysis of Variance (MANOVA) was used to compare the effects of the teaching model on the five performance variables—notes, rhythm and timing, articulation, dynamics, and style and mood—while an independent samples t-test compared post-test learning motivation scores between the experimental and control groups.

4. Results

4.1. Results of Cucurbit Flute Skills–Pre-Test

4.1.1. Normality Test Results–Pre-Test

Table 3.
Normality test results–pre-test.

DV	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Cucurbit flute skills	Control group	0.966	25	0.548
	Experimental group	0.985	25	0.957

Table 3 displays the results of the normality test from the Shapiro-Wilk tests. Given the sample size of fewer than 50, the Shapiro-Wilk test is more appropriate. The results indicate that, for both the experimental and control groups, the scores of the cucurbit flute skills follow a normal distribution ($p>0.05$). This confirms the normality assumption, validating the use of parametric analysis.

Table 4.
Independent sample t-test for pre-test of cucurbit flute skills performance.

		Levene's Test		t-test	
		F	Sig.	t	Sig.
total score	Equal variances assumed	1.902	0.174	-0.88	0.192

The results of the independent sample t-test for the pre-test of cucurbit flute skills performance, Table 4, indicate that there is no significant difference between the two groups. Levene's Test for Equality of Variances shows an F-value of 1.902 with a significance level of 0.174, which is greater than 0.05, suggesting that the variances can be considered equal.

4.2. MANOVA Assumption Test

Table 5.
Normality test results–post-test.

DV	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Notes	Control group	0.957	25	0.365
	Experimental group	0.947	25	0.21
Rhythm and timing	Control group	0.971	25	0.661
	Experimental group	0.949	25	0.239
Articulation	Control group	0.955	25	0.324
	Experimental group	0.95	25	0.249
Dynamics	Control group	0.971	25	0.668
	Experimental group	0.966	25	0.558
Style and mood	Control group	0.968	25	0.588
	Experimental group	0.92	25	0.051

Table 5 presents the results of normality tests for five variables (NOTES, RHYTHM AND TIMING, ARTICULATION, DYNAMICS, STYLE AND MOOD) in both control and experimental groups using the Shapiro-Wilk tests. For the control group, all variables except ARTICULATION show a normal distribution ($p > 0.05$), with Shapiro-Wilk significance values ranging from 0.365 (NOTES) to 0.668 (DYNAMICS). The experimental group also shows a normal distribution for most variables, with Shapiro-Wilk significance values from 0.21 (NOTES) to 0.558 (DYNAMICS).

Table 6.
Homogeneity test result.

Levene's Test of Equality of Error Variances				
	Levene Statistic	df1	df2	Sig.
Notes	0	1	48	1
Rhythm and timing	0.089	1	48	0.767
Articulation	1.787	1	48	0.188
Dynamics	2.46	1	48	0.123
Style and mood	1.863	1	48	0.179

The Levene's Test results Table 6 indicate that these differences are demonstrated through variance analysis. Levene's test for NOTES ($F=0$, $P=1$), RHYTHM AND TIMING ($F=0.089$, $P=0.767$), ARTICULATION ($F=1.787$, $P=0.188$), DYNAMICS ($F=2.46$, $P=0.123$), and STYLE AND MOOD ($F=1.863$, $P=0.179$) shows that the assumption of equal variances holds, as all P-values exceed 0.05.

4.3. Results of Multivariate Test

The multivariate tests in Table 7 indicate significant differences between the experimental and control groups on the post-test since Hotelling's Trace, Roy's Largest Root, Pillai's Trace, and Wilks' Lambda all show statistically significant results ($p<0.000$).

Table 7.
Multivariate test results – post-test.

Effect		Value	F	Error df	Sig.
Group (Experimental group & Control Group)	Hotelling's Trace	493.069	4339.004b	44	0
	Roy's Largest Root	493.069	4339.004b	44	0
	Pillai's Trace	0.823	40.989b	44	0
	Wilks' Lambda	0.177	40.989b	44	0
	Hotelling's Trace	4.658	40.989b	44	0
	Roy's Largest Root	4.658	40.989b	44	0

Table 8.
Tests of Between-Subjects Effects.

Tests of Between-Subjects Effects			
Dependent Variable	**Mean Square**	**F**	**Sig.**
Notes	1.62	0.585	0.448
Rhythm and Timing	450	156.16	0
Articulation	87.12	39.54	0
Dynamics	16.82	3.56	0.065
Style and Mood	95.22	44.288	0

The variance analysis (Table 8) reveals that the P-values for RHYTHM AND TIMING, ARTICULATION, and STYLE AND MOOD are all less than 0.001 post-intervention, indicating that the peer assessment-based station rotation model significantly improved these skills. However, the P-values for NOTES (0.448) and DYNAMICS (0.065) are not statistically significant, suggesting no substantial improvement in these areas. This demonstrates that while the intervention was highly effective for certain aspects like timing, articulation, and style, it had a limited impact on note accuracy and dynamics. The significant results highlight the model's ability to enhance students' rhythmic accuracy, expression, and stylistic interpretation, which are crucial elements in musical performance. The non-significant results for NOTES and DYNAMICS imply that these elements may require additional focused instruction or practice.

4.4. Results of Students' Learning Motivation

The independent sample t-test results (Table 9) indicate significant differences in learning motivation between the control group and the experimental group taught via the peer assessment-based station rotation model. This demonstrates the model's effectiveness in enhancing learning motivation compared to traditional methods.

Table 9.
Independent sample t-test of learning motivation.

	Levene's Test for Equality of Variances		**t-test for Equality of Means**		
		F	t	df	Sig. (2-tailed)
Learning motivation	Equal variances assumed	16.138	-25.083	48	0
	Equal variances not assumed		-25.083	34.293	0

5. Discussion

This study aimed to address two core research questions: whether a peer-assessment-based station rotation model significantly enhances students' cucurbit flute skills and learning motivation compared to traditional teaching methods. The peer-assessment-based station rotation model was implemented in the experimental group, while the control group followed traditional teaching methods. Key findings revealed significant improvements in the experimental group's cucurbit flute skills, particularly in rhythm, articulation, and style, as well as a substantial enhancement in learning motivation. However, no significant differences were observed in note accuracy and dynamics.

The findings of this study align with existing literature on peer assessment and station rotation models. Previous research has highlighted the effectiveness of peer assessment in fostering critical thinking and self-regulation skills [9]. The significant improvements in rhythm, articulation, and style observed in this study align with these perspectives, as peer feedback played a crucial role in guiding student practice and refinement. Similarly, the station rotation model has been recognized for its ability to accommodate diverse learning styles and promote personalized learning [26]. In this study, the model provided a structured yet flexible learning framework that enabled students to practice and apply their skills across multiple dimensions.

However, some results diverge from existing literature. While prior studies have noted the potential of peer assessment to enhance technical skills across various domains, the current study found no significant improvements in note accuracy and dynamics. Topping suggested that peer assessment is effective in improving higher-order thinking skills but may be less reliable in assessing purely technical aspects that require precise feedback [13]. This indicates that certain technical skills, such as note accuracy and dynamics in cucurbit flute playing, may require more specialized instruction and feedback mechanisms beyond peer assessment.

The experimental group exhibited substantially higher levels of intrinsic motivation, self-efficacy, and perceived control compared to the control group. This was surprising given the relatively short duration of the intervention and the complexity of the model. The use of TikTok as a platform for peer assessment and performance sharing appeared to play a pivotal role in enhancing motivation by introducing elements of creativity, audience engagement, and real-world relevance. Students were motivated to practice and improve their skills to showcase their performances to a broader audience. This finding underscores the potential of digital tools to transform traditional music education and create more engaging and motivating learning experiences.

While rhythm and timing, articulation, and style and mood showed significant improvement, note accuracy and dynamics did not. This suggests that the model may be more effective for skills that benefit from collaborative practice and peer feedback, such as timing and expression, rather than purely technical aspects like note accuracy. This insight highlights the importance of tailoring instructional strategies to specific learning objectives and skill areas. Future refinements of the model could incorporate more targeted practice and feedback mechanisms for technical skills, such as

using specialized software for note recognition or providing additional teacher-led instruction in breath control and finger placement.

6. Conclusion and Recommendation

This study explored the effectiveness of a peer-assessment-based station rotation model in improving undergraduate students' cucurbit flute skills and learning motivation, compared to traditional teaching methods. The results demonstrated that the experimental group significantly outperformed the control group in rhythm, articulation, and style, alongside a marked increase in learning motivation. These improvements suggest that the peer-assessment-based station rotation model effectively enhances specific technical and expressive skills while fostering student engagement.

For future research, expanding the sample size and extending the intervention duration could provide a clearer picture of the model's sustained impact. Exploring its adaptability to other traditional instruments or cultural contexts would enhance its practical utility. Moreover, integrating advanced technologies, such as AI-driven feedback systems, could address technical deficiencies like note accuracy, offering a more robust learning framework. Educators are encouraged to adopt this model cautiously, supplementing it with direct instruction to balance its benefits and shortcomings.

In conclusion, the peer-assessment-based station rotation model presents a promising approach to enhancing cucurbit flute skills and motivation, contributing to the evolving landscape of music pedagogy. While it excels in fostering engagement and specific competencies, its limitations necessitate ongoing refinement. This study lays a foundation for future innovations in teaching traditional instruments, advocating for a blend of peer-driven and technology-enhanced strategies.

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