

Teaching Pitch Matching in Classroom Settings: Strategies, Barriers, and Post-Pandemic Adaptations

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Teaching Pitch Matching in Classroom Settings: Strategies, Barriers, and Post-Pandemic Adaptations

Proposal

My name is Rachael Griffith, an elementary (primary) music teacher in Boise, Idaho, USA, and chair of the Idaho All-State High School Treble Honor Choir. With over a decade of experience teaching grades K–12 (ages 5-18), I am undertaking a research project to investigate the strategies, challenges, and innovations of classroom music educators in teaching pitch matching to their students.

Field of Interest

This study is situated in music education, focusing on vocal pedagogy for young singers aged 7–17. It explores how general music and choir teachers design and implement pitch matching activities, the tools they use, and the professional development resources they access. By examining teachers' lived experiences, the research aims to deepen understanding of effective instructional approaches for this developmental stage (Butler, Smith & Jones, 2010).

Justification for the Research

The COVID-19 pandemic has significantly altered both student and teacher experiences in music classrooms. Remote learning, social distancing, and interruptions to in-person instruction have affected students' vocal development and limited teachers' ability to provide immediate feedback (European Network of Music Teachers Associations, 2021). Many teachers I know, myself included, have adapted by developing innovative strategies in real time. This project seeks to learn from these adaptations and highlight

effective post-pandemic practices to inform my teaching and contribute to the professional community.

While research on pitch matching in children is well established, there is a gap regarding teachers' perspectives and decision making processes. Most studies focus on student outcomes, with less attention to instructional challenges faced by educators. This project aims to identify classroom practices that are effective but may not be documented in existing literature, filling a critical gap and providing practical insights for teacher training and curriculum design (Cooper & Humphreys, 2016; Pears & Shields, 2016).

Research Methodology

Objectives

- Document current instructional strategies and adaptations for pitch matching.
- Explore the impact of post-COVID-19 changes on instruction.
- Highlight successful, underreported practices.
- Provide actionable recommendations for educators and training programs.

How, When, and Where

The research will be conducted from April 2025 to July 2025 in Boise and surrounding Idaho regions. Data will be collected both online and in person, ensuring accessibility and context rich information.

Population/Sample

The target population is elementary and secondary music teachers working with students aged 7–17. The sample will include 10-30 teachers from public and private schools, selected purposely for diversity in experience and context. A subset of 3-5 teachers will participate in in-depth interviews, chosen to represent a variety of instructional approaches.

Methodological Approach and Design

A mixed-methods, sequential explanatory design will be used. Phase one involves quantitative data collection via surveys to identify trends and common practices. Phase two uses qualitative interviews to explore these practices in greater depth. This approach allows for both generalizable data as well as nuanced understanding of teacher experiences (Butler, Smith & Jones, 2010; Cooper & Humphreys, 2016).

Data Collection and Analysis

- Surveys: Online surveys will gather demographic data, instructional strategies, challenges, and reflections on post-pandemic changes.
- Interviews: Semi-structured interviews will allow teachers to elaborate on their experiences and share successful strategies.
- Analysis: Quantitative data will be analyzed using descriptive statistics and cross tabulation. Qualitative data will be thematically coded to identify recurring themes and innovative practices.

Ethics

All participants will be fully informed, with consent obtained. Data will be anonymized and securely stored. Participation is voluntary, with the right to withdraw at any time. The study will comply with institutional ethical guidelines.

Conclusion

By focusing on classroom teachers' experiences, this project will generate actionable recommendations for music educators and training programs. The mixed-methods approach provides a comprehensive understanding of teaching pitch matching to pre-adolescent and adolescent voices, supporting more effective and confident music teaching.

Individual Learning Outcomes

I aim to:

- Deepen my understanding of effective pitch matching pedagogy;
- Analyze post-COVID-19 impacts on music instruction;
- Develop mixed-methods research skills;
- Recognize study limitations;
- Contribute practical insights to the music education community.

Report

Introduction

“Pitch matching” - the ability to accurately reproduce musical pitches - is fundamental in elementary and secondary music education, forming the basis for vocal development, ensemble singing, and musical confidence (Morrison, 2001; Cardany, 2013; Green, 2014; Welch, 2016). Students with strong pitch-matching skills are more likely to be involved in music throughout their lives (Welch, 2016). Traditionally, interactive, in-person methods have been central to building these skills (Cardany, 2013; Adams, 2016). However, the COVID-19 pandemic in 2020 forced a rapid shift to remote and hybrid instruction (Crawford et al., 2020; Daubney et al., 2021; Biasutti et al., 2021; Harris & Wheeler, 2022), profoundly impacting the relational, embodied aspects of music-making vital to pitch matching (Biasutti et al., 2021; Harris & Wheeler, 2022).

In my own teaching, I adapted by exploring online tools and video assignments. While this allowed lessons to continue, students often faced technology barriers, reduced individualized support, and increased “Zoom fatigue” (McWhirter, 2020, p. 41). Still, this period encouraged flexible, blended strategies and innovation (Green, 2014; Crawford et al., 2020). Compared to research on student outcomes, there remains little focus on the classroom adaptations developed by teachers themselves (Cardany, 2013; Welch, 2016;

Hennessey et al., 2020), highlighting a need for practical research to support professional development (Daubney et al., 2021; Hennessey et al., 2020).

This study, grounded in my experiences as both practitioner and researcher, explores current and evolving pitch-matching practices in US classrooms post-pandemic, as well as teachers' professional learning needs. Through interviews and surveys, I aim to bridge research and classroom reality, offering actionable recommendations for teachers and policymakers.

Literature Review

Framing the Review

Relevant literature was sourced through academic databases (ERIC, JSTOR, Sage Journals, UWTSD Library), focusing on "pitch matching," "music education," "online learning," and "pandemic adaptations." Studies were included if they addressed pitch matching in K–12 or secondary settings, instructional approaches, or the influence of technology and psychosocial factors on music learning. The emphasis was on peer-reviewed articles from the last twenty years, with selective inclusion of practitioner reports when offering contemporary insights. Out-of-scope were studies centered on higher education, instrumental-only pedagogy, or adult learners, keeping the review squarely on school-aged students.

This review synthesizes research on pedagogy, cognitive development, technology, psychosocial influences, and educational adaptations, aiming to clarify best practices and persistent challenges for supporting pitch-matching in diverse classroom contexts.

Core Pedagogical Approaches

Effective pitch matching pedagogy is anchored in live vocal modeling. Teacher demonstrations, particularly when adapted to match students' vocal range and timbre, serve as crucial exemplars of accurate intonation and phrasing (Granot et al., 2013). Yet, research also notes that adult teachers can find it difficult to model in children's ranges, and students may sometimes respond better to models who share their gender or vocal

characteristics (Granot et al., 2013; Morrison, 2001; Hinkley, 2018). For students facing particular challenges, instrumental cues can sometimes be as effective as vocal ones (Moore, 2004; Cardany, 2013).

Echo singing, call-and-response, and harmonized rounds are widely used to build pitch discrimination, or the ability to distinguish subtle pitch differences. Such strategies promote repetition, aural focus, and participation, thriving within routines that offer frequent, short exercises (Pfordresher & Demorest, 2021; Demorest et al., 2015).

A key element is pedagogical differentiation. Younger or beginner students often respond best to playful games and slides, while older or more advanced pupils benefit from harmonizing, interval work, and improvisation (Moore, 2004; Cardany, 2013; Demorest et al., 2015; Hinkley, 2018). Peer practice and ensemble singing also promote inclusion and boost both individual and collective accuracy in pitch matching (Welch et al., 2020).

Influential Factors

Pitch discrimination is foundational to pitch matching, as those who excel at hearing differences generally learn to sing on pitch more quickly (Moore, 2004; Hedden, 2012; Demorest et al., 2015). There is debate over whether main challenges are perceptual or production-based, with calls for more research on this distinction (Hedden, 2012).

Strong evidence shows that early and regular musical training—including singing, instruments, and ensemble work—fosters auditory memory and vocal control, leading to long-term benefits for pitch skills (Demorest et al., 2015; Cardany, 2013; Moore, 2004).

Frequent exposure to singing at home or in the community further develops these abilities, while a lack of early experience or negative cultural attitudes often means students need more school support (Moore, 2004; Cardany, 2013).

Developmental transitions, like puberty, present particular challenges—especially for students assigned male at birth, whose changing voices can impact pitch accuracy and confidence (Granot et al., 2013; Morrison, 2001; Cardany, 2013; Pfordresher & Demorest, 2021). Some studies report an advantage for students assigned female at birth during adolescence, but most research agrees that, with equitable opportunities, all genders

can achieve similar proficiency (Morrison, 2001; Welch et al., 2020). More global, longitudinal studies are still needed.

Neurodiversity also matters: students with strengths in memory or attention may progress faster, but those with dyslexia, ADHD, or autism display unique musical capabilities or require extra support (Morrison, 2001; Moore, 2004; Demorest et al., 2015). Flexibility and individualized pedagogy are widely recommended (Cardany, 2013; Granot et al., 2013), although specific guidance on inclusive practice is still emerging.

Technology's Role

Technology has increasingly impacted pitch matching instruction. Tools like Sing & See, Tonal Energy, or pitch-matching apps offer instant, visual feedback, making practice both interactive and accessible, especially for students needing extra affirmation or those practicing outside the classroom (Rutkowski, 2015; Wilson et al., 2017; Hinkley, 2018; Wise, 2021). Yet, whole-class implementation remains difficult due to logistical issues and device limitations (Murgia et al., 2020). Blended models, mixing digital feedback with traditional classroom methods, have become a pragmatic solution.

Psychosocial Dynamics

Technical proficiency is just one part of pitch matching. Students' self-perception, confidence, motivation, and sense of inclusion greatly affect their willingness to learn and sustain musical engagement (Pfordresher & Demorest, 2021). Mismatches between ability and self-image (either under- or over-confidence) are frequent (Morrison, 2001; Cardany, 2013).

A supportive classroom climate is therefore vital. Teachers who normalize mistakes, encourage risk-taking, and deliver constructive feedback help build resilience and a growth mindset (Hinkley, 2018). Communal and peer-supported singing nurtures belonging and motivation, and thoughtfully facilitated peer assessment can raise standards without undermining individual confidence (Cardany, 2013). Cultural and community context reinforce or hinder these dynamics: in environments where singing is normalized, students tend to report greater confidence and engage more fully,

whereas in less supportive or stigmatized settings, extra encouragement and culturally relevant repertoire are essential (Green, 2014; Moore, 2004; Welch et al., 2020).

Pandemic Adaptations and Ongoing Change

The COVID-19 pandemic drove a swift shift to online and hybrid music education, transforming pitch-matching instruction (Murgia et al., 2020; NATS, 2022). On the plus side, video demonstrations and asynchronous tasks offered flexibility and self-paced practice (Daubney et al., 2021; Harris & Wheeler, 2022). Digital tools allowed targeted feedback and facilitated virtual peer interaction (Wise, 2021).

However, technology also introduced barriers; particularly for students without reliable access or those struggling with the lack of hands-on, in-person correction and group singing experiences, key for developing ensemble tuning (Daubney et al., 2021; Harris & Wheeler, 2022; NATS, 2022). The normalization of blended instruction is now seen as an opportunity, fostering more individualized and flexible assessment, while also demanding more deliberate attention to social-emotional learning and inclusion (Welch et al., 2020; Green, 2014).

Remaining Gaps and Directions

Persistent gaps remain. Most studies are grounded in Western, monolingual contexts, and little is known about how gender, neurodiversity, and culture combine to shape pitch-matching development (Welch et al., 2020; Green, 2014; Rutkowski, 2015; Demorest et al., 2015; Morrison, 2001). The long-term impact of pandemic-era innovations is also unclear, as is the challenge of ensuring equitable technology access and community engagement in music instruction (Daubney et al., 2021; Harris & Wheeler, 2022).

Literature consistently highlights the value of early, engaging musical exposure, adaptive classroom climates, and culturally responsive instruction (Green, 2014; Welch et al., 2020; Moore, 2004; Granot et al., 2013; Cardany, 2013). Yet, fine-tuning strategies for students with limited prior experience or specific learning needs remains an evolving field.

In summary: This body of research informs my project by highlighting both established best practices and critical knowledge gaps. It calls for more qualitative, classroom-based documentation of teacher adaptations and underscores the value of focusing not just on instructional technique, but also on the broader social, cultural, and technological contexts that shape teachers' and students' experience, and success, with pitch matching (Daubney et al., 2021; Harris & Wheeler, 2022; Green, 2014).

Methodology

Research Paradigm and Theoretical Framework

This study adopts a qualitative dominant, pragmatist paradigm with elements of mixed methods, to explore pitch-matching pedagogy in elementary and secondary music education. The pragmatist paradigm is well suited to educational research where the primary aim is not only to understand practice but to inform actionable improvements (Creswell & Plano Clark, 2018). Given the focus on capturing teachers' lived experiences, adaptations, and professional needs during a period of rapid educational change, a constructivist lens also guides the work; recognizing that knowledge is discursively constructed through dialogue and context (Lincoln & Guba, 1985).

The study is informed by sociocultural theory (Vygotsky, 1978), which recognizes learning as a situated, social process deeply affected by context, tools, and relationships. This framework is appropriate for the investigation of music pedagogy, as it highlights the collaborative and embodied nature of musical learning, the impact of social disruptions such as COVID-19, and the mediated role of technology.

Research Design and Methods

Data Collection

To address the research objectives, a multi-method approach was employed:

1. Semi-structured Interviews:

Semi-structured interviews were conducted with music educators in the US, purposely sampled to reflect different school settings, levels of resources, and pandemic responses. While all survey respondents were offered the option to participate in the interview process, only one was available to actually participate in the interview. The core interview topics (such as teaching adaptations, technology use, and assessment approaches) were selected based on gaps identified in the literature review. Specifically, the literature highlighted that while much is known about student outcomes, there is a lack of classroom-based research capturing teachers' adaptive strategies, the influence of school context, and evolving professional development needs. As such, the interview questions were designed to probe these areas in depth, ensuring the study addressed underexplored aspects of pitch matching instruction and post-pandemic practice. The semi-structured protocol enabled the exploration of both commonalities and differences in participant experiences, allowing educators to share their strategies, challenges, and professional learning needs in their own words. This approach ensured consistency across interviews while also allowing unique perspectives to emerge.

2. Surveys:

An online survey, distributed via professional networks, was also given to a separate set of educators. The survey included both closed and open-ended questions, enabling collection of quantitative data (frequency of specific pitch-matching activities, perceived confidence with technology) and qualitative insights (open responses detailing classroom adaptations or requests for professional development). This dual approach offered breadth and depth, essential for mapping both widespread trends and individual nuances (Creswell & Plano Clark, 2018).

Justification:

Semi-structured interviews provide rich, contextually grounded narratives, while surveys increase sample size and diversity. Together, these methods strengthen validity through

triangulation, illuminating multiple facets of complex, evolving pedagogical practice (Denzin, 2017).

Interview Participant Table

Participant ID	Role/Position	Years Teaching Experience	Grade Level(s) Taught	Location (State/Region)	School Setting	Gender	Notes (e.g., Specialty)
A	Choir Teacher	18	K-12, University	Idaho, USA	Suburban, Rural	M	Choir, General Music
Z	Choir Teacher	14	K-12	Midwest & Pacific Northwest, USA	Suburban, Rural	M	Choir, General Music
B	Choir Teacher	10	6-8	Idaho, USA	Suburban	M	Choir, Instrumental
C	Choir Teacher	20	K-12	Pacific Northwest, USA	Rural	F	Choir, Jazz Studies, Instrumental, General Music

Survey (6 total, anonymous)	Elementary and Junior High Teachers		K-8	Idaho, USA	Urban	M, F	General Music, Choir
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Procedures

1. Ethical Approval:

Institutional ethical guidelines were followed, with research approved by the affiliated university's ethics committee. Participation was voluntary, and informed consent was obtained from all respondents.

2. Recruitment:

Participants were recruited through purposive and snowball sampling via music education networks, ensuring a mix of primary/secondary teachers, experience levels, and geographic contexts. Information sheets outlining the research aims, confidentiality measures, and withdrawal rights were supplied prior to participation.

3. Data Collection:

Interviews were conducted via video conferencing, recorded with permission, and transcribed verbatim. Surveys were administered online (Google Forms), accessible on multiple devices, and all responses anonymized at source.

4. Insider-Researcher Procedures:

The researcher is also a practitioner in the field ("insider researcher"), so a research journal was kept throughout to monitor potential bias (Mercer, 2007). Member-checking was conducted by sharing interview transcripts with some participants for validation, enhancing credibility (Birt et al., 2016).

5. Data Management:

All data was securely stored in password-protected, institutionally-approved

platforms, compliant with GDPR/Data Protection Act (UK) or equivalent local protocols.

Data Analysis

Thematic analysis was used as the primary analytic method for qualitative data (Braun & Clarke, 2006). Thematic analysis is well suited for educational research as it allows systematic identification, organization, and insight into core patterns across diverse participant narratives (Hammersley & Atkinson, 2007).

- Familiarization and Coding:
Interview transcripts and open survey responses were read multiple times for immersion. Initial, open coding was applied inductively, with codes capturing significant statements related to pitch-matching pedagogy, adaptation strategies, challenges, and professional needs.
- Theme Development:
Codes were collated and clustered, with themes defined through iterative cycles, comparing across cases and cross-validating with survey data. Themes were refined for internal consistency and distinctiveness, following Braun & Clarke's guidelines (2006).
- Integration with Quantitative Data:
Quantitative survey data were analyzed descriptively (frequencies, cross-tabs) to illustrate the prevalence of key strategies and self-reported professional development needs. These data were used to contextualize and strengthen qualitative findings.
- Transparency and Reflexivity:
Reflexive memos documented analytic choices, ensuring transparency and minimizing the impact of the researcher's professional background on interpretation (Berger, 2015).

Trustworthiness and Rigor

Rigour was established through multiple strategies (Lincoln & Guba, 1985):

- **Credibility:**
Triangulation of interviews and surveys; member-checking; long engagement with data.
- **Transferability:**
Thick description of context, participants, and teaching settings.
- **Dependability & Confirmability:**
Audit trail of analytic decisions; reflexivity journal; external audit by a research supervisor.

Ethical Considerations and Insider Research

Ethical integrity was central throughout. Given the potential for dual roles, the researcher's positionality as an "insider" was openly acknowledged, with explicit efforts to bracket personal practice from analysis (Mercer, 2007). Anonymity and confidentiality were prioritized throughout the study; pseudonyms or participant codes replaced identifying information, and direct quotes are attributed to these codes rather than real names. All other findings are reported in aggregate to further prevent recognition. Power dynamics were minimized by emphasizing participants' expertise and voluntary participation. Participants had the right to withdraw without consequence at any stage. Recognition of work related stress, workload, and wellbeing was also integrated into recruitment and scheduling, ensuring that participation was flexible and respectful of teacher time and circumstances.

Findings, Results, & Discussion

Introduction

This section presents a thorough thematic analysis of qualitative and quantitative data collected through structured interviews and teacher surveys exploring pitch matching pedagogy among local American music educators.

Overview

Participants consistently described student pitch matching difficulties as rooted in a web of interrelated factors: biological, developmental, social, and pedagogical. Few participants viewed pitch matching as a singular, isolated skill; rather, they highlighted its mutable, learnable character shaped by classroom experience, confidence, and social context.

Findings

The Multidimensional Nature of Pitch Matching Challenges

Analysis of interviews and surveys with music educators reveals that pitch matching difficulties are fundamentally multidimensional. Participants consistently described these challenges as a web of interrelated biological, developmental, social, and pedagogical factors. Rather than seeing pitch matching as a discrete skill, teachers conceptualize it as dynamic and heavily contingent on classroom experience, individual confidence, and social context.

Survey respondents noted, for instance, that adolescent male students frequently struggle in the chest or mid-range during periods of vocal change; a pattern echoed in the literature (Welch et al., 2020; Cardany, 2013). As one anonymous survey respondent reflected,

“Some boys think singing high is for girls, or they’ve been told their changed voice can’t sing in the treble range. We see both physical and psychological blocks.”

Participants also underscored the role of early musical exposure and neurodiversity, observing that students who have had limited singing experiences at home, or who present with cognitive differences, may struggle to establish an ‘auditory frame of reference’. These insights are supported by Moore (2004) and Hedden (2012), both of whom stress the complex interplay between physiology, cognition, and culture in pitch development.

“There’s a small group every couple of years who just don’t have the auditory frame of reference, maybe never sang at home—the issue’s not just in the voice but what they’re listening for.”

—A

Physiological factors such as breath support and vowel formation also emerged as important. Teachers described how “under-supported breath” and “dark vowels” contribute not only to muddled group sound but also to individual tuning difficulties, providing in-the-moment evidence for the literature’s emphasis on the interdependence of bodily and cognitive processes in vocal learning (Moore, 2004; Hedden, 2012).

Summary: The findings affirm that pitch-matching in school music is best understood as a multifaceted skill, shaped as much by social and cultural context as by physiological and psychological development. This directly supports the research question’s focus on how classroom practice, confidence, and community shape pitch matching outcomes.

Pedagogical Strategies and Adaptive Routines

A rich tapestry of instructional strategies emerged across both interview and survey data, demonstrating teachers’ active adaptation to the multiple challenges of pitch matching. Classic routines such as echo singing, solfège, and hand signs were widely used; 83% of teachers reported that “echo singing is my go-to,” while 66% employed solfège or hand signs to reinforce interval sense and visual-motor integration.

Call-and-response songs and singing games were valued for their ability to lower anxiety and foster both attentive listening and collaborative risk-taking, especially among young or hesitant students.

Interview data further underscored the differentiated nature of support, with teachers scaffolding progression from basic pitch slides and unison singing to more complex intervallic and harmonic work. Peer pairing and solo/small group ‘spotlighting’ were described as beneficial:

“Placing my strongest pitch matchers next to the ones who struggle has been a game changer.”

—C

These practices align with Cardany (2013) and Hinkley (2018), affirming the value of modeling and gentle exposure for confidence building.

Creative and kinesthetic approaches also figured prominently. Movement, gesture, and playful games were leveraged not only for engagement but for their tangible impact on pitch accuracy. As one teacher puts it,

“We use forehead-to-forehead singing, physical cues, or games like ‘pop the balloon’ for high notes. Getting them moving often gets them singing in tune.”

—Z

This matches findings by Hinkley (2018) that kinesthetic and imaginative play can reduce self-consciousness and encourage fuller vocalization.

Summary: Findings support the argument that a combination of traditional, kinesthetic, and social approaches best facilitate pitch-matching growth in diverse classroom contexts.

Table 1: Most Frequently Reported Strategies

Strategy	% Usage Among Respondents	Key Supporting Quotes
Echo singing	83%	"Echo singing is my go-to..."
Solfège/Hand signs	66%	"Solfège reinforces interval sense."
Call-and-response	66%	"Helps with group listening."
Singing games/rounds	50%	"They'll sing solo if it's a game."
Use of recordings	16%	"Playbacks help them hear errors."

Assessment, Progress, and Evidence of Growth

Assessment of pitch matching relies primarily on informal, ongoing observation rather than formal testing. Educators described "circulating the room" during group singing to identify outlier voices and provide immediate feedback, which facilitated targeted support. They also noted progress in terms of both sound quality and student participation, demonstrating that growth is gauged as much by confidence as by accuracy.

"I listen for less 'mud' in the group sound at the end of the semester—the more in-tune, the clearer the sound."

—A

Quantitative survey data shows clear improvement over the year: only 16.7% of teachers rated beginning-of-year pitch matching as high (4 or 5 on a 5-point scale), but this rose to 83% by year's end. All teachers noted at least "some" improvement. Consistent with Demorest et al. (2015), teachers observed that regular daily singing, even ten minutes, was sufficient to produce measurable gains in most students, suggesting that pitch matching is both learnable and malleable.

"Pitch matching is a learned, malleable skill. With daily singing—even just 10 minutes—almost everyone moves up a level by May."

—Survey

Specialized interventions were seldom necessary. The majority of pitch matching issues responded well to gentle support and confidence-building activities. In rare cases of severe deficit, one-to-one work at the piano or using creative "rainbow ears" methods was adopted.

Summary: Triangulation between observations, teacher reports, and quantitative data shows that regular, inclusive classroom singing reliably improves pitch matching. Both skill and confidence are key indicators of progress, underscoring the value of persistent practice and supportive feedback.

Barriers and Social-Structural Challenges

Findings highlight several enduring barriers to effective pitch matching, including student self-consciousness, gendered expectations, class size, and structural constraints. Adolescent anxiety was marked as the most pervasive challenge. The gap between self-impression and reality was also stated:

"The greatest barrier is when students think they are matching pitches but are not. This last year in particular... it was a struggle all year long. Eventually, it got easier but he still struggled through the end."

—Survey

Persistent reluctance to sing was linked to both vocal changes and fear of peer judgment:

“Generally, I have noticed a reluctance to sing because of fear of being heard. This reluctance has created a plethora of barriers that could be resolved just by using their voices correctly.”

—Survey

Gendered attitudes were especially pronounced among boys, many of whom saw singing in the upper register as “unmasculine” - reflecting stereotype patterns documented by Pfordresher & Demorest (2021).

Structural issues were similarly prominent. Large choir sizes limited opportunity for individualized feedback, with 66.7% of respondents rating this as a “major barrier.” Teachers also grappled with time pressures and the competing demands of performance preparation, which frequently left little space for targeted vocal support. These challenges echo findings from Welch et al. (2020), who call attention to the compounded difficulty of addressing pitch matching in under-resourced or time-constrained settings.

Pandemic-related effects added a further layer, as teachers noted increased anxiety and reduced engagement among students returning from remote learning. One participant stated:

“Building a relationship of trust and safety is harder in this experience than it ever was before the pandemic.”

—Survey

This highlights the intersection between psychological safety and instructional efficacy.

Summary: These barriers reinforce the need for differentiated, flexible instruction and indicate that confidence-building must remain central in contemporary pitch-matching pedagogy.

Technology: Benefits, Supplementary Role, and Constraints

Technology played a complex role in pitch matching instruction, particularly in response to pandemic-driven remote learning. While digital tools such as YouTube, Chrome Music

Lab, Google Classroom, FlipGrid, and custom rehearsal tracks increased access to models and feedback, their implementation was uneven. Teachers reported using technology less frequently post-pandemic, though about two-thirds continued to supplement lessons with digital resources. Specialized pitch-matching apps were rarely used, primarily due to impracticality with large ensembles and polyphonic settings—a limitation in line with Murgia et al. (2020).

The qualitative data indicates that technology’s chief benefit lies in self-assessment; *“Recordings help students hear themselves and spot mistakes they’d miss in the moment.”*
—C

Asynchronous practice was facilitated by custom tracks, allowing individualized support. However, persistent equity issues, such as device and internet access disparities, limited broad adoption. This finding strongly parallels Daubney et al. (2021) and Harris & Wheeler (2022), who also note technology’s dual capacity as a facilitator and a barrier in music education.

Summary: While technology offers valuable supplementary tools for pitch-matching practice and assessment, its impact is constrained by logistical and equity challenges, suggesting that digital solutions should be seen as complementary rather than central.

Table 2: Technology Use Patterns

Digital Tool/Platform	% of Teachers Using	Role in Instruction

YouTube	66%	Reference/Modeling
Chrome Music Lab	33%	Interactive exploration
Google Classroom/Microsoft Teams	66%	Sharing scores, tracks, feedback
Custom Rehearsal Tracks	66%	Home practice, individualized support
Tuner/Pitch-Matching Apps	16%	Mostly for individual, not group use

Social-Emotional and Community Factors

The analysis was unambiguous in highlighting psychological safety, trust, and group belonging as prerequisites for successful pitch-matching. Teachers repeatedly observed that when students “feel safe within the class to try as a group, small group or individual,” their willingness to participate and risk making mistakes increases, which accelerates progress. Collective games, spotlighting, and peer modeling were identified as crucial for destigmatizing error and nurturing self-assurance.

Community context strongly influenced students’ starting points. Those raised in households or communities with active singing traditions adapted more quickly to pitch-matching tasks, whereas those from backgrounds where music was absent or stigmatized required more foundational support and encouragement.

“If these steps are ignored in early stages, the ability to latch onto pitch-matching skills will be harder to access.”

—Survey

Teachers advocated for early and consistent vocal engagement in the curriculum as a preventive strategy, echoing claims from Green (2014) and Welch et al. (2020) linking community and cultural support to outcomes.

Summary: Social-emotional and community context fundamentally shape both access and engagement in pitch matching. Group belonging, developed through playful warm-ups, relationship building, and normalized error making, was seen as essential for progress. Teachers used collective games, small group “spotlighting,” and role switching to foster engagement and inclusion.

Innovations and Post-COVID Adaptations

Post-pandemic teaching ushered in new routines and lasting adaptations. While some teachers reverted to pre-pandemic methods, most reported ongoing use of digital resources, especially practice tracks and video exemplars, to reinforce independent learning.

“Because of all the online materials we had to track down and create, I have access to a lot more videos, slides, etc. that incorporate vocal exploration.” —Survey

Enhanced social-emotional focus, such as trust-building activities and small successes, was commonly described as necessary for rebuilding group confidence in the wake of collective disruption.

Flexible grouping and part assignment were also identified as critical, especially in navigating students’ changing voices. By responding adaptively to individual comfort and skill levels, teachers sought to avoid the entrenchment of pitch-matching difficulties.

Summary: These innovations signal an evolution in pedagogical practice that is likely to remain integral to pitch-matching instruction post-pandemic.

Professional Development Needs and Gaps

Participants called attention to the inadequacy of current professional development (PD) offerings, expressing a desire for more practical, age-appropriate, and research-informed training. Direct requests included:

“A proper step-by-step methodology that can function like a flow chart... with real kids of similar age and gender so the instruments are as similar as possible.”

—Z

Also mentioned were mentorship and workshops featuring real-life demonstration with students of varying ages and genders. Many teachers found existing PD,

“too elementary-focused or impractical for older students.”

—A

They would prefer informal observation, peer learning, and access to video-based exemplars.

This aligns closely with the literature’s observation that robust professional development is necessary not only for technical skill acquisition but for nurturing adaptive expertise in diverse, changing contexts (Cardany, 2013; Welch et al., 2020).

Summary: There is clear consensus among educators that professional development must be practical, contextually relevant, and inclusive, especially to address challenges of changing voices and severe pitch-matching deficits.

Table 3: PD/Resource Needs Expressed

Need	Illustrative Quote	% Respondents Mentioning

Sequential, video-based pitch-matching interventions	"Videos of this happening in real time...would be so insightful."	100% (open-ended)
Workshops/games-based resources	"Workshops, possibly webinars, tried and true games or sings the kids buy into."	67%
Cross gender demo and teaching techniques	"Cross gender teaching, male teacher to girls, female teacher to boys."	33%
Digital pitch visualization tools	"Maybe a digital platform like a guitar tuner...show if they were matching."	33%
Early and consistent singing in elementary curriculum	"Practicing singing at an early age... would all but eliminate the need for supports."	33%

Table 4: Key Pitch-Matching Strategies Used by Teachers

Strategy	Frequency (%)
Echo singing	83
Solfège/Hand signs	66

Call-and-response	66
Singing games	50
Recordings	16

Table 5: Change in Perceived Student Pitch-Matching Proficiency

Timepoint	% High/Very High (4–5)	% Moderate (3)	% Low (1–2)
Beginning of School Year	16.7	33.3	50
End of School Year	83	17	0

Problems Encountered and Study Limitations

Like any study, this project had its share of constraints. One of the biggest challenges was timing. Because data collection fell at the end of the U.S. school year (right as summer break began) many educators simply weren't available. This meant that my participant group ended up being smaller and more self-selecting than hoped. Naturally, this makes it harder to claim that the findings represent all music educators, and any generalizations to broader populations should be made with caution.

All participants also were native English language speakers and worked in the U.S. While this focus provided rich insight into pitch matching in these classrooms, it does

leave some voices less heard; particularly those for whom English is a secondary language, or who reside outside the U.S. As the literature notes, most music education research still comes from Western, English-speaking contexts (Welch et al., 2020), so these findings may not fully translate into other educational or cultural settings.

In terms of data, combining surveys and interviews helped capture a range of experiences, but time and participant numbers meant it wasn't possible to make detailed comparisons, like between novice and veteran teachers, or across very different types of schools. Relying on self-report also introduces the usual risk that people present their practice in the best possible light.

Taken together, these limitations suggest there is real value in future studies with broader, more diverse samples, and in-depth, longitudinal research.

Conclusion

These findings present a nuanced and triangulated account of pitch-matching pedagogy, post-pandemic. Both survey and interview data reinforce that pitch matching is acquired through a dynamic interplay of personal confidence, cultural expectation, adaptive teaching, and the responsive use of technology and resources. Challenges persist, but educators demonstrate high levels of ingenuity, resilience, and commitment to fostering inclusive and differentiated learning environments. Barriers such as anxiety, class size, and limited professional development call for targeted interventions and innovation, while adaptations triggered by the pandemic are likely to leave a lasting mark on practice.

Each theme addressed above contributes to answering the research question by evidencing how pitch matching development is shaped by classroom strategy, social context, and individual support, highlighting specific needs and promising areas for future inquiry and action.

Critical Reflection

This research deepened my understanding of effective, classroom-based pitch matching pedagogy, particularly by highlighting the importance of psychological safety, peer mentorship, and flexible, inclusive strategies. Analyzing the post-COVID-19 landscape, I saw firsthand how technology and social-emotional considerations now play an integral role in music instruction, confirming the need for adaptive and student-centered approaches. The mixed-methods process, from data collection through thematic analysis, significantly developed my research skills and emphasized the importance of methodological transparency. I also gained a clear awareness of study limitations, including challenges around timing, sample diversity, and generalizability. Most importantly, by engaging directly with teachers and synthesizing both their experiences and current literature, I was able to contribute practical, context-sensitive insights that can inform and support the broader music education community. I hope to be able to continue this work by developing or finding PD opportunities for myself and my colleagues.

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