Improvisation in music education: empirical evidence, classroom practice, and teacher preparation

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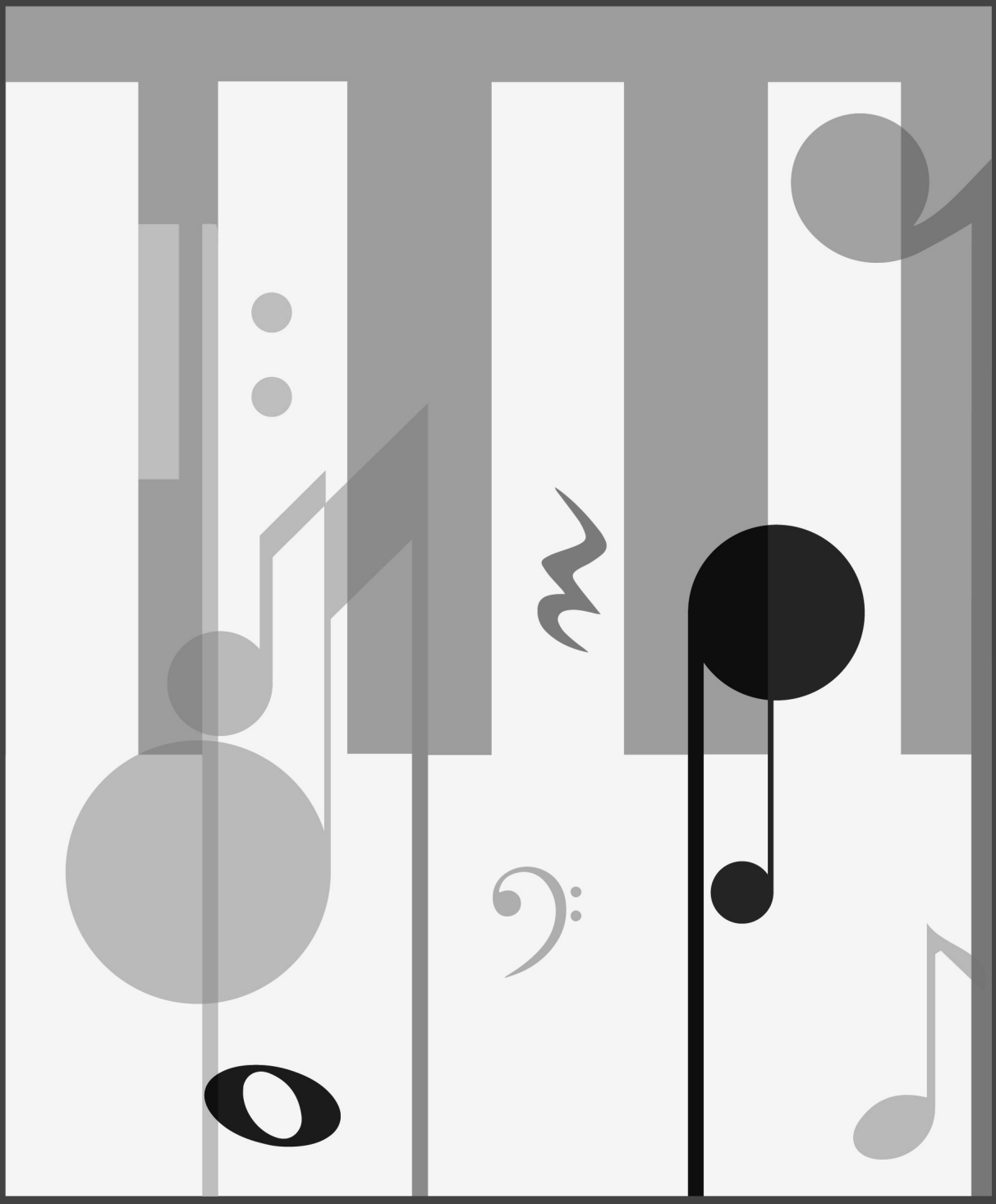

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4. Perceived readiness to improvise and to lead improvisation activities: A mixed-methods study of attitudes and self-efficacy in music teacher education

Abstract

This study investigated how pre-service music teachers' (PMTs) attitudes toward improvisation relate to their self-efficacy. A questionnaire was completed by 123 PMTs from ten music teacher education programs, followed by semi-structured interviews with ten participants. A PLS-SEM indicated that attitude toward studying and teaching significantly predicted self-efficacy for improvisation, whereas the attitude toward inclusion of improvisation showed no significant effect. Mediation analysis further confirmed that improvisation self-efficacy served as a key variable linking attitudes and self-efficacy for teaching improvisation. Qualitative analyses provided explanatory depth by revealing how mastery experiences gradually transformed fear into enjoyment, how teaching-oriented motivation stimulated both personal learning and classroom application, and how endorsing the inclusion of improvisation did not automatically lead to confidence without sufficient preparation. This study contributes to understanding how attitudes and self-efficacy interact and offers pedagogical insights for strengthening pre-service teachers' readiness to incorporate improvisation into their learning and teaching.

*This chapter is an adapted version of:

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4.1. Introduction

Teacher education programs face persistent challenges in developing pre-service teachers' (PMTs) readiness for pedagogically complex practices. Research showed that teaching ability not only requires subject knowledge, but also subject-specific pedagogical content knowledge (PCK; Shulman, 1987) and the readiness shaped by attitude and self-efficacy beliefs (Bandura, 1997; Zee & Koomen, 2016). In music education, Ballantyne and Canham's (2023) importance-confidence analysis across dimensions of music teachers' works revealed that pedagogical knowledge and skills are highly important. Their results showed that novice teachers reported lower confidence than more experienced teachers in several areas. This tension between perceived importance and confidence may also be relevant during the pre-service stage, highlighting the importance of examining how PMTs' attitudes and self-efficacy beliefs relate to perceived readiness for specific practices.

One such practice is musical improvisation. As a creative activity, improvisation receives widespread support in national policies and educational frameworks, with research consistently demonstrating that improvisation fosters creativity, musicianship, and engagement (Koutsoupidou, 2008; Siljamäki & Kanellopoulos, 2020). In classroom settings, improvisation refers to generating and shaping musical ideas in real time. Rather than random sound making, improvisation is "*purposeful sounds through time, no intention for revision or replication, and freedom to make melodic and rhythmic decisions within certain constraints."* (Kratus, 1995, p. 27). For example, students could improvise a melody using only three pitches, create rhythm variations, or engage in call-and-response and exchanges with peers. These structured activities provide opportunities for creative decision-making and allow beginners to engage in musical improvisation. Improvisation has been included in school music curricula and policy frameworks in many countries (Larsson & Georgii-Hemming, 2019). For example, students are expected to improvise and compose for diverse purposes, developing musical ideas through structures, styles, genres and traditions (*National Curriculum in England*).

Beyond the curricular requirements, improvisation is not only a musical skill, but also a pedagogical resource through which students can explore, create, and understand musical concepts. Drawing on Shulman's (1987) concept of PCK and its subsequent application in music education, effective music teaching requires not only musical

knowledge and skills, but also music-specific PCK (Ballantyne & Packer, 2004; Kong, 2025). Research in music education has further distinguished teachers' music content knowledge (CK) from their pedagogical content knowledge (PCK), suggesting that these two dimensions may not always develop in parallel (Chung & Ho, 2026). In this context, music-specific PCK refers to the knowledge and skills required to teach music content in pedagogically meaningful ways, effectively guide students to participate in music activities, implementing the curriculum, explaining and demonstrating musical concepts, and assessing students' musical learning (Ballantyne & Packer, 2004; Grieser & Hendricks, 2018). When applied to improvisation activities, teachers need to transform improvisation into teachable tasks, appropriate scaffolds, and visible learning processes for students. Developing such domain-specific PCK requires not only personal musical experience but also opportunities for professional preparation (Chung & Ho, 2026; Kong, 2025).

However, translating this recognized value into routine classroom practice is constrained by multiple interconnected challenges. At the system level, improvisation may be constrained by the contradiction between standard evaluation and the open, unpredictable outcomes of musical creation, making it difficult to implement in an outcome-driven curriculum (Treß et al., 2022). At the teacher level, research on the PMTs' professional identities suggests that their creative musical identities are shaped by professional socialization and are closely related to their self-perceived competence and comfort with both personal practice and teaching creative activities (Randles & Ballantyne, 2018; Randles & Smith, 2012). Many PMTs face challenges balancing their identities as musicians and as teachers. Professional socialization shapes their perception of their own abilities, including personal practice and the ability to teach creative activities (Randles & Ballantyne, 2018). Consequently, this challenge would further affect PMTs' confidence and willingness to implement improvisation into teaching. At the pedagogical level, teachers face practical limitations, such as limited time and insufficient pedagogical scaffolding (Bogojević & Pance, 2022; Makris et al., 2021; Piazza & Talbot, 2021).

Among these challenges, research has identified teachers' attitudes toward improvisation, confidence with improvisation, training or musical background, and classroom practice experience as particular influential teacher-level factors determining successful implementation of improvisation in music education (Koutsoupidou, 2005;

Larsson & Georgii-Hemming, 2019; Whitcomb, 2013). Research has suggested that music teachers' perceptions of importance and confidence may not parallel (Ballantyne & Canham, 2023). For example, teachers may regard improvisation as important, however, feeling insufficiently confident to improvise themselves or to teach it. The importance of understanding these teacher-level factors is underscored by empirical evidence that improvisation instruction, when implemented effectively, significantly enhances students' musical achievement (Azzara, 1993).

PMTs report varying confidence levels for teaching improvisation, with confidence differences attributable to grade level and background experiences (Bernhard & Stringham, 2016; Ng, 2021). The pre-service phase represents a critical developmental period for understanding and shaping the relationship between improvisation-related attitudes and self-efficacy beliefs, with significant implications for subsequent classroom practice and student learning outcomes. However, existing studies still leave several issues insufficiently examined. First, the research in the field of music education has often addressed attitudes (e.g., Koutsoupidou, 2005) and self-efficacy (e.g., Bernhard & Stringham, 2016) separately, with limited attention to distinct attitude dimensions, and their interconnections with different forms of efficacy beliefs. Second, previous research has provided limited evidence on whether different attitude dimensions toward improvisation are differentially related to efficacy beliefs. Third, although general teacher education research suggests that self-efficacy may mediate the relationship between attitude and teaching practice (Bas, 2022; Vieira et al., 2024), this path has received limited direct examination in music education, particularly in relation to improvisation.

This study aims to identify these research gaps, examine how three different attitude dimensions are related to two self-efficacy beliefs, and test whether personal improvisation self-efficacy plays an intermediary role between attitude and teaching confidence. Although many factors would affect teacher training (such as musical experience and institutional support), we focus specifically on attitudes and self-efficacy, because these are cognitive attributes that can be adapted during pre-service training, which makes them more actionable intervention targets than relatively fixed or contextual variables.

4.2. Literature review and theoretical framework

4.2.1. Attitudes as motivational foundations

Attitude reflects evaluative orientations toward objects, behaviors, or outcomes, serving as the motivational foundation that shapes an individual's willingness to engage in specific practices (Fishbein & Ajzen, 1975a). According to The Theory of Planned Behavior (Ajzen, 1991), attitudes, together with subjective norms and perceived behavioral control, are key determinants of behavioral intentions and subsequent actions.

Although attitudes have been recognized as important in shaping teaching practices, less attention has been paid to distinguishing multiple attitude dimensions and examining how these dimensions relate to different forms of efficacy beliefs in pre-service teacher preparation. While several studies have addressed attitudinal factors, few have systematically measured attitudes as a distinct psychological construct or investigated how different attitude dimensions relate to teaching outcomes. For example, Koutsoupidou (2005) found that while most primary music teachers in England acknowledged the educational value of improvisation, less experienced teachers reported limited use due to unfamiliarity, lack of confidence, or time constraints. Similarly, recent studies by Nikolaou (2023) found that although PMTs reported positive attitudes toward improvisation after receiving systematic training, a considerable number (41%) of teachers mentioned that they were only moderately prepared to implement improvisation activities. Ng (2023) further emphasized that developing confidence and a positive attitude toward improvisation requires continuous support to motivate PMTs to incorporate improvisation in their future teaching. This gap between attitude and practice may also reflect the pedagogical complexity of improvisation. Research suggests that effective improvisation requires specialized pedagogical knowledge, including strategies such as modeling, scaffolding, coaching, and reflective processes (de Bruin, 2019b). Furthermore, diverse pedagogical visions and approaches to improvisation exist across different educational contexts (Siljamäki & Kanellopoulos, 2020).

More recently, Korošec et al. (2022) examined students' attitudes toward improvisation and found that more positive attitudes were associated with higher flow experiences during improvisation, suggesting that favorable evaluations may foster engagement and skill development. However, their focus was on learner-flow rather than

systematically examining how different attitude dimensions relate to teaching confidence or practice. Cossey (2024) further identified teachers' understanding of how to teach improvisation as a major influence on whether it was included in piano lessons, yet the study did not empirically examine attitude dimensions. Therefore, while existing research acknowledges that attitudinal factors influence the teaching and learning of improvisation, there remains a gap in systematically conceptualizing and measuring attitudes as a multidimensional construct within this context.

4.2.2. Self-efficacy for improvisation and teaching improvisation

Self-efficacy refers to an individual's belief in the capability to complete specific actions to achieve specific goals (Bandura, 1997). According to the social cognitive theory of Bandura (1997), self-efficacy not only influences individuals' goals and behaviors but is also affected by environmental factors. Teachers' self-efficacy appears to be a key factor influencing the learning outcomes of both teachers and students in music education (J. J. West & Frey-Clark, 2019). Research in both general and music education has suggested that self-efficacy is multidimensional and varies by domain and task (e.g., Orejudo et al., 2021; Zee & Koomen, 2016). For example, people may feel confident in one area yet less so in another (Tschannen-Moran & Hoy, 2001). In music teacher education, Burak (2019) also distinguished pre-service teachers' self-efficacy in musical ability and their self-efficacy in music teaching, and found that these two constructs were strongly related. Such specificity underscores the necessity of specifying the domain of efficacy under investigation. In the music context, we distinguish the self-efficacy beliefs into two domains: self-efficacy for improvisation (SEI) and self-efficacy for teaching improvisation (SETI).

Self-efficacy for improvisation (SEI) refers to PMTs' confidence in their own ability to engage in spontaneous musical creation and make appropriate real-time music decisions. As improvisation demands on-the-spot creativity, interactive responsiveness, and risk-taking, effective SEI is regarded as a key factor in facilitating improvisational practice: individuals who believe in their improvisational abilities are more likely to seek out opportunities for improvisational practice, experiment with new ideas, and persevere when faced with improvisational challenges. Research indicates that self-efficacy for improvisation can be systematically developed through appropriate pedagogical

approaches. Bernhard and Stringham (2016) found a positive connection between prior experience in jazz and improvisational activities and confidence in improvisation, which tended to rise with increased experience and educational progression. This association probably indicates a development of mastery experiences in improvisation settings. In addition, sequential scaffolding and explicit strategy instruction enhance improvisational skills and confidence (Hickey, 2009; Hickey et al., 2016; Kratus, 1995). These findings align with Bandura's (1997) the perspective of mastery experiences as the most powerful source of self-efficacy: successful improvisation experiences, appropriately scaffolded, build confidence for future improvisation challenges.

Self-efficacy for teaching improvisation (SETI) extends Bandura's concept into the pedagogical domain, referring to PMT's confidence in designing, facilitating, and assessing improvisation instruction. Following Tschannen-Moran and Hoy's (2001) conceptualization, teacher self-efficacy is defined as educators' beliefs in their capabilities to affect student performance. SETI specifically encompasses PMT's confidence in their capability to design effective improvisation activities, guide students' improvisational processes, and provide constructive feedback for creative risk-taking. From the PCK perspective, SETI also relies on teachers' ability to transform personal improvisation competence into teachable representations and learning sequences (Chung & Ho, 2026; Grieser & Hendricks, 2018). This includes designing a series of sequence tasks. For example, from highly structured improvisation to more free improvisation, scaffold the activity that suits students' level, and evaluate students' creative process without limiting the exploration. Research shows that while high SEI may contribute to SETI, it is not sufficient on its own; teachers with limited personal improvisational fluency can still develop strong teaching confidence through well-structured teacher education (Ng, 2021, 2022; Ward-Steinman, 2007).

SETI represents not only a psychological outcome but also a behavioral predictor. Teachers' sense of efficacy determines their willingness to adopt new methods, persevere through uncertainty, and support students' creative risk-taking (Tschannen-Moran & Hoy, 2001; Zee & Koomen, 2016). In the context of improvisation pedagogy, SETI serves as a crucial leverage point: without sufficient confidence to teach improvisation, even musically skilled teachers may avoid it. By identifying which attitudinal and experiential factors foster SETI, this study contributes actionable insights for teacher educators. It can inform how pre-

service programs can intentionally cultivate teaching efficacy for improvisation through authentic mastery experiences and reflective pedagogical practice.

4.2.3. The relationship between attitudes and self-efficacy

Recent empirical research provides evidence that attitudes influence self-efficacy and that self-efficacy, in turn, predicts teaching-related outcomes, indicating a mediating pathway from attitudes through self-efficacy to teaching practices. In teacher education, Bas (2022) found that self-efficacy played a mediating role in student teachers' teaching beliefs, attitudes towards teaching, and motivation to teach. Vieira et al. (2024) similarly confirmed that self-efficacy is an important bridge between PMTs' attitudes toward inclusive education and personal accomplishment. These findings reveal a complementary structure: attitudes provide motivational orientation, while self-efficacy provides belief in competence, jointly shaping professional behavior.

Despite this evidence in general teacher education, the mediating role of self-efficacy between attitudes and teaching practices has received limited attention in music teacher education, particularly in the context of improvisation. Current studies in music education have explored attitudes (e.g., Koutsoupidou, 2005) and self-efficacy (e.g., Bernhard & Stringham, 2016) as separate constructs, but their interrelationship remains unclear. Given that both are malleable through pre-service training and jointly influence teaching practices, understanding whether self-efficacy mediates the relationship between attitudes and improvisation teaching confidence is critical for designing effective teacher preparation programs.

4.2.4. The present study and hypotheses

Drawing on these frameworks, this study distinguishes attitudes into three dimensions: **attitude toward studying improvisation, attitude toward teaching improvisation,** and **attitude toward inclusion of improvisation.** These dimensions are conceptually distinct and may not develop in parallel. For instance, a teacher might enjoy improvisation personally but feel unprepared to teach it or may support its inclusion in the curriculum while lacking the practical tools to implement it effectively. Previous evidence demonstrates that while teachers generally value improvisation, their confidence in

teaching it varies widely (Bernhard & Stringham, 2016; Larsson & Georgii-Hemming, 2019), and longitudinal research suggests that professional attitudes are adaptable through training (Tok, 2011). However, existing research has not systematically examined how these distinct attitudinal dimensions relate to teachers' improvisation-related self-efficacy, nor how these relationships evolve during pre-service training.

Building on this theoretical foundation, the present study examines how these three attitudinal dimensions relate to two efficacy beliefs: **self-efficacy for improvisation** and **self-efficacy for teaching improvisation**. While general teacher education research suggests that attitudes influence teaching behavior through self-efficacy (Bas, 2022; Vieira et al., 2024), whether this pathway operates directly, indirectly through self-efficacy for improvisation, or both remains unclear in the context of improvisation teaching. We therefore investigate how attitudes differentially predict these efficacy beliefs, and how efficacy beliefs in turn shape PMTs' intentions to employ improvisation in their teaching. To achieve this, we adopt a sequential explanatory mixed methods design that integrates quantitative data from PMT surveys with qualitative interviews, allowing us to contextualize and deepen our understanding of the survey findings.

Central to this investigation is the hypothesized relationship between self-efficacy for improvisation and self-efficacy for teaching improvisation. We propose that self-efficacy for improvisation serves as a developmental foundation for self-efficacy for teaching improvisation. This hypothesis is grounded in the principle that personal competence precedes pedagogical confidence: teachers who feel capable of improvising themselves are better positioned to model, scaffold, and respond to students' improvisational efforts. General teacher efficacy research supports this premise, demonstrating that high self-efficacy correlates with teaching quality, persistence through challenges, and willingness to adopt innovative methods (Holzberger et al., 2013; Klassen & Chiu, 2010; Zee & Koomen, 2016). However, empirical evidence for this developmental sequence within improvisation teaching remains limited. Moreover, self-efficacy develops most readily during early training and becomes increasingly stable over time (Hoy & Spero, 2005), making the pre-service phase a critical period for testing and supporting this relationship.

Specifically, this study draws on the theory of planned behavior (Ajzen, 1991), and social cognitive theory to examine how attitudes and self-efficacy interact (Bandura 1997)

to examine how attitudes and self-efficacy relate in the context of improvisation. We conceptualize attitudes as PMTs' perceived orientations toward learning, teaching, and supporting the inclusion of improvisation (AS/AT/AI), while self-efficacy reflects their perceived capability to improvise, or to teach improvisation (SEI and SETI, respectively). In Bandura's framework, mastery experience is the most important source of self-efficacy. Attitudes may relate to efficacy beliefs through motivational and cognitive pathways. For example, a positive attitude can enhance the behavioral intention of seeking learning opportunities, as well as influence how they interpret and evaluate their own practice (Ajzen, 1991). Understanding how these constructs interact is essential for designing teacher preparation programs that address both motivational and competence-related barriers to improvisation instruction.

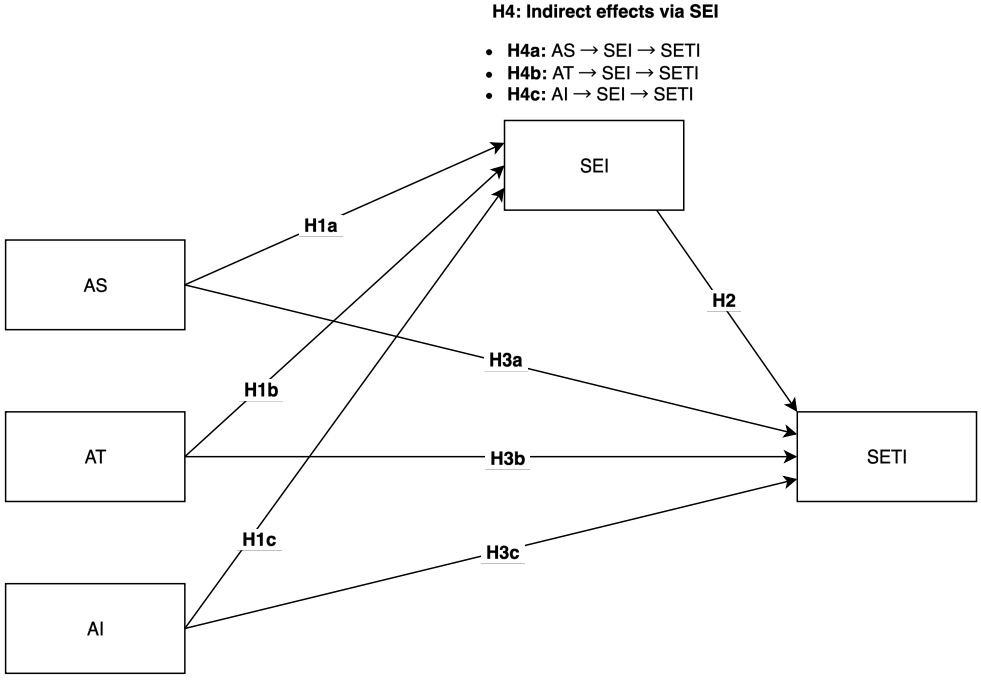

Figure 4.1. The proposed research model for predicting self-efficacy of teaching improvisation

Note: AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

We include attitude toward studying improvisation (AS), attitude toward teaching improvisation (AT), and attitude toward inclusion of improvisation (AI) as predictors, self-efficacy for improvisation (SEI) as a mediator, and self-efficacy for teaching improvisation (SETI) as the outcome. Building on this framework, we propose the following research question: What are the relationships between PMTs' attitudes (i.e., AS, AT, and AI) and their self-efficacy for improvisation (SEI), and self-efficacy for teaching improvisation (SETI)? Figure 4.1 illustrates the hypothesized relationships among these constructs

H1: AS, AT, and AI are positively associated with SEI.

H2: SEI positively predicts SETI among PMTs.

H3: AS, AT, and AI have direct effects on SETI, independent of their indirect effects through SEI.

H4: The relationship between attitudes (AS, AT, and AI) and SETI is mediated by SEI.

By testing these hypotheses, this study aims to provide evidence-informed guidance for music teacher education. If attitudes are associated with personal improvisation confidence (H1) and teaching readiness (H3, H4), and if personal mastery serves as a foundation for pedagogical confidence (H2), then effective interventions must address both motivational dispositions and competence development. These findings will inform the design of targeted professional development programs that strengthen teachers' capacity to implement improvisation in music classrooms.

4.3. Method

This study employed an explanatory sequential mixed-method design (Creswell & Clark, 2017). Data were collected through a questionnaire, and the relationships among attitudes and self-efficacy regarding improvisation were tested. Follow-up semi-structured interviews illustrate and explain quantitative patterns. Abbreviations for groups and variables are listed in Appendix A.

4.3.1. Research context

In the Netherlands, ten conservatories and universities of applied sciences offer a bachelor's program in Music Teacher Education, preparing students for primary, secondary, and community settings. This research focuses on third- and fourth-year bachelor PMTs,

who are at a critical transition point from academic study to the actual practice of teaching in schools. At this stage, students engage in school internships, gaining first-hand teaching experience and encountering the complex challenges of incorporating improvisation into their instructional practice.

Compared to first- and second-year PMTs, they possess greater experience in both learning and teaching contexts. Across the ten institutions, approximately 225 third- and fourth-year bachelor's PMTs were enrolled in the music education program during Spring 2024 in the Netherlands, though cohort sizes varied considerably across institutions.

4.3.2. Data collection and measuring instruments

4.3.2.1. Procedures

We used a mixed-method design comprising (i) a questionnaire adapted from prior validated scales and refined through a pilot with three PMTs, and (ii) an interview guide aligned to the questionnaire constructs for drawing an interpretive illustration of the questionnaire data. A music teacher educator, co-author, facilitated introductions to pedagogy course leaders at all ten higher music education institutions in the Netherlands. The first author then recruited on-site and distributed the online Qualtrics survey. Participation was voluntary with informed consent, and ethical approval was granted by the research ethics committee (IREC_ICLON 2023-07). Participants were informed that they could withdraw at any time without any reason, and their responses would be treated confidentially. Survey data were collected anonymously, and interview data were pseudonymized at transcription. Any identifying information was removed. Data were collected from March to June 2024.

4.3.2.2. Participants

In total, 123 PMTs completed the questionnaire, which took about 10 to 15 minutes to complete. Participants were not recruited based on their previous improvisation experience. Eligibility criteria were (a) registered in the third- or fourth-year bachelor's music education program in the academic year 2023–2024, and (b) voluntary consent to participate. During the data collection for the questionnaire and interviews, participants were encouraged to reflect on their current stage of music teacher education. For example,

reflect on the experience gained through course learning, peer teaching, and internships. Although the focus was on their current training experiences, some participants naturally drew on their earlier improvisation experiences or reflected on their future teaching expectations.

Table 4.1 presents demographic information for the PMT's questionnaire participants. To complement the survey findings, follow-up semi-structured interviews were conducted with one representative PMT from each of the ten participating institutions (Appendix D). Each interview lasted 40-60 minutes, conducted in English. All participants signed a consent form and permitted recording.

Table 4.1 Demographic and descriptive characteristics of the participants (n=123)

	Category	Frequency	%
Gender	Female	63	51.2%
	Male	54	43.9%
	Others	6	0.04%
Age	18–22	72	58.5%
	23–25	34	27.6%
	≥26	17	13.8%
Grade	Year 3	79	71.6%
	Year 4	44	28.4%
School location	Amsterdam	14	11.4%
	Den Haag	8	6.5%
	Enschede	16	13.0%
	Groningen	7	5.7%
	Leiden	10	8.1%
	Maastricht	16	13.0%
	Rotterdam	7	5.7%
	Tilburg	10	8.1%
	Utrecht	26	21.1%
	Zwolle	9	7.3%

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4.3.2.3. Questionnaire development and measures

The questionnaire consisted of three sections: demographics, variables in the research model, rated on a 5-point Likert scale, and optional open-ended questions for deeper insight. For each variable, validated scales were used, and items were only adapted to fit the specific variable and context of music (teacher) education. Before distribution, the questionnaire was reviewed by three Dutch native speakers, who participated in a translation and group discussion to ensure the accuracy and linguistic equivalence of the items. All example items with factor loadings can be found in Appendix E.

Attitude toward studying improvisation was measured by six items, which were adapted from Wei et al. (2024). Attitude toward studying refers to the general belief in favorability and the benefits of improvisation. Next, the six-item scale by Admiraal et al. (2017) was adapted for **attitudes toward teaching improvisation**. It refers to the general belief of personal preference in teaching improvisation. In order to examine PMTs' **attitudes toward inclusion of improvisation**, the items by Piazza and Talbot (2021) were adapted to match the improvisation contexts. Attitude toward the inclusion of improvisation refers to PMTs' endorsement of its inclusion in music education across contexts (e.g., school curricula and teacher education).

Self-efficacy for improvisation was assessed by adapting the scale by Chen et al. (2001) with eight items. It measures PMTs' belief in their capacity to succeed in self-practicing and learning improvisation. In addition, eight items were developed to measure PMTs' **self-efficacy for teaching improvisation**. The original form with 24 items came from

Tschannen-Moran and Hoy (2001). We adapted the instructional strategies section in the improvisation teaching context for measuring the PMTs' belief in their own ability to positively influence (future) students' learning. All the items were formatted on a 5-point Likert scale, scoring from 1 (strongly disagree) to 5 (strongly agree).

4.3.2.4. Interview protocol

To extract as much information as possible from the interview, we posed open-ended primary questions supplemented by pre-determined follow-up questions. We inquired about participants' experiences with learning improvisation during their undergraduate studies and (where applicable) teaching improvisation, focusing specifically on five core variables (AS, AT, AI, SEI, and SETI). For example: "Do you think it is important for bachelor students in music education to have improvisation in the curriculum?" and "Do you feel confident or well-prepared to teach improvisation by yourself after the instruction from your bachelor study?" Follow-up questions were used to seek further explanation, clarify meaning, and inquire about reasons for "Why / Why not?".

4.3.2.5. Factor structure and validity of the questionnaire.

An exploratory factor analysis (EFA) was performed in IBM SPSS 29.0 to examine the measurement structure and detect possible cross-loadings. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test validated the appropriateness of doing the EFA (Kaiser, 1974). Following the common guidelines, items with factor loadings below .50 or cross-loadings over .40 were removed (Ferguson & Cox, 1993; Hair, Black, et al., 2019, p. 151). Based on the factor analysis, we could keep all three attitudes and the two self-efficacy dimensions.

4.3.3. Data analysis

4.3.3.1. Quantitative data

We determined the minimum sample size using G*Power 3.1 (Faul et al., 2009). Taking the variable self-efficacy for teaching improvisation (SETI) as the most demanding endogenous construct with four predictors (AS, AT, AI, SEI), we ran a priori power analysis (F test: Linear multiple regressions: Fixed model, R2 deviation from zero). With $\alpha = .05$, power = .80, and a medium effect size ($f^2 = 0.15$), the analysis indicated a minimum of 85

cases (Hair et al., 2021, p. 18). Since our study collected 123 valid responses, exceeding both criteria, the sample size is considered adequate.

Building on prior research on attitudes and self-efficacy, this study explores the interrelationships and predictive effects among the five constructs. To test these relationships, we applied Partial Least Squares Structural Equation Modeling (PLS-SEM), which emphasizes prediction and is well-suited for small-to-medium sample sizes as well as exploratory, theory-extending research (Hair et al., 2011). Compared with covariance-based SEM, PLS-SEM is more appropriate for our study because of the relatively small sample size, the focus on prediction-oriented modeling, and the aim of model development, which aligns well with the aim of this study. PLS-SEM was conducted in R (Version 2025.05.0). The data were bootstrapped with 5,000 subsamples to ensure stable and reliable results.

4.3.3.2. Qualitative data

The thematic analysis (Braun & Clarke, 2006) with an inductive approach (Elo & Kyngäs, 2008) was adapted for the exploration of the qualitative dataset. The qualitative analysis aimed to capture the key factors shaping PMTs' attitudes towards improvisation, exploring the development of self-efficacy, and understanding the underlying reasons for the interactions between attitudes and self-efficacy. First, we transcribed the semi-structured interviews on Amberscript (https://app.amberscript.com/). The interview transcripts were inductively coded in ATLAS. ti 25 to identify recurring patterns related to attitudes and self-efficacy, while also allowing for new themes to emerge. The codes were then organized into broader themes and compared with the quantitative model to explore additional influences beyond the questionnaire. During the coding procedure, the authors engaged in multiple discussions to resolve any disagreements between the coding and the categories. Ultimately, the qualitative findings were integrated with quantitative results, providing a more comprehensive understanding of PMT's attitudes and self-efficacy for improvisation.

4.4. Result

4.4.1. Descriptive analysis

Exploratory group comparisons were performed to examine potential differences by gender, grade, and age (Table 4.2). Levene's tests confirmed homogeneity of variances for all variables (ps > .05). A one-way ANOVA revealed significant gender differences in AS, F(1, 121) = 4.25, p = .042, η^2 = .07, SEI, F(1, 121) = 7.83, p < .001, η^2 = .12, and SETI, F(1, 121) = 3.76, p = .046, η^2 = .06. Male students (M = 4.12, SD = 0.53) scored higher than female students (M = 3.85, SD = 0.49) on these variables. No significant differences were observed across grade or age, all ps > .05.

A repeated-measures ANOVA revealed a significant main effect of construct, $F(2, 244) = 80.67$, $p < .001$, $\eta^2 = .40$, indicating that PMTs' mean ratings differed across the three variables. Bonferroni-adjusted pairwise comparisons showed that AI ($M = 3.98$, $SD = 0.83$) was significantly higher than both SEI ($M = 2.95$, $SD = 0.85$; $p < .001$) and SETI ($M = 3.35$, $SD = 0.78$; $p < .001$), and SETI was significantly higher than SEI ($p < .001$). This pattern suggested that PMT feels more confident about teaching improvisation than performing improvisation themselves. As one PMT explicitly noted: "*I will always know more than the kids in the class*" (PMT 1). Although PMT felt that their personal improvisational abilities (SEI) were still limited by professional standards, they were confident to support improvisational teaching self-efficacy (SETI) in primary and secondary education.

Table 4.2 Group differences in five variables via one-way ANOVA and T-test

Variable	Gender		Grade		Age	
	F	η^2	t	*d*	*F*	η^2
AS	4.25*	.07	0.65	.12	0.82	.01
AT	1.10	.02	1.48	.28	0.18	.00
AI	0.82	.01	1.42	.28	0.13	.00
SEI	7.83***	.12	1.59	.27	0.01	.00
SETI	3.76*	.06	0.97	.27	0.95	.02

Note. Gender = female, male, other;Grade = 3rd and 4th year; Age = 18–22, 23–25, ≥26 years. p < .05*, p < .01**, p < .001***. AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

4.4.2. Measurement model assessment

The measurement model was first examined in SPSS to establish reliability and convergent validity. All reflective indicator loadings exceeded the recommended threshold of 0.708. As shown in Table 4.3, all average variance extracted (AVE) values were above 0.50, Cronbach's α values ranged from 0.812 to 0.912, and composite reliability (CR) values ranged from 0.886 to 0.932, all within the recommended ranges (Hair, Black, et al., 2019; Hair et al., 2021). These results indicate satisfactory internal consistency and convergent validity across constructs.

Table 4.3 Reliability and convergent validity of the measurement model.

Latent variables	Correlation					AVE	Cronbach's α	CR
	1	2	3	4	5			
AS	1					0.621	0.855	0.891
AT	0.606**	1				0.694	0.855	0.900
AI	0.541**	0.658**	1			0.723	0.812	0.886
SEI	0.447**	0.389**	0.270*	1		0.697	0.912	0.932
SETI	0.396**	0.538**	0.350**	0.585**	1	0.647	0.891	0.916

Note: CR: composite reliability; AVE: average variance extracted. ** $p < 0.01$
AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

Table 4.4 Discriminant validity of the constructs (Fornell-Larcker criterion)

	AS	AT	AI	SEI	SETI
AS	**0.788**				
AT	0.600	**0.833**			
AI	0.551	0.665	**0.850**		
SEI	0.488	0.411	0.290	**0.835**	
SETI	0.440	0.557	0.369	0.602	**0.805**

Note: AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

Next, discriminant validity was examined using the PLS-SEM analysis conducted in R. As shown in Table 4.4, the Fornell-Larcker criterion was satisfied for all constructs, indicating that each construct's AVE exceeded its correlations with other constructs (Fornell & Larcker, 1981). Given recent evidence that the Fornell–Larcker criterion alone may not reliably detect discriminant validity issues, the heterotrait–monotrait ratio (HTMT; Table 4.5) was additionally examined as a more rigorous criterion (Henseler et al., 2015). All HTMT

values ranged from 0.316 to 0.795, well below 0.85, providing strong evidence of discriminant validity for the measurement model.

Table 4.5 Discriminant validity of the constructs (HTMT)

	AS	AT	AI	SEI	SETI
AS					
AT	0.703				
AI	0.658	0.795			
SEI	0.495	0.436	0.316		
SETI	0.445	0.610	0.417	0.649	

Note: AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

4.4.3. Structural model assessment

As common method bias is a potential concern in survey-based research, we examined the collinearity among predictors. In this study, the variance inflation factor (VIF) ranged from 1.36 to 2.16. All values were well below the threshold of 3, indicating that multicollinearity was not a problematic issue (Hair et al., 2021, p. 96).

To evaluate the significance of the structural relationships, a bootstrapping process was conducted using 5,000 samples taken with replacement from the original dataset. The structural model showed satisfactory explanatory power. According to Hair et al. (2019, p. 11), R^2 values of 0.25, 0.50, and 0.75 present weak, moderate, and substantial explanatory power. The model explained 26.3% of the variance in SEI (R^2 = 0.263, adjusted R^2 = 0.244) and 47.8% of the variance in SETI (R^2 = 0.478, adjusted R^2 = 0.460), indicating moderate explanatory power for SEI and substantial explanatory power for SETI. The PLSc results produced highly consistent path coefficients and a slightly increased explained variance (SEI: R^2 = .315, adjusted R^2 = 0.297; SETI: R^2 = .578, adjusted R^2 = 0.564), further confirming the robustness of the structural correlations. Figure 4.2 presents the results of the PLS-SEM analysis of the proposed model.

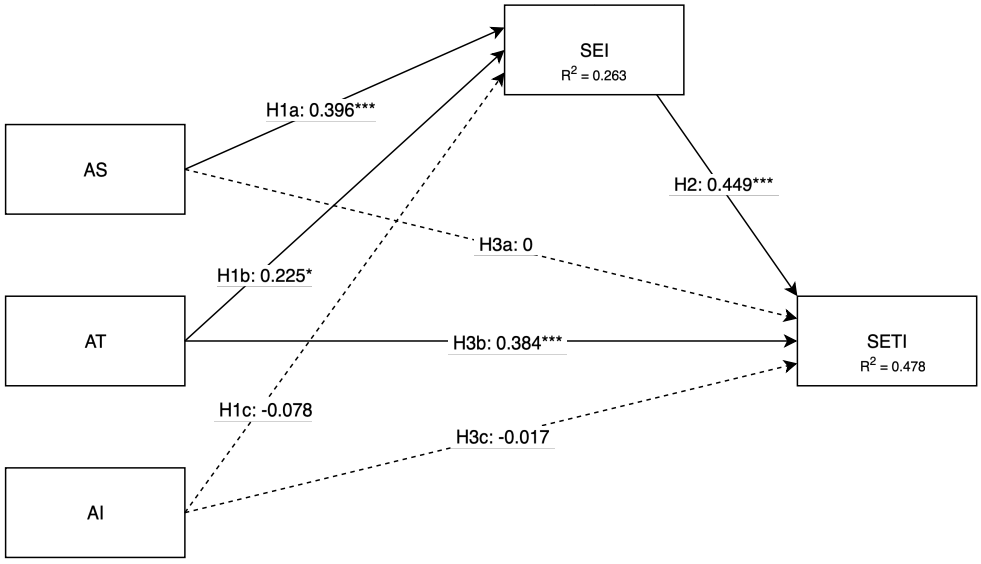

Figure 4.2. Structural model results for predicting self-efficacy for teaching improvisation

Note:

1. Solid lines represent significant paths; dashed lines represent non-significant paths.
2. ***$p < 0.001$, *$p < 0.05$.
3. AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

Table 4.6 Results of direct effects (H1-H3) and indirect effects (H4).

Hypotheses	Path	β	t-value	p-value	95% CI	Supported
H1a	AS→SEI	0.396***	4.323	0.000	[0.219, 0.579]	✓
H1b	AT→SEI	0.225*	2.025	0.043	[0.003, 0.439]	✓
H1c	AI→SEI	-0.078	-0.623	0.533	[-0.324, 0.162]	✗
H2	SEI→SETI	0.449***	5.723	0.000	[0.291, 0.599]	✓
H3a	AS→SETI	0.000	-0.002	0.998	[-0.204, 0.218]	✗
H3b	AT→SETI	0.384***	3.754	0.000	[0.175, 0.575]	✓
H3c	AI→SETI	-0.017	-0.186	0.853	[-0.190, 0.167]	✗
H4a	AS→SEI→SETI	0.178***	3.449	0.000	[0.077, 0.278]	✓
H4b	AT→SEI→SETI	0.101	1.909	0.056	[-0.003, 0.205]	✗
H4c	AI→SEI→SETI	-0.035	-0.620	0.535	[-0.146, 0.076]	✗

Note: $p < 0.001$***, $p < 0.05$*; AS = Attitude toward studying improvisation, AT = Attitude toward teaching improvisation, AI = Attitude toward inclusion of improvisation, SEI = Self-efficacy for improvisation, SETI = Self-efficacy for teaching improvisation.

Table 4.6 presents the path coefficients, t-values, and significance levels for all hypothesized relationships in the structural model. Effect sizes higher than 0.02, 0.15, and 0.35 are typically interpreted as small, medium, and large effect sizes, respectively (Chin, 2009; Cohen, 2013). A greater effect size between two latent variables indicates a stronger association between them.

Self-efficacy for improvisation (SEI) was the strongest predictor of Self-efficacy for teaching improvisation (SETI) ($\beta = 0.449$, $p < 0.001$), while also functioning as an essential mediator. Attitude toward studying improvisation (AS) showed a strong positive effect on SEI ($\beta = 0.396$, $p < 0.001$) and indirectly influenced SETI through this mediation ($\beta = 0.178$, $p < 0.001$). Attitude toward teaching improvisation (AT) had direct impacts on SETI ($\beta = 0.384$, $p < 0.001$) and SEI ($\beta = 0.225$, $p < 0.05$). Attitude toward inclusion of improvisation (AI) did not significantly predict either SEI ($\beta = -0.078$, $p = 0.533$) or SETI ($\beta = -0.017$, $p = 0.853$).

AI showed no significant correlations with either efficacy construct, although attaining the highest mean scores ($M = 3.98$), while AS and AI displayed no direct effects on SETI.

4.4.4. Findings from the interviews

4.4.4.1. Experiential foundation

Interviews indicate a three-stage experiential process, transforming fear into confidence via scaffolded success and continued engagement. Many participants recalled initial anxiety when first asked to improvise. PMT6 described: "*My first impression was: I'm scared, this is awful. But then my teacher said: start with three notes… it was scary, but then relieving. It became fun, like a game*." This step-by-step scaffolding approach transforms anxiety into enjoyment, thereby fostering positive emotional experiences. Once enjoyment replaced fear, students engaged voluntarily and repeatedly. PMT6 continued: "*My whole drum career is basically improvising… a lot of jazz improvisation and stuff*." The "fun" derived from early successes supports long-term engagement, transforming initial practice into a personal learning habit. Over time, repeated improvisational experiences build into mastery. By the bachelor phase, PMT6 stated, *"I feel positive and confident (in improvisation)."*

A positive learning attitude motivates PMT to engage in achievable improvisation tasks. The repeated successes reinforce enjoyment, thereby maintaining practice and ultimately building self-efficacy in improvisation.

4.4.4.2. Teaching orientation

Interviews revealed that a teaching-oriented attitude (AT) functions as both a motivational and identity-based driver, fostering self-efficacy in two interconnected ways: by motivating personal learning (AT → SEI) and by strengthening teaching confidence (AT → SETI).

For many PMTs, the desire to teach improvisation inspired their own motivation to refine their improvisational skills. "*I really want to... see the possibilities in it to teach. So, I'm thinking, okay, I want to learn more about my own improvisation to also give it to students"* (PMT 2). The pedagogical intention creates a purposeful context for skill development, turning self-improvement into a professional commitment rather than a personal hobby. Over time, the connection between individual growth and students' future learning gradually becomes evident, thereby enhancing their sense of efficacy (SEI) in improvisation itself.

Beyond personal mastery, pedagogical motivation also fostered confidence for teaching improvisation. PMT1 recalled: "*Yes, I do (feel confident to teach improvisation). It has given me a lot more because I've always wanted to do improvisation with children, but I never knew how. But now I've had so many different types of how you can do improvisation in class that I have all the tools I need to implement it in my work*." Her statement shows the conversion of intention into efficacy through building up teaching strategies and refining practices.

This attitude dimension connects directly to how PMT conceives, and potentially identifies with, the teaching profession, making it particularly relevant for teacher preparation.

4.4.4.3. Translating personal mastery into teaching confidence

Interviews confirmed that SEI serves as the most immediate foundation for teaching confidence. Participants consistently described how their own improvisational competence

provides the psychological foundation necessary for teaching: "*I'm comfortable doing it myself... so I guess I'm comfortable teaching it as well*" (PMT9). This transfer from personal to pedagogical confidence captures how teaching self-efficacy is grounded in experience, showing that the sense of security that comes from personal competence.

Several PMTs described this progression as an emotional transformation, from fear and hesitation to confidence to guide students. For example, "*I feel confident [to teach improvisation] because I don't feel scared myself anymore. Now I feel like I can teach other people*" (PMT5). Having overcome personal anxiety through repeated improvisation practice, she perceived her own growth as evidence of what could be achieved by her students, strengthening her confidence as an educator.

As PMTs became fluent in improvisation, their attention gradually shifted from self-performance to facilitation. PMTs turning the sense of "I can do it" into "I can guide it." This developmental transition captures the essence of the SEI → SETI pathway: teaching confidence grows from the lived experience of doing.

4.4.4.4. Recognizing the value, missing the practice

Despite strong encouragement for the educational benefits of improvisation, participants struggled to convert this acknowledgment into practical confidence. Many PMTs described improvisation as "fun" or "important"; however, their appreciation often lacked experiential grounding. PMT3 described, "*It's not very clear why I should improvise with my students, even though it's a fun thing to do*". PMT3's statement highlights a gap between valuing improvisation and knowing how to translate it into teaching practice. Similarly, PMT2 described feeling confident to use improvisation only in "*safe*" one-on-one lessons, but not in classroom settings where outcomes felt unpredictable: "*Some kids enjoyed it, and others didn't… I just want them to have fun*. " Her description reveals how uncertainty about classroom dynamics limits the transformation of positive attitudes into teaching confidence.

A further dimension of this disconnection emerged through insufficient preparation experiences. For example, "*I do think [improvisation] is important... but if you never really did that, it's also hard to say to the students. If you yourself are not even sure what you're doing. Because we didn't really do that in the bachelor's, I don't really think that it has so*

much influence on my teaching skills" (PMT10). His reflection shows that recognizing the value of improvisation is not enough. Without concrete experience and training, this belief remains theoretical and cannot translate into confidence for teaching.

Collectively, these narratives explain why the quantitative model found no significant link between AI and both forms of self-efficacy. While PMTs cognitively valued improvisation, the lack of meaningful practical experience or structured pedagogical guidance hindered this belief from becoming an embodied skill. In summary, attitudinal support without experiential grounding fails to generate efficacy.

4.5. Discussion

This study examined the relationships between three dimensions of attitudes toward improvisation and two forms of self-efficacy beliefs among PMTs. The findings provided new insights into how different attitudinal orientations promote the development of the preparation of improvisation in teaching practice. It holds major implications for music teacher education. We will discuss our findings in relation to existing theory and research, address unexpected findings, and consider practical implications for teacher preparation programs.

4.5.1. The central role of self-efficacy for improvisation

The result confirmed the central role of self-efficacy for improvisation in the model, highlighting its strong association with teachers' attitudes toward improvisation. This pattern suggests that attitudes and self-efficacy beliefs operate as key motivational beliefs that shape intentions and guide teaching-related actions (Ajzen, 1991; Bandura, 1997). In line with Bandura's social cognitive theory, mastery experiences emerged as a primary source of confidence: PMTs who experienced success in improvisation felt more capable of applying it in educational contexts. Previous studies have reported similar patterns in other educational domains, where positive attitudes and self-efficacy jointly predict stronger behavioral intentions and classroom implementation (Prior et al., 2016; Wei et al., 2024).

The finding is also consistent with prior music research, showing that related forms of music-specific self-efficacy are often closely associated. Burak (2019) found that pre-service teachers' self-efficacy in music ability and the self-efficacy of music teaching

significantly predicted each other. Orejudo et al. (2021) also found that the self-efficacy for learning strongly predicted the self-efficacy for public performance among music students. Furthermore, Biasutti and Concina (2018) also showed that the self-efficacy of music teachers is shaped by a variety of personal and professional factors. These studies show that self-efficacy beliefs related to music are interrelated but not interchangeable. In the current study, this pattern is specifically reflected in the relationship between SEI and SETI: self-confidence in improvisation may help improve teaching confidence, but it does not automatically translate into confidence in engaging students in improvisation activities.

Moreover, SEI also functioned as a mediator between attitudes and SETI, revealing that positive attitudes alone are insufficient for developing teaching confidence. It must be accompanied by opportunities to build a sense of ability and mastery through improvisation practice. Consistent with this, previous studies have emphasized the central role of self-efficacy as a proximal predictor of teaching-related motivation and action. For example, Bas (2022) demonstrated that teaching self-efficacy mediates the relationship between attitudes toward teaching and teachers' motivation. Similarly, Vieira et al. (2024) reported that when training enhances individuals' attitudes, self-efficacy increases accordingly and further promotes their sense of accomplishment. Collectively, these studies reinforce the central position of self-efficacy as an important factor translating attitudinal beliefs into pedagogical practice.

4.5.2. Differential effects of attitude dimensions

Further analysis revealed significant differences among attitude dimensions in predicting efficacy beliefs. AS significantly predicted SEI but not SETI, indicating that valuing personal learning fosters one's own skill development but does not automatically translate into teaching confidence. This distinction between believing in one's capacity to learn versus one's capacity to facilitate others' learning, underscores that pedagogical self-efficacy requires more than personal mastery; it demands experiences that bridge personal skill with instructional practice (e.g., modeling, leading, and reflecting on improvisation in teaching contexts).

AT significantly influenced both SEI and SETI, with stronger direct links to SETI than AS. This pattern is conceptually consistent with the framework of teacher efficacy

(Tschannen-Moran & Hoy, 2001), suggesting that teaching-oriented attitudes are more directly linked to instructional confidence than attitudes focused on personal learning. PMTs who view improvisation as a teaching tool, rather than merely a personal skill, tend to feel more capable of facilitating it in the classroom. This reflects a motivational shift from self-development to pedagogical engagement. This finding extended beyond Koutsoupidou's (2005) identification of teacher attitudes as a key implementation factor, specifically illustrating how teaching-focused attitudes uniquely promote professional competence.

AI did not predict either SEI or SETI, indicating a gap between curriculum endorsement and capability beliefs. AI mainly reflects a value or advocacy perception, while efficacy beliefs on learning and teaching improvisation are more based on practical experience and task-specific judgments. This interpretation is consistent with work by Ballantyne and Canham (2023), who suggest that importance (i.e., knowledge or skills teachers perceive as essential in their work) and confidence (i.e., a sense of capacity in performing these tasks) are distinguishable dimensions that do not always change in synchrony. Furthermore, our findings echo previous evidence that PMTs may value creative activities such as improvisation while still reporting lower confidence or comfort in engaging with or teaching them (Bernhard & Stringham, 2016; Randles & Ballantyne, 2018; Randles & Smith, 2012).

The perspective of PCK helps explain why AI did not predict efficacy beliefs. Supporting improvisation's inclusion is not the same as knowing how to design and teach it. Previous music education studies have shown that teacher preparation depends not only on valuing musical content, but also on developing the ability to transform music knowledge into teachable and learnable classroom experiences (Grieser & Hendricks, 2018; Mateiro et al., 2012). In music teaching, PMTs need music-specific pedagogical skills to transform musical knowledge into classroom practice, such as activity design, scaffolding, explaining, assessment, and feedback (Ballantyne & Packer, 2004; Grieser & Hendricks, 2018). This is also consistent with recent evidence that self-efficacy in music teaching is differentiated across domains. For example, Chung and Ho (2026) found that preschool music teachers reported lower self-efficacy in CK than in PCK for implementing musical play.

This suggests that pedagogical confidence in music teaching does not simply derive from personal musical confidence but also depends on PCK and practice-based preparation.

According to Social Cognitive Theory (Bandura, 1997), self-efficacy develops through mastery experience and supported practice, rather than by abstract advocacy. AI may raise awareness, but it does not build the sense of capability that comes from envisioning oneself successfully engaging in the activity. This helps explain why teachers often support creative activities but integrate them inconsistently (Piazza & Talbot, 2021). Teacher education may need structured and practice-based opportunities, for example, modeling, coaching, and scaffolding, as in cognitive apprenticeship frameworks (de Bruin, 2019b). In addition, mentoring and ongoing professional learning can play a crucial role in helping teachers navigate the transition from pre-service preparation to the teaching practice (Ballantyne & Zhukov, 2017).

These results may also be understood in relation to identity development in music teacher education. The literature on the musician-teacher dilemma has long suggested that PMTs may experience tension between developing as musicians and as teachers (Mark, 1998; Pellegrino, 2009). If improvisation is perceived primarily as an advanced performance skill, PMTs may evaluate themselves through a musician or performer perspective. In this case, PMTs may recognize its value, but at the same time feel unprepared to use it in teaching. Recent studies suggest that PMT's professional identity development is complex and dynamic (Yang, 2022), shaped by program experiences, curriculum, and authentic teaching opportunities (Albert, 2023). Research also demonstrated that music teacher role-identity is constructed through ongoing negotiation during undergraduate education (Long, 2024). These literatures suggest that attitudes toward improvisation may differ depending on whether improvisation is perceived as a form of personal musical development or as a pedagogical practice. From this perspective, AS predicting SEI only may reflect a stronger orientation toward personal musical growth, whereas AT predicting both SEI and SETI may indicate a pedagogical orientation toward facilitating others' learning. The non-significant effect on AI is consistent with the framework of Ballantyne and Canham (2023), showing that importance and confidence are separate concepts. This may help explain why teachers recognize the value of improvisation but seldom implement it (Piazza & Talbot, 2021).

4.5.3. Implications for music teacher education

This research provides a theoretically informed and empirically tested basis for designing more effective pedagogical preparation for improvisation in music teacher education. Our findings suggest that the development of teaching confidence involves both a direct path (teaching-oriented attitude → teaching self-efficacy) and an indirect path (attitudes → personal skills confidence → teaching self-efficacy). In this process, SEI serves as a key mediator linking attitudinal orientations and teaching confidence.

AT directly predicted SETI, indicating that teaching-oriented attitudes can support instructional confidence. The mediating role of SEI suggests that this effect may be strengthened when PMTs also builds confidence in their own improvisation ability. In other words, programs cannot rely on cultivating a teaching-centred attitude, they should also give priority to experiential learning that supports personal mastery.

This is consistent with Azzara's (1993) emphasis on the role of improvisation experience in developing confidence, while further specifying a possible pathway: positive attitudes (AS/AT) → self-efficacy for personal improvisation (SEI) → pedagogical confidence (SETI). Critically, SEI is shaped by mastery experiences in improvisation, successful practice builds the sense of "I can do this," which may then supports the belief "I can teach this" (Bandura, 1997). Therefore, teacher education programs could provide structured opportunities for PMTs to develop improvisation skills through repeated, scaffolded practice, as such experiences may form an important foundation for both SEI and SETI.

Teacher education programs could support PMTs' improvisation preparation from two complementary roles: as learners developing their own improvisational skills (building AS and SEI), and as facilitators leading improvisation activities with peers or students (building AT and SETI). Given that SEI mediates the relationship between AS and SETI in our model, progressive mastery experiences are essential: starting with simple, low-risk group activities, such as rhythmic call-and-response or melodic variations, allows PMTs to accumulate successful experiences that build SEI. Because AT directly predicts SETI, programs should integrate pedagogical rehearsal opportunities, such as microteaching sessions in which PMTs lead improvisation activities with peers, to help them envision themselves as capable educators. These peer teaching experiences may strengthen both personal mastery and readiness.

For PMTs new to improvisation, especially those from classical backgrounds, our finding that AS predicts SEI suggests that instruction should emphasize exploratory, non-evaluative practice in supportive environments where mistakes are tolerated and regarded as part of developing musical imagination. This approach aligns with research highlighting the importance of creative, supportive environments and reflective improvisation pedagogies (Biasutti & Frezza, 2009; Burnard & Dragovic, 2015). The differential effects of attitude dimensions suggest that programs could strategically integrate three components: (1) personal improvisation practices (addressing the AS→SEI pathway), (2) pedagogical rehearsal opportunities (addressing the AT→SETI pathway), and (3) scaffolded mastery experiences (strengthening SEI as the mediator).

4.5.4. Limitations and future research

Several limitations of this study should be acknowledged. First, the cross-sectional survey design prevents causal inference. Longitudinal research is needed to confirm how attitudes and efficacy beliefs evolve dynamically across teacher preparation programs. Second, although we collected both quantitative and qualitative data, our sample was limited to the Dutch national context. Future studies should examine the model in broader cultural contexts and educational systems. Third, the study focused exclusively on psychological beliefs, without including behavioral or teaching performance variables. Fourth, prior improvisation experience was not directly measured in the survey, although it emerged in the interview data. This makes it difficult to distinguish whether participants' self-efficacy reflects program effects, personal beliefs, or previous experience. Given that mastery experiences function as a key source of self-efficacy (Bandura, 1997), future research could include prior experience as a variable in the quantitative model by, for example, measuring years or frequency of improvisation, coursework, ensemble participation, or other related practical experiences. Future research should incorporate observational or performance-based indicators of improvisational ability and teaching practice to better connect PMTs' perceived confidence with their actual instructional behavior. Such research could test whether the pathways identified in our model predict actual classroom implementation of improvisation. Additionally, research exploring factors underlying the teacher's self-efficacy can offer valuable insights into how novice teachers

develop professional identity and competence. Understanding these factors can inform the design of scaffolded interventions that build realistic and sustainable teaching confidence among PMTs.

4.6. Conclusion

This study deepens the understanding of how PMTs develop confidence for teaching improvisation by examining the interplay between attitudinal dimensions and self-efficacy beliefs. Findings reveal that positive attitudes (toward studying and teaching improvisation) significantly predicted improvisation self-efficacy, which functioned as the central pathway to teaching confidence, supporting that self-efficacy for improvisation provides an important foundation for pedagogical readiness. Attitudes toward inclusion of improvisation (AI) did not predict either form of self-efficacy. This non-significant pattern reveals a critical distinction: endorsing curriculum inclusion operates through different psychological paths than action-oriented attitudes, suggesting that valuing improvisation at the curricular level does not necessarily translate into perceived capability to perform or teach it.

The findings also highlight the complementary roles of self-efficacy and PCK in teaching preparation. While SEI provides a foundation for SETI, transforming personal improvisation ability into effective teaching requires PCK related to improvisation (e.g., knowing how to design, scaffold, and assess students' improvisation development). For teacher education, these findings highlight the importance of cultivating personal improvisation skills (as a foundation for SEI), as well as PCK (as the support for transforming SEI into effective teaching practice). The findings underscore the need to provide PMTs with structured opportunities to develop personal improvisational skills. Therefore, teacher education programs may incorporate progressive mastery experiences, peer learning opportunities, and supportive environments that embrace mistakes and encourage exploration. Such practices not only enhance self-efficacy but also sustain long-term motivation and professional autonomy, thereby advancing PMTs' readiness to lead creative musical activities in diverse classroom contexts.