Kastamonu Education Journal, 2025, Vol. 33, No:3, 612-624
doi: 10.24106/kefdergi.1750209

| Research Article / Araştırma Makalesi |

Use of Metacognitive Strategies in Studies on Maqam-based Piano Pieces

Makamsal Piyano Eserlerine Yönelik Çalışmalarda Üstbilişsel Stratejilerin Kullanımı[1]

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Keywords

1. Piano education
2. Maqam-based piece studies
3. Metacognitive strategies
4. Metacognitive awareness
5. Study diaries

Anahtar Kelimeler

1. Piyano eğitimi
2. Makamsal eser çalışmaları
3. Üstbilişsel stratejiler
4. Üstbilişsel farkındalık
5. Çalışma günlükleri

Received/Başvuru Tarihi
29.01.2025

Accepted / Kabul Tarihi
25.07.2025

Abstract

Purpose: The aim of this study is to examine the effect of using metacognitive strategies in piano education on metacognitive awareness and piano performance. In addition, it was aimed to reveal the metacognitive knowledge and metacognitive regulation skills used by the students in the process of studying maqam-based pieces.

Design/Methodology/Approach: The research was conducted within the scope of mixed method. The quantitative dimension of the study used a one-group pretest-posttest experimental design. In the experimental process, individual piano lessons were held with the study group students (N=8) for 9 weeks, and the process of studying maqam-based pieces was carried out using metacognitive strategies. Quantitative data were obtained through the Metacognitive Awareness Inventory (MAI) and Piano Performance Rubric for Maqam-based Pieces (PPRMP). Within the qualitative dimension, the piece study diaries kept by the study group during the experimental process were analyzed.

Findings: It was determined that the use of metacognitive strategies in the process of studying maqam-based pieces made a significant difference in the metacognitive awareness levels and piano performance levels of the study group. In the piece study diaries, many expressions were found in which students reflected their metacognitive knowledge and skills about their learning processes and piano performances. It was determined that students mostly used metacognitive monitoring and evaluation skills in the experimental process.

Highlights: Although the metacognitive awareness of the study group regarding the knowledge of cognition dimension was higher than the regulation of cognition, it was determined that the activities related to the regulation of cognition were reflected more in the piece study diaries. Since piano education is an applied field, students' use of metacognitive editing skills and their frequent reflection of editing activities in their diaries are compatible with the structure of the process.

Öz

Çalışmanın amacı: Bu çalışmanın amacı, piyano eğitiminde üstbilişsel stratejilerin kullanımının üstbilişsel farkındalık ve piyano performansı üzerindeki etkisini incelemektir. Bununla birlikte öğrencilerin makamsal eser çalışma sürecinde kullandıkları üstbilişsel bilgilerinin ve üstbilişsel düzenleme becerilerinin ortaya çıkarılması amaçlanmıştır.

Materyal ve Yöntem: Araştırma karma yöntem kapsamında yürütülmüştür. Çalışmanın nicel boyutunda tek grup ön test-son test deneysel desen kullanılmıştır. Deneysel süreçte çalışma grubu öğrencileri (N=8) ile 9 hafta boyunca bireysel piyano dersi yapılmış ve üstbilişsel stratejiler kullanılarak makamsal eser çalışma süreci gerçekleştirilmiştir. Nicel veriler Bilişötesi Farkındalık Envanteri (BFE) ve Makamsal Eserlere Yönelik Piyano Performans Rubriği (MEYPPR) aracılığıyla elde edilmiştir. Nitel boyut kapsamında çalışma grubunun deneysel süreç boyunca tutmuş olduğu eser çalışma günlükleri incelenmiştir.

Bulgular: Makamsal eser çalışma sürecinde üstbilişsel strateji kullanımının çalışma grubunun üstbilişsel farkındalık düzeyleri ve piyano performans düzeyleri üzerinde anlamlı bir fark oluşturduğu tespit edilmiştir. Eser çalışma günlüklerinde öğrencilerin öğrenme süreçlerine ve piyano performanslarına yönelik üstbilişsel bilgi ve becerilerini yansıttıkları birçok ifadeye rastlanmıştır. Öğrencilerin deneysel süreçte en fazla üstbilişsel izleme ve değerlendirme becerilerini kullandıkları belirlenmiştir.

Önemli Vurgular: Çalışma grubunun bilişin bilgisi boyutuna ilişkin üstbilişsel farkındalıklarının bilişin düzenlenmesine göre daha yüksek olmasına rağmen eser çalışma günlüklerinde bilişin düzenlenmesine ilişkin faaliyetlerin daha çok yansıtıldığı tespit edilmiştir. Piyano eğitiminin uygulamalı bir alan olması nedeniyle öğrencilerin üstbilişsel düzenleme becerilerini kullanmaları ve düzenleme faaliyetlerini günlüklere sıklıkla yansıtmış olmaları sürecin yapısı ile uyumludur.

[1] This study is based on the doctoral dissertation of the first author under the supervision of the second author.

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Citation/Alıntı: Tuncer Tüfekçi, E., & Albuz, A. (2025). Use of Metacognitive Strategies in Studies on Maqam-based Piano Pieces, *Kastamonu Education Journal, 33*(3), 612-624. doi: 10.24106/kefdergi.1750209

INTRODUCTION

Within today's contemporary education approach, rather than teaching knowledge and skills through a superficial transfer, it is necessary to provide students with an awareness of their thinking skills and to manage their learning processes. In this context, in the education process, students are expected to approach knowledge critically and constantly question their learning situations rather than learning knowledge directly through memorization. To meet these expectations, students must recognize and organize their learning processes using planning, monitoring, and evaluation skills. The concept of metacognition, which has been the subject of many studies in educational psychology and learning, is related to individuals' taking an active role in their learning by following their learning stages, in other words, their cognitive processes.

Metacognition includes the knowledge of individuals in line with their awareness of their cognitive processes and their ability to monitor, control, organize, and evaluate those processes (Jacobs & Paris, 1987; Wilson, 1999; Papaleontiou-louca, 2003). The concept of metacognition, which was first used by Flavell in 1976, refers to the active monitoring of information processing processes that occur through the cognitive interactions of the individual with the environment. This monitoring process usually takes place in line with specific goals and objectives. Metacognition also encompasses the regulation and organization of these processes, depending on the information obtained from monitoring (Flavell, 1976). Thus, the relationship between cognition and metacognition can be understood by defining cognitive skills as “worker” and metacognitive skills as “boss.” While cognitive skills include recording, inferring, comparing, and analyzing information, metacognitive skills include executive/controlling processes such as planning, monitoring, and evaluation (Hartman, 1997).

Researchers have created various models of metacognition regarding the structure of metacognition and its components (Brown, 1987; Flavell, 1979; Jacobs & Paris, 1987; Paris & Winograd, 1990; Pintrich et al., 2000; Schraw & Dennison, 1994; Tobias & Everson, 2002). In Flavell's (1979) metacognition model, which is one of the first models created to understand the structure of metacognition, there are four essential components: "metacognitive knowledge," "metacognitive experiences," "goals (or tasks)," "actions (or strategies)." Metacognitive knowledge refers to an individual's knowledge about cognitive tasks, goals, and experiences. This component includes the dimensions of “person knowledge,” “task knowledge,” and “strategy knowledge.” Metacognitive experiences are cognitive or affective experiences that occur before, after, or during a cognitive task. Metacognitive goals reflect the goals set to accomplish a cognitive task; metacognitive actions reflect the strategies used to achieve the goals (Flavell, 1979). Among other metacognition models, Jacobs and Paris's (1987) metacognition model includes two dimensions, namely "self-evaluation of cognition" and "self-management of thinking," while the model of Pintrich et al. (2000) emphasizes the relationship between metacognition and self-regulation with the dimensions of "metacognitive knowledge," "metacognitive judgments and monitoring," "self-regulation and control." As can be understood from the metacognition models briefly described above, there are different perspectives on metacognition and its structure. In addition to these different models, the most accepted approach to metacognition in the literature is that metacognition consists of two essential components: “knowledge of cognition” and “regulation of cognition” (Baker & Brown, 1980; Brown, 1987; Schraw & Dennison, 1994).

Knowledge of cognition is defined as individuals' knowledge of the learning process and learning skills. Knowledge of cognition consists of three sub-dimensions: Declarative, procedural, and conditional knowledge. Declarative knowledge includes the individual's knowledge about their strengths and weaknesses in learning skills; procedural knowledge includes the knowledge about how to perform a learning task and which learning strategies should be used; and conditional knowledge includes the knowledge about when and why learning strategies should be used (Schraw & Dennison, 1994; Schraw & Moshman, 1995). To explain the structures related to the sub-dimensions of knowledge of cognition in the context of music education and instrument education, a student knows that they have deficiencies in reading the notes and expressing that they cannot pay enough attention to the nuances when they cannot read the notes can be shown as an example of the student's declarative knowledge. Knowing which strategies to use and how to use strategies to practice a new etude (for example, working at a slow tempo, dividing the piece into sections, rhythmic reading, etc.) represents procedural knowledge; knowing which practice strategies to apply in the face of situations such as the period in which the piece was composed, the characteristics it contains, and its difficulty level represents conditional knowledge.

Regulation of cognition, another essential component of metacognition, includes metacognitive activities that enable the individual to control the learning process. This component consists of five sub-dimensions: Planning, monitoring, evaluation, debugging, and information management. Planning involves setting goals and strategies for completing the task before starting to learn it. Metacognitive monitoring is when individuals follow themselves and their learning situation with awareness during the learning process, and metacognitive evaluation is when individuals analyze their learning performance after the task. While debugging involves the use of strategies to eliminate the mistakes made by the individual during learning, information management is the strategy used by the individual to organize the information they encounter for learning in a permanent way (Schraw & Dennison, 1994). In this context, a student's preliminary preparations, such as selecting the necessary technical exercises, preparing a study plan, and setting general or specific goals by considering the piece to be learned within the scope of instrument studies, can be shown as an example of planning. It is a sign of metacognitive monitoring when the student follows whether they play the piece at a constant tempo during the performance and whether they apply the nuances in the piece as they should. After the performance is completed, analyzing the adequacies and inadequacies and reflecting on the strategies' effect reflect metacognitive evaluation. The student's thinking and applying different solutions to eliminate their mistake in playing

different rhythmic patterns indicates that they use debugging strategies, visualizing the expression elements (cantabile, dolce, scherzando, etc.) that they need to apply by marking them with different colored pencils is an example of information management strategies.

All dimensions of metacognition support music education students' content knowledge, technical skills, and musical development. Especially in instrument performance, the use of psychomotor skills comes to the fore. In addition, for these skills to develop correctly, students must have sufficient knowledge and comprehension of the exercises, etudes, or pieces studied. This complex activity of music performance requires critical thinking skills and metacognitive awareness (Machfauzia et al., 2020). Metacognitive skills can develop spontaneously during musical experiences. On the other hand, practices aimed at revealing awareness of metacognition in learning environments and supporting metacognitive thinking during learning tasks are necessary. These practices include using metacognitive strategies that guide students to understand their learning processes and enable them to realize their thoughts and practices aligned with their thoughts during the learning process. Benton (2013) stated the importance and necessity for teachers to direct students to use metacognitive strategies such as reflecting on learning, making self-evaluations for improvement, and participating in a think-aloud session. In addition, metacognitive strategies such as planning, monitoring, evaluating, identifying difficulties, thinking aloud, identifying what you know and what you do not know, deep thinking questions, modeling, and journaling are suggested to be used in learning environments by different researchers to develop metacognitive knowledge, metacognitive skills and thus awareness of them (Blakey & Spance, 1990; Costa, 1984; Papaleontiou-louca, 2003). Reflective journals, in which students share their observations about their learning processes, are tools used in research to develop and assess metacognition (Fleur et al., 2021). Besides, these materials, such as strategy evaluation matrix and regulatory checklists, are useful tools for developing metacognitive knowledge and metacognitive regulation (Schraw, 1998).

Many studies have been conducted on metacognition and metacognitive strategies in general and vocational music education. The topics addressed in these studies include determining the metacognitive strategies used by students within the scope of instrument education (Güven & Kılıç, 2021), determining the level of use of metacognitive strategies by prospective music teachers (Deniz, 2015), examining the development of the experimental process on metacognitive awareness (H. Yokuş, 2010; Sakarya & Şendurur, 2020; Kaplan & Aykut, 2022) and examining the effect of developing metacognition on performance in instrument education (T. Yokuş, 2010; Bathgate et al., 2012; Ergin & Durak, 2016; Bonnaire & González-Moreno, 2023). These studies showed that the studies conducted to develop metacognition in music education effectively improved students' metacognitive awareness and instrument performance. In addition, it is known that metacognitive skills contribute to the development of important competencies in the field of music education, such as self-confidence, independent learning, deciphering skills, listening comprehension skills, and music performance (Avcı Akbel, 2019). Therefore, high metacognitive awareness and the use of metacognitive skills in the learning process contribute to the development of students in different competence areas.

Metacognitive skills and metacognitive strategy use are observed more in expert than novice musicians (Hallam, 2001). Expert musicians follow their learning processes with awareness in line with the goals they set, are aware of the requirements for the task, organize their study time to get maximum efficiency, identify difficult passages in the piece they are studying, and select and apply appropriate strategies for them (Benton, 2014). All these behaviors are directly related to the use of metacognition. Metacognitive knowledge and skills play an important role in musicians' designing, monitoring, evaluating, and, when necessary, modifying and improving their instrumental studies in line with specific performance goals (Concina, 2019). In this direction, it is thought that ensuring that the metacognitive behaviors seen in expert musicians are performed by students receiving instrument training will increase the success of students' instrument performance. In piano education, supporting students to use metacognitive strategies in the learning process and enabling them to carry out the study process with metacognitive awareness is predicted to contribute to both the development of students' self-learning skills and the highest level of efficiency from piano education.

This study aimed to examine the effect of metacognitive strategies on students' metacognitive awareness and piano performance levels and to determine the metacognitive knowledge and skills used by students during the study process. In line with this purpose, answers to the following questions were sought:

1. Is there any difference between the metacognitive awareness scores of the study group before and after the experimental process?
2. Is there any difference between the piano performance scores of the study group before and after the experimental process?
3. How is the study group’s use of metacognition during the experimental process reflected in the piece study diaries?

METHOD/MATERIALS

Research Design

The research was conducted using a mixed method in which quantitative and qualitative data collection methods were used together; it was carried out in line with the convergent parallel design, one of the mixed method designs. In the convergent parallel design, qualitative and quantitative data collected simultaneously in the research process are analyzed separately and combined at the interpretation stage. This design enables the problem addressed in the research to be examined from different perspectives

by using quantitative and qualitative data types together (Creswell & Plano Clark, 2020). In this context, using the convergent parallel design in the study was aimed at complementing the data on quantitative and qualitative dimensions and examining the research problem from a broader perspective.

In the quantitative dimension of the study, "one-group pretest-posttest experimental design" was used to determine whether the process of studying maqam-based pieces in which metacognitive strategies were used created a significant difference in students' metacognitive awareness levels and piano performance levels. In the experimental process, individual piano lessons were conducted with each student in the study group for 45 minutes per week through 9 weeks. During the individual lessons, specific metacognitive strategies were used, and the “process of studying maqam-based pieces” was carried out using maqam-based pieces composed by the researcher. In the pretest and posttest phases, students' metacognitive awareness levels and piano performance levels were evaluated through quantitative measurement tools. In the qualitative dimension of the study, the piece study diaries kept by the study group students during the process of studying maqam-based pieces were analyzed to determine the metacognitive knowledge and skills of the students that emerged during the study process.

Study Group

The study group of the research consists of 8 students studying at Kastamonu University Faculty of Education, Department of Fine Arts Education, Division of Music Education, same university's Institute of Social Sciences, Department of Fine Arts Education, Music Education Program in the spring semester of the 2022-2023 academic year.

Initially, considering that the performance levels of the study group students should be at an average level, the piano performances of eleven students who had received piano training were evaluated through the Piano Performance Rubric for Maqam-based Pieces (PPRMP). All eleven evaluated students scored above the average score (62.5) that can be obtained from the PPRMP. After the preliminary evaluation, three students reported that they could not participate in the face-to-face experimental process due to the decision of the Council of Higher Education (YÖK) to switch to distance education for the spring semester of the 2022-2023 academic year. For this reason, the experimental process was carried out with the participation of eight students. All the study group students (N=8) are female, and the group consists of four undergraduate and four graduate students.

Data Collection Tools

In this study, the Metacognitive Awareness Inventory (MAI) and Piano Performance Rubric for Maqam-based Pieces (PPRMP) were used to obtain data related to the quantitative dimension. The data relating to the qualitative dimension of the study were obtained through Piece Study Diaries.

Metacognitive Awareness Inventory (MAI)

In the pretest and posttest stages of the study, the MAI was used to measure the metacognitive awareness levels of the students. The MAI was developed by Schraw and Dennison (1994) to determine the awareness levels of individuals regarding their metacognition. The inventory was adapted into Turkish by Akın et al. (2007). The inventory is a 5-point Likert-type measurement tool consisting of 52 items. According to the results of exploratory factor analysis, the inventory consists of two main components, namely knowledge of cognition and regulation of cognition, and a total of eight subcomponents. The sub-components of knowledge of cognition are “declarative knowledge,” “procedural knowledge,” and “conditional knowledge;” the sub-components of regulation of cognition are “planning,” “monitoring,” “evaluation,” “debugging,” and “information management.” The Cronbach's alpha reliability coefficient for the whole inventory is .95 (Akın et al., 2007). Within the scope of this study, the internal consistency coefficient of the MAI was reanalyzed with a pilot study conducted with 51 students studying in the music teaching program before the experimental process, and the reliability coefficient was calculated as .95, similar to the results obtained from the Turkish form.

The minimum score that can be obtained from the MAI is 52, and the maximum score is 260. To interpret the metacognitive awareness levels, raw scores are divided by the number of items, and transformed scores are obtained. Accordingly, 2.5 points and above are considered high metacognitive awareness, and 2.5 points and below are considered low metacognitive awareness (Akın et al., 2007).

Piano Performance Rubric for Maqam-based Pieces (PPRMP)

In the pretest and posttest stages of the study, the PPRMP prepared by the researcher was used to determine the piano performance levels of the students. Before the PPRMP was prepared, the measurement tools developed to evaluate piano performance in the literature were examined (Grançer Okay, 2010; Kaynak, 2011; Minez, 2012; Tunç, 2016; Turgut & Dalkıran, 2021), and a new measurement tool suitable for the purpose of the research was needed. Accordingly, a rubric consisting of three dimensions, namely “knowledge dimension,” “technical dimension,” and “musical expression dimension,” and 25 items were prepared. In the development phase of the rubric, content validity and Cronbach's alpha reliability coefficient were examined. The knowledge dimension consists of 6 items, the technical dimension consists of 14 items, and the musical expression dimension consists of 5 items.

The content validity of the rubric items and the entire rubric was examined using the Lawshe technique as a result of the evaluation of nine instructors who are experts in the field of piano education. Accordingly, since the content validity index value

(0.94) calculated for the entire rubric was greater than the minimum value (0.778) determined according to the number of experts, it was determined that the content validity of the rubric items was significant (Yeşilyurt & Çapraz, 2018). Cronbach's alpha reliability coefficients for the reliability of the rubric were calculated as .72, .63, and .70 for the knowledge, technical, and musical expression dimensions, respectively. At the same time, the reliability coefficient for the whole rubric was .80. According to the results obtained, it was determined that the rubric had a good level of reliability (α=.80).

PPRMP is a 5-point Likert scale, and the performance levels are "completely correct/fully adequate (5)," "largely correct/largely adequate (4)," "partially correct/partially adequate (3)," "largely incorrect/largely inadequate (2)," "completely incorrect/fully inadequate (1)". The minimum score that can be obtained from PPRMP is 25, and the maximum score is 125. To interpret the piano performance levels, raw scores are divided by the number of items, and transformed scores are obtained. The score levels created for the evaluation of the transformed scores obtained through PPRMP were determined as follows: Very low-performance level (1.00-1.80), low-performance level (1.81-2.60), medium performance level (2.61-3.40), high-performance level (3.41-4.20), very high-performance level (4.21-5.00).

Piece Study Diaries

The piece study diaries, from which the study's qualitative data were obtained, are the diaries in which the study group students conveyed their feelings and thoughts about all the studies in the process of studying maqam-based pieces. The diaries were kept after each piano lesson, except for the last week of the study period and at the end of an individual practice session during the week. Thus, when the experimental study was completed, a total of 128 diaries, 16 from each student, were obtained.

Data Collection Process

The experimental process of the research is based on the use of metacognitive strategies in the process of studying maqam-based pieces. In this direction, the pieces to be studied and the stages of the study process were determined.

In the experimental process, it would be appropriate to work on pieces that had not been encountered before in terms of students gaining new learning experiences and equal opportunities for everyone. From this point of view, the researcher composed four pieces in Hüseyni, Hicaz, Segah and Kürdi maqams to be used in the research. The pieces were written within the framework of the "quartet harmonic approach," "quartet harmonic and contrapuntal approach," and "harmonic and contrapuntal mixed approach" (Albuz, 2020) from Turkish music polyphony approaches. Expert opinions were consulted on the accuracy of the polyphony approaches used in the study and the suitability of their difficulty levels to the study process. The necessary arrangements were made in line with the opinions.

To determine the piano pieces to be performed by the students in the pretest and posttest, a piece pool consisting of nine maqam-based pieces used in piano education, compatible with the maqams of the pieces to be studied in the experimental process, was created. The created piece pool was presented to four experts in piano education. In line with the expert evaluations, "Sarı Zeybek" from Tuğcular's (2017) book "Piyano Albümü: Anadolu Ezgileri" was used in the pretest, and "Segah" from Tuğcular's (2003) book "Türkünün Rengi: Piyano için 23 Parça" was used in the posttest. In the pretest and posttest stages of the experimental process, the piano performances of the students for the related pieces were video recorded to be evaluated with PPRMP. Then, the students answered MAI.

The process of studying maqam-based pieces was carried out in 5 stages for each piece, considering the preliminary works, the work to be done on the piece, and the time planning of the experimental process. The stages are as follows:

- Stage 1: Examining the maqam structure of the piece/Working on scales and cadences related to the maqam,
- Stage 2: Analyzing and deciphering the piece,
- Stage 3: Scale and cadence repetition,
- Stage 4: Studies related to the piece,
- Stage 5: Performing and completing the piece.

In the experimental process, metacognitive strategies of "planning," "monitoring," "evaluation," "identifying difficulties," "identifying what you know and what you do not know," "deep thinking questions," "thinking-aloud" and "journaling" were used to improve students' metacognitive regulation skills and increase their metacognitive awareness. Planning, monitoring, and evaluation strategies were used through the regulatory checklist prepared by the researcher according to the study process. Students answered the questions about these strategies in writing on the regulatory checklist. The planning strategy questions were about setting goals and learning strategies for studying and creating a time plan, and the questions were answered at Stage 2 before starting to study the piece. Monitoring strategy questions were about determining whether the control of posture, hand-wrist position, checking the accuracy of technique, nuance applications, monitoring performance errors, and the questions were answered in Stage 4 during the process of studying the piece. The evaluation strategy questions were about evaluating the performance process from different perspectives, and the questions were answered in Stage 5 after the completing the piece was completed.

Other metacognitive strategies were applied verbally at every stage of the study process. In the strategies of identifying difficulties and what they know and do not know, the teacher asked the students to express the problems they encountered while studying the pieces and to identify the knowledge they had about their characteristics. With deep thinking questions, the student was directed to think about issues such as determining the preliminary work for the piece and identifying the causes of mistakes.

With the think-aloud strategy, the student was encouraged to express their thoughts verbally during the lesson, and with the journaling strategy, the student was encouraged to express their thoughts about the study process and performance in writing. In this way, students monitored their thoughts both verbally and in writing and directed the performance process according to their needs. In the study, “keeping a diary” was used as a metacognitive strategy and data collection tool.

Apart from these strategies, the Strategy Evaluation Matrix prepared by the researcher, which includes some learning strategies that can be used in piano education, was given to the students. This matrix includes strategies such as marking, mental repetition, grouping, simulation, summarizing, etc., and the answers to the questions “how to use,” “when to use,” and “why to use” regarding the use of these strategies. This matrix was used during the lesson to help students think about which strategies they can use in their work and to mobilize their procedural and conditional knowledge in this direction.

In the posttest phase of the experimental process, the students' piano performances of the last test piece were recorded to be evaluated with PPRMP, and the MAI was answered by the students. The experimental process of the research is shown in Figure 1.

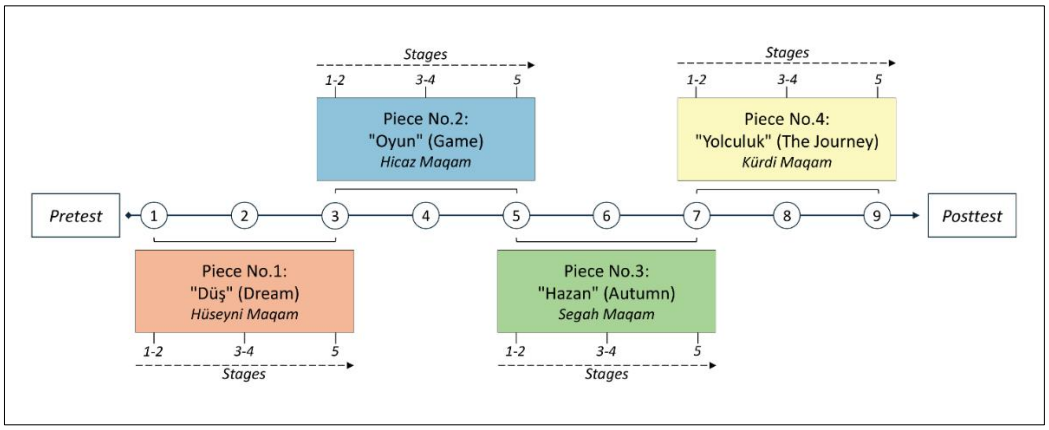

Figure 1. Experimental process of research

Data Analysis

In the study, descriptive statistics values of the pretest and posttest scores obtained with MAI and PPRMP were examined, and normality analyses were performed. The statistical significance value was accepted as $p<.05$.

Table 1. Descriptive statistics for measurements

Measurements	N	Mean	Median	SD	Minimum	Maximum	Skewness	Kurtosis
MAI Pretest	8	188.75	188.00	26.80	156	227	.237	-1.396
MAI Posttest	8	202.13	194.50	27.52	168	242	.591	-.969
PPRMP Pretest	8	74.75	73.67	12.46	59	93	.296	-1.155
PPRMP Posttest	8	95.38	95.33	12.16	73	118	.040	3.142

Descriptive statistics of the obtained scores are presented in Table 1. In this direction, it was examined whether the pretest and posttest scores of both scales showed normal distribution. It is seen that the arithmetic means and median values of MAI and PPRMP pretest and posttest are close to each other. It is recommended that the skewness and kurtosis values in a data set should be in the range of ±1 to show a normal distribution (Huck, 2012). According to the results obtained, it is seen that the skewness coefficients are within the range of ±1, and the kurtosis coefficients take values outside these limits. In addition, the normality assumption for the pretest-posttest difference scores of the MAI and PPRMP was examined with the Shapiro-Wilk test. According to the results of the analysis, it was observed that the difference scores for MAI (SW = .880, df = 8, p = .187) and PPRMP (SW = .990, df = 8, p = .994) showed a distribution close to normal. Although the data obtained from both measurement tools indicate a normal distribution, it is recommended to use nonparametric tests when working with small samples (Can, 2023; Köklü et al., 2021; Mishra et al., 2019). Therefore, the Wilcoxon signed-ranks test, one of the non-parametric tests, was used to analyze the difference in measurements. The effect size was analyzed by calculating the r effect value. In the interpretation of the calculated r-effect sizes, the thresholds suggested by Cohen (1988), "0.10 = small effect, 0.30 = medium effect, 0.50 = large effect," were used (as cited in Kilmen, 2020).

In the descriptive statistics tables for the dimensions of MAI and PPRMP, raw score means, and median values of the relevant dimensions are presented together (see Tables 3 and 5). In addition, transformed mean scores were obtained for a more straightforward interpretation of the scores by dividing the raw score by the total number of items belonging to the dimensions. These scores ranged between 1.00-5.00 and were interpreted according to the evaluation criteria specified for the scale scores (see Data Collection Tools).

Table 2. Inter-rater Reliability Results for Piano Performance Assessment

Measurements	N	Kendall's W	*p*
Pretest	3	.965	.005
Posttest	3	.920	.007

In the study, the piano performances of the study group were evaluated by three field experts through PPRMP. Kendall's Coefficient of Concordance was applied to examine the inter-rater agreement (Table 2). According to the results obtained, a statistically significant and high agreement was found between the raters ($W_{Pretest}$= .965; $W_{Posttest}$= .920; $p < .05$).

The qualitative data collection tool of the study, the piece study diaries, was analyzed using a descriptive analysis method. Descriptive analysis is an analysis method based on summarizing and interpreting data according to previously determined themes (Yıldırım & Şimşek, 2016). In this direction, first of all, a literature review was conducted on the theoretical structure of metacognition and metacognitive behaviors that occur in music performance, and in line with the studies examined (Akın & Abacı, 2011; Benton, 2013; Boğar, 2018; Hallam, 2001; Kincannon et al., 1999; Li et al., 2023; Sever, 2017; Whitebread et al., 2009) a qualitative analysis framework was created in accordance with Schraw and Dennison's (1994) metacognition model. Then, the researcher conducted a preliminary review of the diary data; the diaries were read many times at different times, and the student expressions were evaluated to see whether they reflected metacognition. The compatibility of the qualitative analysis framework with the data from the study diaries was reviewed and made ready for the coding process. For the diary data, the researcher and an academician carried out a coding study with the title of professor specializing in music education. At the end of the coding process, the inter-coder agreement was calculated as 94% in line with Miles and Huberman's (2021) intercoder reliability formula [Reliability = Agreement / (Agreement + Disagreement) X 100]. According to the results obtained, it was determined that the codings were consistent with each other. In addition, the categories obtained in line with the coded statements were checked by an academician specialized in educational sciences.

After the coding of the qualitative findings, frequency analysis was performed on the codes related to the dimensions of metacognition. In presenting the findings, directly quoted student statements are given along with the student number and the diary number in which the statement appears. For instance, the code "S1.2a" refers to the statement in the lesson diary kept by student number 1 in week 2, while the code "S1.2b" refers to the statement in the self-study diary of the same student in week 2.

FINDINGS

Findings from the Metacognitive Awareness Inventory (MAI)

In order to compare the metacognitive awareness levels of the study group before and after the intervention, the pretest and posttest mean scores of the metacognitive essential dimensions are presented in Table 3.

Table 3. Descriptive statistics according to metacognitive awareness dimensions

Metacognitive Awareness Dimensions	Pretest Mean	Pretest Median	Pretest Transformed Mean Score	Posttest Mean	Posttest Median	Posttest Transformed Mean Score
Knowledge of Cognition	64.13	63.50	3.77	124.63	124.50	4.06
Regulation of Cognition	68.25	66.50	3.56	133.88	128.00	3.83

As seen in Table 3, the mean and median values of the pretest and posttest scores for both dimensions of metacognitive awareness are close to each other. When the transformed scores were analyzed, it was understood that the study group showed high metacognitive awareness both in the pretest and posttest. An increase in posttest scores was observed in both dimensions. To examine whether there was a difference in the metacognitive awareness scores of the study group before and after the experimental process, the Wilcoxon signed-rank test was applied, and the findings are presented in Table 4.

Table 4. Wilcoxon Signed-Rank Test Results for Metacognitive Awareness Scores

Posttest - Pretest	n	Mean Rank	Sum of Ranks	*z*	*p*	*r*
Negative Ranks	1	1.00	1.00	-2.383	.017	-.84
Positive Ranks	7	5.00	35.00			
Ties	0					

According to the Wilcoxon signed-rank test results given in Table 4, there was a statistically significant difference between the MAI pretest and posttest scores of the study group (z=-2.383, p<.05). Considering the rank averages and rank sums, it was determined that the difference was in favor of the posttest MAI score. From this point of view, it can be said that the process of studying maqam-based pieces based on metacognitive strategies is effective in improving students' metacognitive awareness levels. The fact that seven students' posttest scores were higher than their pretest scores and one student's posttest score decreased shows that the study process created a positive result in general. In addition, the effect size obtained shows that the experimental process has a great effect on students' metacognitive awareness levels (r = -.84).

Findings from the Piano Performance Rubric for Maqam-based Pieces (PPRMP)

To compare the piano performance levels of the study group before and after the intervention, the pretest and posttest mean scores of the performance dimensions are presented in Table 5.

Table 5. Descriptive statistics according to piano performance dimensions

Piano Performance Dimensions	Pretest Mean	Pretest Median	Pretest Transformed Mean Score	Posttest Mean	Posttest Median	Posttest Transformed Mean Score
Knowledge Dimension	16.96	15.00	2.83	22.46	23.34	3.74
Technical Dimension	44.54	45.67	3.18	56.00	54.67	4.00
Musical Expression Dimension	13.25	12.50	2.65	17.10	16.83	3.38

According to Table 5, the mean and median values of the pretest and posttest scores for all piano performance dimensions are close to each other. When the mean scores of the study group regarding the piano performance dimensions are examined, it is seen that they performed at a medium level in all dimensions in the pretest. In the posttest, while there was a high level of performance in the knowledge dimension and technical dimension, the performance level in the musical expression dimension remained at a medium level. However, when all dimensions are taken into consideration, it is observed that there is a specific increase in the posttest score averages compared to the pretest. To examine whether there was a difference in the piano performance scores of the study group before and after the experimental process, the Wilcoxon signed-rank test was applied, and the findings are presented in Table 6.

Table 6. Wilcoxon Signed-Rank Test Results for Piano Performance Scores

Posttest - Pretest	n	Mean Rank	Sum of Ranks	*z*	*p*	*r*
Negative Ranks	0	.00	.00	-2.521	.012	-.89
Positive Ranks	8	4.50	36.00			
Ties	0					

According to the test results given in Table 6, there was a statistically significant difference between the PPRMP pretest and posttest scores of the study group (z=-2.521, p<.05). When the rank averages and sums are evaluated, it is seen that this difference is in favor of positive ranks, that is, the posttest score. These findings show that the process of studying maqam-based pieces utilizing metacognitive strategies is effective in improving students' piano performance levels. In addition, the calculated effect size shows that the experimental process has a large effect on students' piano performance levels (r = -.89).

Findings from the Piece Study Diaries

The use of metacognitive knowledge and metacognitive regulation activities of the study group was determined through the piece study diaries. The total number of diaries kept by the students during the process was 128. It was determined that 318 sentences in these diaries reflected metacognition.

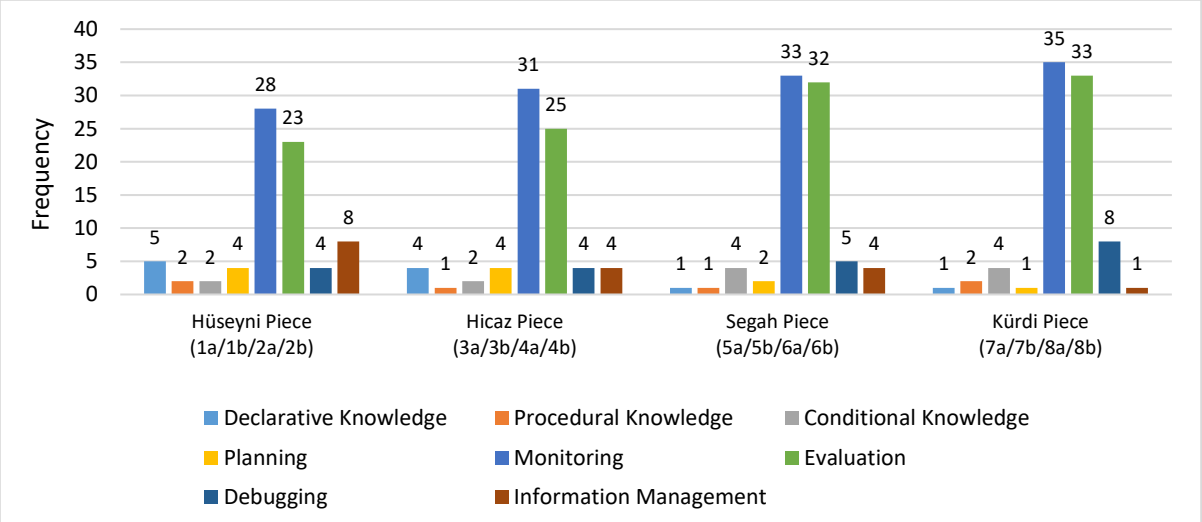

Figure 2. The distribution of student expressions in the diaries in the process of studying maqam-based pieces according to metacognitive dimensions

As can be seen in the graph above (Figure 2), the practices carried out by the students during the process of studying maqam-based pieces are mainly related to the monitoring and evaluation dimensions. It is understood that the students made metacognitive monitoring of their thoughts and learning processes in each piece they worked on during the process and metacognitive evaluation at the end of the process. An increase is observed in the students' statements regarding metacognitive monitoring and evaluation from the first piece (Hüseyni Piece) to the last piece (Kürdi Piece). It was determined that the

expressions related to other metacognitive sub-dimensions were encountered less frequently than the monitoring and evaluation expressions. The frequency values of the expressions related to these dimensions did not change much during the process.

Regarding the monitoring dimension, it was observed that the students identified the mistakes they made during the performance, the weaknesses of the performance, and the difficulties they encountered in their performance; they controlled their focus and the problems they experienced in this regard, and they directed themselves to improve their performance. In this context, in line with the statements, it was understood that the students consciously monitored their learning processes and performances with awareness. For example, one of the students said, "I tried to pay attention to all the techniques and nuances from the beginning of the piece." (S4.5b.) and explained what he directed his attention to in his performance, while another student said, "When I tried to play fast, I could not use the pedal correctly." (S6.2a.), and explained a mistake he made during his performance. All the works studied generally observed such tendencies toward watching the performance.

In the evaluation dimension, it was determined that the students evaluated the realization of their goals during the study process, their comprehension of the learned task, their knowledge and skill gains, the effects of the strategies they used on their performances, their success and development status, and determined the requirements for better progress in the following performance processes. It was observed that the most common statements in the evaluation dimension included evaluating the effects of the strategies, as in the statement, "I think that I applied the term 'espressivo,' which I just learned, correctly since I identified the chords in the piece and made groupings, coded the notes visually and played the transcription with its nuances from the beginning." (S4.7b.). In addition, statements in which the requirements for a better performance were identified were also frequently encountered, such as "I do not think my playing performance is bad, but I need to complete my knowledge deficiencies." (S2.1a.).

Statements about declarative knowledge, procedural knowledge, conditional knowledge, planning, debugging, and information management were rarely found in the diaries. Students who reflected their declarative knowledge in their diaries generally expressed how their learning processes worked and the strengths and weaknesses they saw in themselves during the learning process. Statements such as "I have a strong visual memory." (S5.2a.), "I have some difficulty deciphering because of my lack of studying or not working in a programmed way." (S1.1a.) indicates that students have an awareness of their own cognitions and, more broadly speaking, their own learning processes.

Statements about declarative knowledge, procedural knowledge, conditional knowledge, planning, debugging, and information management were rarely found in the diaries. Students who reflected their explanatory knowledge in their diaries generally expressed how their learning processes worked and the strengths and weaknesses they saw in themselves during the learning process. Statements such as "I have a strong visual memory." (S5.2a.), "I have some difficulty deciphering because of my lack of studying or not working in a programmed way." (S1.1a.) indicates that students have an awareness of their own cognitions and, more broadly speaking, their own learning processes.

Considering procedural and conditional knowledge, it was found that students knew some learning strategies to be used in piano studies and in which situations they would use these strategies. When the student expressions related to these two dimensions were examined, it was observed that one student reflected his procedural knowledge as "When I went out, when I was doing chores at home, when I was traveling, when I was sitting, and even before I fell asleep, I did mental repetitions and exercises on how I should work on the pedal." (S3.2b.). Another student conveyed his situational knowledge, including the reason for using the strategy: "Since there were patterns that I had not practiced before, I started to separate these patterns in terms of duration and by counting and marking them." (S8.5b.).

Regarding the planning dimension, which is one of the rarely encountered dimensions, it was observed that the students set some goals for the piece, identified the strategies they could apply, and made a time plan to complete the piece. "My goal while practicing this piece is to practice more frequently than usual, to reinforce my ear familiarity with the related maqam, and to perform all the details of the piece fully." (S4.1a.); the same student also made a time plan for the same piece and expressed it as follows: "Since I had already looked at the piece I was going to study, I thought that 40 minutes would be enough for me today, and I made my plan in advance in such a way that no external factor could interrupt this time." (S4.1b).

It was determined that the students who used debugging strategies generally used different strategies such as marking, repeating, practicing slowly, practicing with a metronome, and practicing with two hands together/separately to eliminate the mistakes and difficulties they made in their performances during the experimental process. One student expressed the use of strategies to correct errors in her performance as follows: "Although there were no errors in the measures themselves, there were errors in the connections, so I practiced by connecting two measures with the next two measures." (S7.7b.). Similarly, another student reflected on her use of strategy to overcome the difficulties she experienced in her performance as follows: "I tried to work on the difficult parts differently by developing my own strategy." (S3.5b).

It has been observed that students who use information management strategies use strategies such as marking, taking notes, repeating, and thinking out loud to remember and consolidate new information they encounter during the study of the maqam-based piece and to focus on information they consider important. Students encountered theoretical information about maqams that they had not encountered before, as well as many different terms and signs related to nuance, tempo, and techniques. Accordingly, it was determined that the students made an effort to learn the information they encountered during the process. The student used the repetition strategy to remember the information encountered in the piece with the statement, "I reminded

myself by repeating the information in the piece from time to time in order not to forget it." (S5.8b.). Similarly, the same student conveyed the strategy she used to reinforce the information he encountered with the expression, "To be honest, I played the piece very slowly on purpose to get the number of measures well-established without speeding up the piece." (S5.6b.).

DISCUSSION, CONCLUSION AND SUGGESTIONS

This study aimed to examine the effect of metacognitive strategies on students' metacognitive awareness and piano performance levels and to determine the metacognitive knowledge and regulation activities used by students during the study process. According to the results of the analyses related to the quantitative dimension of the study, it was determined that the use of metacognitive strategies in the process of studying maqam-based pieces significantly affected the metacognitive awareness levels and piano performance levels of the students. Bonnaire and González-Moreno (2023) concluded that the development of metacognitive awareness in piano education positively affects piano performance success. T. Yokuş (2010) conducted activities to develop metacognitive skills within the scope of guitar education and concluded that these activities effectively increased guitar students' metacognitive awareness levels, performance success, and knowledge levels about guitar lessons. H. Yokuş (2010), who examined the effects of using learning strategies in piano education, found that it increased students' performance success and metacognitive awareness levels. In this study, students were given information about learning strategies and the reasons for their use through a strategy evaluation matrix. In this context, it can be said that the direct transfer or indirect application of strategies for developing learning strategies and metacognition in the instrument training process has a positive effect on students' instrument performances.

Brundage (2019) examined the metacognitive habits of twelve piano students through self-report and suggested that the performance levels of students with high metacognitive skills were higher than those of students with low metacognitive skills. Ferenc (2016), who conducted research within the scope of the music theory course of music education, observed that using metacognitive reflection assignments improved students' skills, such as understanding their own learning processes, identifying their strengths and weaknesses, and evaluating the learning strategies they use. In this study, students reflected on their learning situations through organizer checklist questions, think-aloud strategy, and piece study journals. As a result, it was determined that the student's metacognitive awareness and piano performance levels improved after the experimental process.

According to the findings obtained from the qualitative dimension of the study, it was determined that the students frequently used metacognitive monitoring and metacognitive evaluation skills during the process of studying maqam-based pieces. In the statements reflected in the piece study diaries, it was observed that the students conveyed less about the knowledge dimension of cognition than the regulation dimension of cognition. Piano education is a process that requires the student to monitor their performance, direct their thoughts, and instantly find solutions to the difficulties or mistakes they encounter. In this respect, the fact that the students' statements about metacognitive monitoring and metacognitive evaluation were encountered intensively in the study is consistent with the structure of the study process.

Power and Powell (2018), who examined the metacognitive approaches used by young string musicians in their practice, observed that musicians make plans for the area that needs to be improved in their practice, choose appropriate strategies to eliminate deficiencies or develop a specific skill, and evaluate their learning processes. At the end of the process, it was revealed that the efficiency level obtained from the study processes increased, and musicians realized a better understanding of their practices. In this study, it was observed that the students made plans such as organizing time, choosing strategies, identifying the deficiencies in their performances, and the subjects in which they were competent, and evaluating their performances in their piece study diaries.

Colombo and Antonietti (2017), in their study, observed a piano teacher and four students of the teacher and found that the teacher mainly used metacognitive regulation in the lesson and used metacognitive knowledge less. It was also observed that the students mainly used metacognitive control strategies related to metacognitive regulation in the lesson. As can be seen, the use of metacognitive regulation skills in piano lessons is a common situation. In this study, it was found that metacognitive knowledge awareness was higher than metacognitive regulation awareness while students transferred their metacognitive awareness through self-report via MAI. In the piece study diaries, students tended to reflect more on their metacognitive regulation activities than on their metacognitive knowledge. This difference observed between the results shows that the students reflected their high awareness of their metacognitive knowledge through metacognitive monitoring and evaluation in the process of studying maqam-based pieces within the scope of the piano lesson.

This study has some limitations, such as the fact that the study group consisted of eight students, specific metacognitive strategies were used, and four maqam-based pieces were studied in the study process. Considering these limitations, the following suggestions are offered for future research and applications to produce more generalizable results and to examine metacognitive approaches from different perspectives:

1. Conducting experimental studies with a larger sample group, metacognitive strategies will provide more generalizable results. In addition, in-depth research with students with different performance levels will enable the qualitative findings obtained on the use of metacognition in instrumental performance to be addressed from a different perspective.
2. To examine the use of metacognition in the performance process in more detail, students' metacognitive knowledge and skills can be examined on one etude or one piece written in forms such as sonata, prelude, and fugue instead of working

on multiple different pieces. Considering the views that metacognitive experiences are more likely to occur in situations that require high levels of conscious thinking (Flavell, 1979), it would be helpful to consider the performance level of the students and the musical and technical elements of the works in the selection of the works to be studied for students to use metacognitive skills more intensively.

3. In individual instrument lessons given within the scope of vocational music education, it is important for students to recognize their own learning process and to organize their studies in this direction. In this context, it would be useful for instructors to sample their own use of metacognition in individual instrument lessons and to encourage metacognitive thinking by enabling students to reflect on their thinking processes verbally and in writing. Such studies will enable students to develop metacognitive knowledge and skills, thus, self-regulation competencies. In this direction, it is recommended that educators should systematically include strategies and activities for the development of metacognitive awareness and metacognitive skills in their lesson plans.
4. Students' metacognitive activities during the piano practice process can be categorized in different ways, such as low, medium, high, or sufficient, insufficient. Thus, the relationship between students' metacognitive use and piano skills can be systematically analyzed.
5. Apart from individual piano lessons, in group piano studies within the scope of orchestra lessons, students' metacognitive planning, monitoring, and evaluation before, during, and after the performance, and expressing them through thinking aloud will enable knowledge transfer between students through peer learning. In this way, students will learn different methods and strategies for piano studies and gain different experiences. It is recommended that teachers and researchers use such studies in lessons and evaluate their effects.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research is based on the first author's PhD thesis and was supported by the Scientific and Technological Research Council of Türkiye (TÜBİTAK) under the 2211-A National Doctoral Scholarship Program.

Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The research process's theoretical framework, methodology, and design were carried out in collaboration with the first and second authors. Data collection, data analysis, evaluation of the findings, and manuscript drafting were carried out by the first author under the supervision of the second author. The second author contributed to revising the study's methodological approach and the manuscript's final editing. Both authors read and approved the final version of the article.

Ethics Committee Approval Information

The study is derived from the first author's doctoral dissertation. Ethics committee approval for the study was obtained at the Gazi University Ethics Commission meeting dated 07.02.2023 and numbered 02 with the research code 2023-106.

REFERENCES

Akın, A., & Abacı, R. (2011). *Biliş ötesi.* Nobel.

Akın, A., Abacı, R., & Çetin, B. (2007). Bilişötesi Farkındalık Envanteri'nin Türkçe formunun geçerlik ve güvenirlik çalışması. *Kuram ve Uygulamada Eğitim Bilimleri, 7*(2), 655–680.

Albuz, A. (2020). Türk müziğinde çokseslilik yaklaşımlarına genel bir bakış. *Afyon Kocatepe Üniversitesi Akademik Müzik Araştırmaları Dergisi, 6*(Special issue), 374–398. https://dergipark.org.tr/tr/pub/amader/issue/56876/769714

Avcı Akbel, B. (2019). Müzik eğitiminde bilişötesi stratejilerin kullanımı. In B. A. Akbel (Ed.), *Güzel Sanatlar Eğitimi Araştırmaları I* (pp. 1–12). Akademisyen Kitabevi.

Baker, L., & Brown, A. L. (1980). *Metacognitive skills and reading*. (ERIC Document Reproduction Service No. ED195932). http://files.eric.ed.gov/fulltext/ED195932.pdf

Bathgate, M., Sims-Knight, J., & Schunn, C. (2012). Thoughts on thinking: Engaging novice music students in metacognition. *Applied Cognitive Psychology, 26*(3), 403-409. https://doi.org/10.1002/acp.1842

Benton, C. W. (2013). Promoting metacognition in music classes. *Music Educators Journal, 100*(2), 52–59. https://doi.org/10.1177/0027432113500077

Benton, C. W. (2014). *Thinking about thinking: Metacognition for music learning.* Rowman & Littlefield Education.

Blakey, E., & Spence, S. (1990). *Developing metacognition.* ERIC Digest. https://eric.ed.gov/?id=ED327218

Boğar, Y. (2018). Literature review on metacognition and metacognitive awareness. *Anatolian Journal of Teacher, 2*(2), 136–168. https://dergipark.org.tr/tr/download/article-file/613670

Bonnaire, S., & González-Moreno, P. (2023). Developing metacognition as an instructional approach for enhancing young pianists' musical expressivity. *International Journal of Music Education, 41*(2), 199–210. https://doi.org/10.1177/02557614221115805

Brown, A. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. Weinert & R. Kluwer (Eds.), *Metacognition, motivation and understanding* (pp. 65–116). Erlbaum.

Brundage, S. (2019). Metacognition and music: An investigative study among collegiate piano majors. *Piano Pedagogy Forum, 20*(2), 2–16. https://pianoinspires.com/wp-content/uploads/2022/08/Piano_Pedagogy_Forum_-_Volume_20_-_No._2_-_November_2019.pdf

Can, A. (2023). *Spss ile bilimsel araştırma sürecinde nicel veri analizi* (11th ed.). Pegem Akademi.

Colombo, B., & Antonietti, A. (2017). The role of metacognitive strategies in learning music: A multiple case study. *British Journal of Music Education, 34*(1), 95–113. https://doi.org/10.1017/S0265051716000267

Concina, E. (2019). The role of metacognitive skills in music learning and performing: Theoretical features and educational implications. *Frontiers in Psychology, 10,* 1583. https://doi.org/10.3389/fpsyg.2019.01583

Costa, A. L. (1984). Mediating the metacognitive. *Educational Leadership, 42*(3), 57–62. https://files.ascd.org/staticfiles/ascd/pdf/journals/ed_lead/el_198411_costa.pdf

Creswell, J. W., & Plano Clark, V. L. (2020). Karma yöntem desen seçimi (A. Delice, Trans.). In Y. Dede & S. B. Demir (Trans. Eds.), *Karma yöntem araştırmaları: Tasarımı ve yürütülmesi* (pp. 61–117). Anı Yayıncılık. (Original work published 2011).

Deniz, J. (2015). Müzik öğretmeni adaylarının bilişötesi öğrenme stratejilerini kullanma düzeyleri. *Akademik Sosyal Araştırmalar Dergisi,* (14), 1–14. https://doi.org/10.16992/ASOS.667

Ergin, E., & Durak, Y. (2016). Bilişüstü özdüzenlemenin deşifre çalma becerisine ve deşifre çalma tutumuna etkileri. *Uluslararası Eğitim Bilimleri Dergisi, 3*(7), 131–158. https://doi.org/10.16991/INESJOURNAL.246

Ferenc, A. (2016). Promoting metacognitive reflection in music theory instruction. *Journal of Music Theory Pedagogy,* 30, 23–85. https://doi.org/10.71156/2994-7073.1183

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. Resnick (Ed.), *The nature of intelligence* (pp. 231–236). Lawrence Erlbaum.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*(10), 906–911. https://doi.org/10.1037/0003-066X.34.10.906

Fleur, D. S., Bredeweg, B., & van den Bos, W. (2021). Metacognition: Ideas and insights from neuro- and educational sciences. *npj Science of Learning, 6*(1), 13. https://doi.org/10.1038/s41539-021-00089-5

Grançer Okay, N. (2010). *Piyano performansının değerlendirilmesi* (Publication No. 261969) [Doctoral dissertation, Marmara University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=b6KgOFc3sRGHrLy0r7ByGw&no=lhLdQ4VGMFoc-ORoV5F3CQ

Güven, E., & Kılıç, D. B. Ç. (2021). Müzik öğretmeni adaylarının bilişötesi öğrenme stratejilerinin çeşitli değişkenler açısından incelenmesi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi,* (60), 480–509. https://doi.org/10.21764/maeuefd.934739

Hallam, S. (2001). The development of metacognition in musicians: Implications for education. *British Journal of Music Education, 18*(1), 27–39. https://doi.org/10.1017/S0265051701000122

Hartman, H. (1997). *Human learning and instruction.* City College of New York. https://www.researchgate.net/publication/313360794_Human_Learning_and_Instruction

Huck, S. W. (2012). *Reading statistics and research.* Pearson.

Jacobs, J. E., & Paris, S. G. (1987). Children's metacognition about reading: Issues in definition, measurement, and instruction. *Educational Psychologist, 22*(3-4), 255–278. https://doi.org/10.1080/00461520.1987.9653052

Kaplan, G., & Aykut, Ç. (2022). Üstbilişi geliştirmek için düzenlenmiş olan öğretim etkinliklerinin öğretmen adaylarının üstbilişsel farkındalıklarına etkisinin incelenmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi, 23*(1), 23–51. https://doi.org/10.21565/ozelegitimdergisi.715775

Kaynak, T. (2011). *Piyano eğitimi yarıyıl sonu sınavlarında öğrenci performansının rubrik ile ölçülmesi* (Publication No. 290513) [Doctoral dissertation, Gazi University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=Ux9sfzNKnyjeQKt8jfAfbQ&no=An5nBN_u_3Z_DamRQKekvw

Kilmen, S. (2020). *Eğitim araştırmacıları için spss uygulamalı istatistik* (3rd ed.). Anı Yayıncılık.

Kincannon, J., Gleber, C., & Kim, J. (1999). *The effects of metacognitive training on performance and use of metacognitive skills in self-directed learning situations.* (ERIC Document Reproduction Service No. ED436146). https://files.eric.ed.gov/fulltext/ED436146.pdf

Köklü, N., Büyüköztürk, Ş., & Çokluk, Ö. (2021). *Sosyal bilimler için istatistik* (25th ed.). Pegem Akademi.

Li, W., Manoharan, P., Cui, X., & Liu, F. (2023). The development and validation of a metacognitive questionnaire for music learning. *TEM Journal, 12*(2), 1090–1099. https://doi.org/10.18421/TEM122-55

Machfauzia, A. N., Djohan, D., & Sittiprapaporn, P. (2020). Intellectual character of metacognition in thinking strategies. *Asian Journal of Medical Sciences*, *11*(1), 51–56. https://doi.org/10.3126/ajms.v11i1.26519

Miles, M. B., & Huberman, A. M. (2021). Analizde ilk adımlar (A. Ersoy, Trans.). In S. Akbaba Altun & A. Ersoy (Eds.), *Genişletilmiş bir kaynak kitap: Nitel veri analizi* (4th ed., pp. 50–89). Pegem Akademi. (Original work published 1994).

Minez, T. (2012). *Piyano eğitiminde rubrik ile geleneksel ölçme-değerlendirme yöntemlerinin karşılaştırılması (İnönü Üniversitesi örneği)* (Publication No. 314196) [Master's thesis, İnönü University]. YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=Zn5CgrBWLKFYiQaAMPuoTw&no=cE89fj_S1OHhrnTRbCJB_A

Mishra, P., Pandey, C. M., Singh, U., Keshri, A., & Sabaretnam, M. (2019). Selection of appropriate statistical methods for data analysis. *Annals of Cardiac Anaesthesia*, *22*(3), 297–301. https://doi.org/10.4103/aca.ACA_248_18

Papaleontiou-louca, E. (2003). The concept and instruction of metacognition. *Teacher Development, 7*(1), 9–30. https://doi.org/10.1080/13664530300200184

Paris, S. G., & Winograd, P. (1990). Promoting metacognition and motivation of exceptional children. *Remedial and Special Education, 11*(6), 7–15. https://doi.org/10.1177/074193259001100604

Pintrich, P. R., Wolters, C. A., & Baxter, G. P. (2000). Assessing metacognition and self-regulated learning. In G. Schraw & J. Impara (Eds.), *Issues in the measurement of metacognition* (pp. 43–97). University of Nebraska Press.

Power, A. M., & Powell, S. J. (2018). Engaging young string players in metacognition. *International Journal of Music Education, 36*(4), 659–670. https://doi.org/10.1177/0255761418771989

Sakarya, G., & Şendurur, Y. (2020). Anlamayı izleme stratejilerinin keman öğrencilerinin bilişötesi farkındalık düzeyine etkisi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi,* (53), 435–457. https://doi.org/10.21764/maeuefd.632135

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19*(4), 460–475. https://doi.org/10.1006/ceps.1994.1033

Schraw, G., & Moshman, D. (1995). Metacognitive theories. *Educational Psychology Review, 7*(4), 351–371. https://doi.org/10.1007/BF02212307

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science, 26*(1), 113–125. https://doi.org/10.1023/A:1003044231033

Sever, G. (2017). Müzik performansının alt beceri alanlarına ilişkin müzisyenlerin algıları. *Turkish Studies, 12*(17), 371–396. https://doi.org/10.7827/TurkishStudies.11847

Tobias, S., & Everson, H. T. (2002). *Knowing what you know and what you don't: Further research on metacognitive knowledge monitoring.* (Research Report No. 2002-3). College Entrance Examination Board. https://files.eric.ed.gov/fulltext/ED562778.pdf

Tuğcular, E. (2003). *Türkünün Rengi: Piyano için 23 Parça* (Expanded 2nd ed.). Özkan Matbaacılık.

Tuğcular, E. (2017). *Piyano Albümü: Anadolu Ezgileri.* Arkadaş Yayınevi.

Tunç, T. (2016). Polifonik nihavent bir piyano eserinin seslendirilmesine yönelik öğrenci performanslarının incelenmesi. *Eğitim ve Öğretim Araştırmaları Dergisi, 5*(Special issue), 361–379. http://www.jret.org/FileUpload/ks281142/File/40.turgay_tunc.pdf

Turgut, Ş., & Dalkıran, E. (2021). Piyano eğitimi dersi performans ölçümüne yönelik dereceli puanlama anahtarının geliştirilmesi: Geçerlik ve güvenirlik çalışması. *Sanat ve Tasarım Dergisi, 11*(2), 438–449. https://doi.org/10.20488/sanattasarim.1048952

Whitebread, D., Coltman, P., Pasternak, D. P., Sangster, C., Grau, V., Bingham, S., Almeqdad, Q., & Demetriou, D. (2009). The development of two observational tools for assessing metacognition and self-regulated learning in young children. *Metacognition and Learning, 4*(1), 63–85. https://doi.org/10.1007/s11409-008-9033-1

Wilson, J. (1999). Defining metacognition: A step towards recognising metacognition as a worthwhile part of the curriculum [Paper presentation]. AARE Conference, Melbourne, Australia. https://www.aare.edu.au/data/publications/1999/wil99527.pdf

Yeşilyurt, S., & Çapraz, C. (2018). Ölçek geliştirme çalışmalarında kullanılan kapsam geçerliği için bir yol haritası. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi, 20*(1), 251–264. https://doi.org/10.17556/erziefd.297741

Yıldırım, A., & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri.* Seçkin.

Yokuş, H. (2010*).* Piyano eğitiminde öğrenme stratejilerinin kullanılmasının öğrencilerin başarılarına ve üstbilişsel farkındalıklarına etkisi. *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi,* 31, 145–160. https://dergipark.org.tr/tr/download/article-file/1657

Yokuş, T. (2010). Üstbilişin gitar performans başarısına etkisi. *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi,* 31, 161–175. https://dergipark.org.tr/tr/download/article-file/1658