

Scale Construction Difficulties in Senior High School Music: An Action Research Case in the Ghanaian Setting

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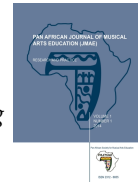


Abstract

This classroom action research investigated the procedural difficulties experienced by Music students in constructing major scales and evaluated a structured instructional intervention designed to address these challenges within a senior high school music classroom in Ghana. The study involved twenty Form Two Music students at Adisadel College in the Central Region of Ghana who were purposively selected because they exhibited persistent difficulties in major scale construction. Data were collected using a diagnostic pre-test, unstructured interviews, and a post-intervention assessment following a five-week instructional programme. Quantitative data were analysed using frequencies and percentages. The diagnostic assessment revealed substantial procedural difficulties in constructing the F major and D major scales before the intervention. Following the instructional programme, most students successfully completed the procedural tasks included in the post-intervention assessment, including the application of accidentals, construction of major scales with and without key signatures, identification of natural semitone positions, and staff notation exercises. The findings suggest that the structured instructional approach effectively supported students' procedural competence in the scale-construction tasks addressed during classroom instruction. Because the post-intervention assessment evaluated only the instructional content explicitly taught during the intervention, the findings are interpreted as evidence of successful acquisition of the targeted procedural skills rather than transfer of learning or broader conceptual understanding. Although limited to a single classroom, the study provides practical guidance for improving music theory instruction through structured, sequential, and keyboard-supported teaching approaches in senior high school music education.

Introduction

Music theory provides the conceptual and practical foundation upon which performance, composition, analysis, and musicianship are developed. Among its core elements, the major scale occupies a central position because it establishes the tonal framework from which melodies, harmonies, key signatures, and chordal relationships are derived (Lidin, 2023; Guo et al., 2024). Consequently, the ability to accurately construct major scales is an essential procedural skill for



students studying Western tonal music in formal school curricula. In Ghanaian secondary schools, where the music curriculum is predominantly grounded in Western tonal theory, competence in major scale construction is fundamental to success in music notation, keyboard practice, harmony, sight-singing, and external examinations (Komabu & Dawson, 2024; Addaquay, 2025).

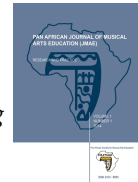
Despite the importance of major scales, research consistently shows that many learners have considerable difficulty acquiring the procedural skills needed for accurate scale construction. Students frequently struggle with the correct placement of accidentals, the application of interval patterns, notation, and the relationship between written musical symbols and keyboard representation (Donn et al., 2024; Villarta & Capili, 2025). Difficulties in these foundational skills may subsequently affect broader aspects of music learning, including harmonic analysis, melodic construction, sight-singing, and keyboard performance (Pomerleau-Turcotte et al., 2022; Fournier et al., 2019). These findings suggest that effective music instruction requires carefully structured pedagogical approaches that explicitly support the development of procedural competence in music theory.

Within Ghanaian music education, similar concerns have been identified. Studies have reported that limitations in instructional resources, inadequate practical engagement with music theory, and inconsistent preparation in foundational musicianship contribute to students' persistent difficulties in mastering theoretical concepts (Agbenyo et al., 2021; Spears & Dordzro, 2023; Nyanney, 2021). Consequently, Ghanaian scholars have advocated instructional approaches that integrate practical demonstrations, keyboard activities, and systematic teaching strategies to strengthen students' engagement with music theory and improve classroom learning (Komabu & Dawson, 2024; Addaquay, 2025).

One instructional approach that has received considerable attention is the use of sequential and multimodal teaching strategies. Research indicates that combining visual, auditory, symbolic, and kinaesthetic representations of musical concepts enables students to acquire procedural musical skills more effectively than relying solely on verbal explanation (Barton & Riddle, 2021; Li & Sun, 2023). In music theory, instructional tools such as tetrachords, interval analysis, guided practice, and piano keyboard demonstrations provide learners with concrete representations of abstract tonal relationships and systematic procedures for constructing scales. These approaches are particularly valuable because they enable students to identify and correct procedural errors during the learning process while strengthening their ability to perform music-theoretical tasks accurately.

The present study is informed by the distinction between procedural knowledge and conceptual understanding in music learning. Procedural knowledge refers to learners' ability to perform musical tasks correctly by applying learned procedures, whereas conceptual understanding involves explaining underlying musical principles and applying them flexibly in unfamiliar situations (Regelski, 2004; Perkins & Salomon, 1992). Because the instructional intervention focused on teaching students how to construct major scales using explicit procedures, the study was designed primarily to examine students' acquisition of procedural competence rather than broader conceptual understanding or transfer of learning. Accordingly, the post-intervention assessment evaluated students' performance on the procedural tasks explicitly addressed during instruction.

The study adopted a classroom action research design because the problem emerged directly from classroom practice. Action research enables teachers to identify instructional problems, implement context-specific interventions, evaluate classroom outcomes, and reflect on improvements in



teaching practice (Mills, 2011; Stringer, 2014). Unlike experimental research, which seeks to establish causal relationships and generalise findings to wider populations, classroom action research primarily aims to improve teaching and learning within a particular educational context. Consequently, the findings of the present study are interpreted as evidence of classroom improvement within the participating class rather than as generalisable estimates of instructional effectiveness.

The study was conducted in the Form Two Music class at Adisadel College, where students consistently had difficulty constructing major scales despite prior classroom instruction. Diagnostic classroom observations and preliminary assessment revealed frequent errors in the application of accidentals, maintenance of interval patterns, and systematic construction of scales. These procedural difficulties limited students' ability to complete subsequent music theory tasks successfully and indicated the need for a structured instructional intervention.

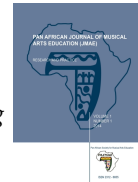
Accordingly, the purpose of this study was to diagnose students' procedural difficulties in major scale construction, implement a structured classroom intervention incorporating accidentals, tetrachords, interval analysis, guided practice, staff notation, and piano keyboard demonstrations, and evaluate students' procedural performance following the intervention within the context of classroom action research. By documenting this instructional process, the study contributes practical evidence that may assist music teachers in designing more systematic approaches to teaching major scale construction in Ghanaian senior high schools.

Major Scale Construction in Music Education

Music, like all other mathematical sciences, operates on fixed and invariable laws, a view echoed in early African music-theoretical writing that treats musical structure as governed by stable, internally coherent principles comparable to mathematical relations (Bey, as cited in Addaquay, 2025). This implies that music is a law-governed system, its principles are permanent, and they are globally acknowledged within particular stylistic frameworks. In Ghanaian formal music education, where Western tonal theory dominates the curriculum, students are therefore expected to acquaint themselves with these laws and to apply them rigorously, especially in high-stakes examination contexts (Addaquay, 2025; Komabu & Dawson, 2024; Arkhurst, 2023).

In the Western tonal framework, the major scale is foundational. Its construction follows a specific intervallic pattern of whole and half steps (tones and semitones): W-W-H-W-W-W-H between successive diatonic notes (Piela, as discussed in Amparbin & Debrah-Otchere, 2023). This pattern positions the major scale as a basic “grammar” from which melodies and harmonies are generated (Amparbin & Debrah-Otchere, 2023; Nayir, 2015). Piela’s assertion that major and minor seconds, arranged in a particular order, yield the major scale reinforces the idea that scale construction is a precise, rule-bound operation rather than an arbitrary choice.

Although this centrality of the major scale is historically rooted in Western art music and is not fully representative of African modal and pentatonic systems, Ghanaian music students operate in an academic environment where Western theory, especially major-minor tonality, is privileged as the primary language of written composition, analysis, and assessment (Komabu & Dawson, 2024; Otchere, 2015; Arkhurst, 2023). Studies on Ghanaian music curricula show a persistent bias towards Western tonal structures, even as scholars call for greater inclusion of indigenous Ghanaian musical logics (Addaquay, 2025; Komabu & Dawson, 2024; Otchere, 2015). Consequently, mastery of major



scale construction remains indispensable for success in theory courses and examinations, even for students whose lived musical worlds are largely African and popular genres.

Instructional Approaches to Teaching Major Scales

Several instructional approaches have been recommended to support students in learning how to construct major scales. One widely used approach involves teaching the intervallic structure of the major scale through the Ionian pattern of whole and half steps. Understanding this interval sequence provides students with a systematic procedure for constructing scales beginning on any tonic rather than relying solely on memorisation (Nayir, 2015; Amparbin & Debrah-Otchere, 2023).

The tetrachord approach similarly simplifies scale construction by dividing the major scale into two four-note groups connected by a whole tone. Ghanaian music theory texts recommend tetrachords because they help students recognise structural relationships among major keys while reducing unnecessary memorisation (Acquah et al., 2022; Komabu & Dawson, 2024).

Instruction concerning accidentals is equally important because accurate placement of sharps and flats preserves the intervallic structure of the major scale. Rather than treating accidentals as isolated symbols, contemporary music pedagogy recommends presenting them as functional devices that maintain the tonal relationships required within each key (Amparbin & Debrah-Otchere, 2023).

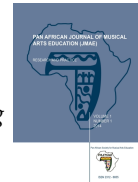
The piano keyboard provides an additional instructional resource by allowing students to visualise and hear interval relationships simultaneously. Keyboard demonstrations enable learners to compare written notation with sounding pitch relationships, thereby supporting procedural accuracy during scale construction (Nyanney, 2021; Li & Sun, 2023). Within the present study, these instructional approaches were integrated into a structured classroom intervention designed to improve students' procedural competence in constructing major scales.

Procedural Knowledge, Conceptual Understanding and Transfer in Music Learning

Music learning encompasses multiple forms of knowledge that contribute to musical development. Regelski (2004) distinguishes between declarative knowledge, which concerns understanding musical facts and concepts, and procedural knowledge, which refers to the ability to perform musical tasks accurately through the application of learned procedures. Within music theory, procedural knowledge includes constructing scales, applying accidentals, identifying interval relationships, and writing correct musical notation.

Conceptual understanding represents a broader form of learning. Rather than simply performing procedures correctly, students demonstrate conceptual understanding when they can explain why musical procedures work, recognise relationships among musical concepts, and apply these principles flexibly in unfamiliar situations. Perkins and Salomon (1992) describe this capacity as transfer of learning, arguing that genuine understanding is demonstrated when learners successfully apply acquired knowledge beyond the specific tasks practised during instruction.

Another important perspective within music education is Gordon's theory of audiation, which describes learners' ability to hear and understand music internally even when no physical sound is present (Gordon, 2012). Audiation extends beyond procedural performance because it involves internal tonal cognition and musical thinking. Although audiation provides an important theoretical perspective for music learning, the present study did not directly assess students' internal auditory processing.



The distinction among procedural competence, conceptual understanding, transfer, and audiation is important when interpreting the findings of this study. The instructional intervention and post-intervention assessment were designed to evaluate students' procedural competence in constructing major scales using the instructional procedures explicitly taught during the intervention. Consequently, the findings should be interpreted as evidence of procedural learning within the classroom context rather than comprehensive evidence of conceptual understanding, transfer of learning, or audiation.

Classroom Action Research as a Framework for Improving Music Instruction

The present study is situated within the tradition of classroom action research, which seeks to improve educational practice through systematic cycles of diagnosis, planning, intervention, observation, and reflection (Mills, 2011; Stringer, 2014). Unlike experimental research, classroom action research is primarily intended to address immediate instructional problems within authentic educational settings rather than establish statistically generalisable causal relationships. Within music education, action research enables teachers to investigate learning difficulties, evaluate alternative instructional strategies, and refine classroom practice in response to students' learning needs. Because the present study focused on improving students' procedural competence in major scale construction within one classroom, action research provided an appropriate methodological framework for designing, implementing, and evaluating the instructional intervention.

Methodology

Research Design

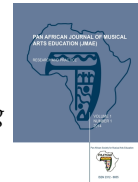
The study adopted a classroom action research design to address an instructional problem identified within a Form Two Music class at Adisadel College in the Central Region of Ghana. Action research is particularly appropriate when teachers seek to improve teaching and learning through systematic cycles of problem identification, planning, intervention, observation, and reflection within authentic classroom settings (Mills, 2011; Stringer, 2014). Unlike experimental research, which primarily seeks to establish causal relationships and generate findings that are statistically generalisable, classroom action research focuses on improving instructional practice within a specific educational context. The present study therefore sought to diagnose students' procedural difficulties in major scale construction, implement a structured instructional intervention, and evaluate students' procedural performance following the intervention.

Study Setting

The study was conducted at Adisadel College, a boys' senior high school located in Cape Coast in the Central Region of Ghana. The school offers Music as an elective subject within the General Arts programme. The intervention was implemented in the Form Two Music class after classroom observations and a preliminary assessment indicated persistent difficulties with students' ability to accurately construct major scales.

Population and Participants

The target population comprised all Music students and Music teachers at Adisadel College. At the time of the study, the school had approximately 3,020 students, including 63 students enrolled in Music across Forms One to Three. The teaching staff consisted of 105 teachers, including one Music teacher responsible for the participating class. The accessible population consisted of the entire Form Two Music class, comprising twenty students. Because the identified instructional problem occurred within this intact classroom, all twenty students participated in the intervention. The use of the



complete class is consistent with the principles of classroom action research, where the emphasis is on improving teaching and learning within a naturally occurring educational setting rather than selecting a statistically representative sample (Mills, 2011).

Sampling Technique

Purposive sampling was employed to select the participating class. The Form Two Music students were deliberately chosen because they demonstrated persistent difficulties in constructing major scales during routine classroom instruction. Patton (2015) notes that purposive sampling is appropriate when participants are selected for possessing characteristics directly relevant to the research problem. In the present study, selecting the intact class enabled the intervention to address the specific instructional challenge experienced by the participating students.

Data Collection Methods

Three complementary methods were employed to collect data: a diagnostic pre-test, unstructured interviews, and a post-intervention assessment.

A diagnostic pre-test was administered before the intervention to identify students' existing procedural difficulties in constructing the F major and D major scales. The purpose of the assessment was not to provide a baseline for measuring learning gain but to diagnose the specific procedural errors requiring instructional attention. The assessment focused on students' ability to apply accidentals correctly and maintain the intervallic structure required for major scale construction. Findings from the pre-test informed the design and sequencing of the intervention.

Unstructured interviews were conducted with participating students and the class Music teacher to explore the nature of the observed learning difficulties. Students were encouraged to describe the challenges they experienced when constructing major scales, while the teacher provided professional insights into recurring classroom difficulties and previous instructional approaches. The interviews informed the planning of the intervention by identifying misconceptions relating to accidentals, interval relationships, and scale-construction procedures.

Following completion of the instructional intervention, a post-intervention assessment was administered. Unlike the diagnostic pre-test, the post-intervention assessment evaluated the procedural competencies addressed during the five-week instructional programme. Students completed tasks involving tetrachords, application of accidentals, construction of major scales with and without key signatures, identification of natural semitone positions, and staff notation.

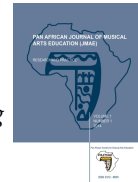
Because the post-intervention assessment evaluated the instructional objectives developed during the intervention rather than replicating the diagnostic pre-test, the two assessments were designed for different educational purposes and therefore do not constitute parallel forms of the same instrument.

Instructional Intervention

The intervention was implemented over five consecutive weeks.

Week One: Accidentals and the C Major Scale

Instruction commenced with the C major scale because it contains no written accidentals and provides a reference point for understanding interval relationships. Students were introduced to the arrangement of notes on the piano keyboard, the distinction between tones and semitones, and the



correct placement of accidentals in written notation. Guided demonstrations and supervised practice were used to reinforce these procedures.

Week Two: Tetrachords and Major Scale Construction

Students were introduced to the concept of tetrachords as a systematic procedure for constructing major scales. Instruction emphasised the relationship between lower and upper tetrachords and demonstrated how successive major scales could be constructed while maintaining the required interval pattern. Guided practice enabled students to construct both sharp-key and flat-key scales using the tetrachord approach.

Week Three: Interval Analysis and Guided Auditory Feedback

Students applied the interval pattern of the major scale (whole-whole-half-whole-whole-whole-half) while constructing major scales. The researcher played the students' written scales on the piano, allowing them to compare the sounding intervals with the expected major-scale pattern. The piano demonstrations functioned as guided instructional feedback rather than as a formal assessment of audiation or independent aural perception. Students used this feedback to identify interval errors, revise accidentals as needed, and strengthen their procedural application of scale-construction principles.

Week Four: Staff Notation and Guided Practice

Students transferred previously constructed scales onto the musical staff using whole notes and practised writing scales both with and without key signatures. Instruction focused on correct notation, placement of accidentals, and systematic application of key signatures. Continued keyboard demonstrations helped students relate written notation to sound pitch relationships.

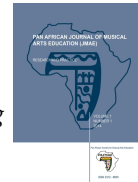
Week Five: Post-intervention Assessment

The final week was devoted to reviewing the instructional content and administering the post-intervention assessment. The assessment evaluated students' performance on the procedural tasks addressed throughout the intervention, including tetrachord construction, application of accidentals, construction of major scales, identification of natural semitone positions, and staff notation.

1. Write the upper tetrachord of the C major scale.
2. Build a scale on the upper tetrachord of C major and apply appropriate accidentals (off-staff).
3. Construct the E major scale with key signature.
4. Construct the E major scale without key signature (ascending and descending).
5. State the two sets of notes between which natural semitones occur.
6. Construct the A $\flat$ major scale with key signature.
7. Construct the following scales with key signatures: G, D, A, E, B.
8. Construct the following flat-key scales with key signatures: F, B $\flat$, E $\flat$, A $\flat$, D $\flat$.
9. Represent the following notes on the bass staff: B $\flat$, F $\flat$, D $\flat$, E $\flat$, C $\flat$, B $\sharp$, F $\sharp$, D $\sharp$, E $\sharp$, C $\sharp$.

Data Analysis

Quantitative data were analysed using descriptive statistics, specifically frequencies and percentages. Descriptive analysis was considered appropriate because the study adopted a classroom action research design intended to document improvements in classroom practice rather than test statistical hypotheses or make population-level inferences (Mills, 2011; Stringer, 2014). The pre-test and post-intervention assessment were analysed separately because they served different



educational purposes. The diagnostic pre-test identified students' initial procedural difficulties, whereas the post-intervention assessment described students' performance following the instructional programme. Consequently, no statistical comparison or estimation of learning gain was undertaken between the two assessments. Qualitative interview data were analysed thematically. Students' responses were reviewed repeatedly, coded for recurring ideas, and organised into themes describing the principal procedural difficulties encountered during major-scale construction. These themes informed both the design of the intervention and the interpretation of the findings.

Researcher Role and Reflexivity

The researcher assumed multiple roles throughout the study, serving as classroom instructor, interviewer, and assessor. This arrangement is common in classroom action research, where practitioners investigate and improve their own instructional practice (Mills, 2011; Stringer, 2014). However, these multiple roles also present potential sources of researcher bias, including expectancy effects, observer bias, and classroom authority effects. The findings are therefore interpreted cautiously as evidence of classroom improvement within the participating class rather than as definitive evidence of causal effectiveness. Because all assessments were scored by the researcher, no independent assessor, inter-rater reliability procedure, or blind scoring protocol was employed. Similarly, the researcher conducted the interviews, creating the possibility of socially desirable responses. These methodological considerations are acknowledged as limitations of the study.

Methodological Limitations

Several methodological limitations should be considered when interpreting the findings. First, the study involved a single intact classroom within one senior high school, limiting the transferability of the findings to other educational settings. Second, the researcher simultaneously served as teacher, interviewer, and assessor, introducing the possibility of researcher expectancy and observer bias. Third, the pre-test and post-intervention assessment were designed for different instructional purposes and therefore were not parallel instruments. Consequently, the study does not estimate learning gains through direct pre-test/post-test comparison. Finally, the post-intervention assessment evaluated procedural tasks explicitly taught during the intervention. It did not assess transfer of learning, independent audiation, or broader conceptual understanding of tonal relationships. Future research should incorporate parallel assessment instruments, independent assessors, transfer tasks, and larger multi-school samples to strengthen methodological rigour and enhance the generalisability of the findings.

Results

The findings are presented in accordance with the study's objectives. Because the diagnostic pre-test and the post-intervention assessment were designed for different educational purposes, the results are reported separately rather than as equivalent measures of learning gain. The pre-test identified students' initial procedural difficulties, whereas the post-intervention assessment described students' performance following the instructional intervention.

Diagnostic Pre-test Findings

The pre-test assessed students' ability to construct major scales prior to the intervention. The results indicated that most students experienced significant difficulty with scale construction.

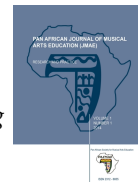


Table 1: Diagnostic Pre-test: Students' Procedural Performance in Constructing the F Major and D Major Scales

Task	Able (n)	Able (%)	Not Able (n)	Not Able (%)
Construction of F Major Scale	3	15	17	85
Construction of D Major Scale	3	15	17	85

The diagnostic pre-test assessed students' procedural ability to construct the F major and D major scales prior to the instructional intervention. As presented in Table 1, only three students (15%) correctly constructed both scales, whereas seventeen students (85%) were unable to complete the tasks successfully. The scripts revealed recurring procedural errors. Many students omitted required accidentals, applied incorrect accidentals, or failed to maintain the correct interval sequence that characterises the major scale. These findings indicate that most students lacked the procedural knowledge required for accurate major scale construction and therefore required targeted instructional support. The interview findings reinforced these observations. Students reported uncertainty regarding the placement of sharps and flats, confusion about the arrangement of whole and half steps, and difficulty extending scale construction beyond the key of C major. The class teacher similarly observed that many students attempted to memorise individual scales rather than apply a systematic construction procedure. Collectively, these findings established the instructional problem that informed the intervention's design.

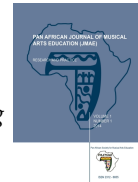
Post-intervention Assessment

The post-test evaluated students' knowledge after the instructional intervention. Most students performed the assessed tasks correctly.

Table 2: Post-intervention Assessment of Procedural Competencies (Part I)

Task	Able (n)	Able (%)	Not Able (n)	Not Able (%)
Writing the Upper Tetrachord of C Major	20	100	0	0
Forming Scale from Upper Tetrachord (G Major)	20	100	0	0
Correct Application of Accidentals	20	100	0	0
Constructing E Major Scale (without key signature)	19	95	1	5
Constructing E Major Scale (with key signature)	19	95	1	5
Stating Natural Semitone Positions	20	100	0	0

Following the five-week instructional programme, students completed a post-intervention assessment designed to evaluate the procedural competencies addressed during classroom instruction. As shown in Table 2, all twenty students (100%) correctly wrote the upper tetrachord of C major, formed the G major scale from the upper tetrachord, correctly applied accidentals, and identified the positions of natural semitones. Nineteen students (95%) accurately constructed the E major scale both with and without key signatures.



Intervention Outcomes

Students were further assessed on more complex scale construction and notation tasks.

Table 3: Post-intervention Assessment of Procedural Competencies (Part II)

Task	Highest Score Achieved	Students Achieving Highest Score	Percentage (%)
Construction of Ab Major Scale (4 accidentals)	4 correct accidentals	18	90
Construction of Sharp-Key Scales (G, D, A, E, B)	5 correct scales	17	85
Construction of Flat-Key Scales (F, Bb, Eb, Ab, Db)	5 correct scales	17	85
Writing 10 Accidental Notes on Bass Staff	10 correct notes	18	90

Table 3 presents students' performance on additional procedural tasks. Eighteen students (90%) correctly constructed the Ab major scale and accurately represented accidental notes on the bass staff. Seventeen students (85%) successfully constructed the complete sets of sharp-key and flat-key major scales included in the assessment. Thus, the post-intervention assessment indicates that most students successfully completed the procedural tasks that had been explicitly addressed during the instructional programme.

Unstructured Interview Findings

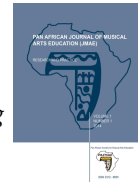
Students' Perceptions of the Intervention

Interview responses obtained following the intervention suggested that students perceived the instructional strategies as helpful in improving their approach to major scale construction. Students indicated that the tetrachord method provided a systematic procedure for constructing scales, while interval analysis clarified the arrangement of whole and half steps. Many participants also reported that the piano demonstrations enabled them to compare their written work with the corresponding sounding intervals, making it easier to identify and correct errors in accidentals and interval placement. The class teacher similarly observed increased confidence among students when constructing scales and noted that students relied less on memorisation and more on the procedures introduced during the intervention. These perceptions suggest that the instructional activities helped students apply the procedural techniques required for accurate major scale construction.

Discussion

The purpose of this classroom action research was to diagnose the procedural difficulties experienced by Form Two Music students in constructing major scales, implement a structured instructional intervention to address those difficulties, and evaluate students' procedural performance following the intervention. The findings indicate that the intervention supported students in successfully performing the scale-construction tasks included in the instructional programme. Although the study was conducted within a single classroom and employed descriptive rather than inferential analyses, it provides valuable evidence regarding instructional strategies that may improve the teaching of major scales in senior high school music education.

The diagnostic pre-test revealed substantial weaknesses in students' procedural ability to construct the F major and D major scales. Most students experienced difficulties applying accidentals correctly, maintaining the intervallic pattern of the major scale, and systematically constructing scales beyond C major. These findings were supported by the interview data, which showed that



many students relied on memorising individual scales rather than applying a consistent construction procedure. The class teacher similarly observed recurring misconceptions relating to accidentals and interval relationships. Together, these findings suggest that students required more explicit and structured instructional support to develop the procedural skills necessary for accurate major scale construction.

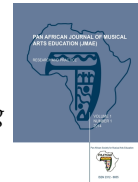
These findings are consistent with previous studies indicating that students frequently experience difficulties with notation, interval recognition, accidentals, and the practical application of music-theoretical concepts (Pomerleau-Turcotte et al., 2022; Donn et al., 2024; Villarta & Capili, 2025). Similar concerns have also been reported in Ghanaian music education, where limited instructional resources, insufficient practical engagement, and challenges in teaching foundational music theory continue to affect students' achievement (Agbenyo et al., 2021; Spears & Dordzro, 2023). The present findings therefore reinforce existing evidence that major-scale construction remains a challenging area of music instruction requiring systematic pedagogical intervention.

Following the five-week instructional programme, students demonstrated strong performance across the procedural tasks included in the post-intervention assessment. Most participants successfully applied accidentals, constructed major scales with and without key signatures, identified natural semitone positions, and completed staff notation exercises. Interview responses further indicated that students regarded the tetrachord approach, interval analysis, guided practice, and piano demonstrations as useful instructional strategies that simplified the process of constructing major scales. These findings suggest that the intervention provided students with practical procedures that enabled them to perform the instructional tasks more confidently and accurately.

The effectiveness of these instructional strategies is consistent with previous literature emphasising explicit, sequential, and activity-based approaches to music instruction (Shitubi et al., 2021; Yuwono et al., 2025). Similarly, multimodal instructional approaches that integrate visual, symbolic, auditory, and kinaesthetic experiences have been shown to enhance students' engagement with music-theoretical content and strengthen procedural musical skills (Barton & Riddle, 2021; Li & Sun, 2023). Within the present study, the combination of tetrachords, interval analysis, guided practice, and keyboard demonstrations provided students with multiple representations of major scale construction, thereby supporting procedural learning within the classroom.

The use of the piano deserves particular attention. Throughout the intervention, the piano served as an instructional tool, providing immediate auditory feedback on the interval relationships represented in students' written scales. By comparing their written work with the corresponding keyboard demonstrations, students were able to identify and correct errors in accidentals and interval placement. However, the piano activities were not designed to assess students' audition or independent tonal cognition. Rather, they served as guided instructional support, reinforcing the procedural application of scale-construction principles in classroom learning.

The distinction between procedural competence and conceptual understanding is also important when interpreting the findings. The post-intervention assessment evaluated students' ability to perform the scale-construction procedures explicitly taught during the intervention. It did not include unfamiliar tasks requiring transfer of learning or independent application of scale-construction principles beyond the instructional content. Consequently, the findings provide evidence of students' acquisition of procedural competence rather than broader conceptual



understanding of tonal organisation. This interpretation is consistent with Regelski's distinction between procedural and declarative musical knowledge and with Perkins and Salomon's framework on transfer of learning, both of which emphasise that conceptual understanding requires successful application of knowledge in unfamiliar contexts.

The findings should also be interpreted within the methodological boundaries of classroom action research. The pre-test and post-intervention assessment served different educational purposes. The diagnostic pre-test identified students' initial procedural difficulties, whereas the post-intervention assessment evaluated procedural competencies developed during the intervention. Consequently, the two assessments were not parallel instruments and should not be interpreted as equivalent measures of learning gain. Rather than estimating causal effects or statistical improvement, the study documents changes in students' classroom performance following a structured instructional intervention.

Another important consideration concerns the researcher's multiple roles as classroom teacher, interviewer, and assessor. Although this arrangement is common in classroom action research, it can introduce expectancy effects, observer bias, and socially desirable responses during interviews. Because all assessments were scored by the researcher, independent verification of scoring decisions was not undertaken. The findings should therefore be interpreted as evidence of classroom improvement within the participating class rather than as conclusive evidence independent of researcher influence.

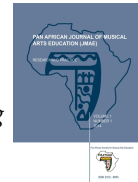
Despite these methodological limitations, the study contributes meaningfully to music education practice. It demonstrates how a structured instructional sequence incorporating accidentals, tetrachords, interval analysis, staff notation, guided practice, and piano demonstrations can be organised to address common procedural difficulties in major scale construction. The intervention offers a practical instructional example that music teachers may adapt to improve classroom teaching of foundational music concepts in Ghanaian senior high schools.

Conclusion

This classroom action research investigated the procedural difficulties experienced by Form Two Music students in constructing major scales and examined the use of a structured instructional intervention to address those difficulties. The diagnostic findings showed that most students had considerable difficulty applying accidentals correctly, maintaining the intervallic structure of the major scale, and constructing scales systematically. These procedural weaknesses justified the implementation of a targeted classroom intervention.

Following the five-week instructional programme, students demonstrated strong performance on the procedural tasks included in the post-intervention assessment. The findings suggest that explicit instruction incorporating tetrachords, interval analysis, guided practice, staff notation, and piano keyboard demonstrations supported students in acquiring the procedural skills required to construct major scales accurately within the scope of the instructional programme.

The findings should be interpreted within the methodological context of the study. Because the pre-test and post-intervention assessment were designed for different instructional purposes, they were not intended to function as equivalent measures of learning gain. Furthermore, the post-intervention assessment evaluated only the procedural tasks explicitly taught during the intervention and therefore does not provide evidence of transfer of learning, independent audiation, or broader

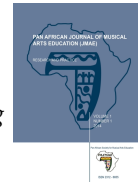


conceptual understanding. Similarly, the researcher's multiple roles as teacher, interviewer, and assessor require that the findings be interpreted cautiously as evidence of classroom improvement rather than statistically generalisable or causal conclusions.

Notwithstanding these limitations, the study demonstrates that classroom action research can provide a valuable framework for identifying instructional problems and developing context-specific teaching strategies. The structured instructional approach implemented in this study offers practical guidance for music teachers seeking to strengthen students' procedural competence in major scale construction and improve foundational music theory instruction in senior high schools.

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