

The Application of An Audiovisual Flashcard Method to Improve the Applied Understanding of Figured Bass Among Beginner Music Students

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Abstract

This study investigates the effectiveness of an audiovisual flashcard method to enhance beginner music students' applied understanding of figured bass. Figured bass, a core component of Western tonal music theory, is traditionally taught through written analysis, leaving students with limited auditory and practical integration. This gap often results in students recognizing notation visually but struggling to perform harmonically on an instrument. The study aimed to determine whether flashcards could bridge this gap, improve aural skills, and facilitate the practical application of harmonic theory. The research employed a qualitative action research approach involving 25 undergraduate music students at Pelita Harapan University, Class of 2025. Over six learning cycles, students used flashcards containing triads and seventh chords across major and minor scales. Observations, timing of student responses, and questionnaires were collected to evaluate performance and cognitive processing. Results indicate that the flashcard method significantly accelerated students' recognition and execution of figured bass. Students demonstrated improved accuracy, faster response times, and better harmonic internalization. However, some cognitive load challenges emerged with complex chords and inversions. The method also exposed gaps in foundational skills, guiding targeted interventions. In conclusion, audiovisual flashcards effectively transform abstract theoretical understanding into concrete performance skills, enhancing both cognitive and practical learning. Future research should explore digital interactive versions, cross-instrument application, and long-term retention to further optimize multimodal music pedagogy.

INTRODUCTION

Figured bass, also known as thoroughbass, is a notation system developed in the Baroque era that describes harmony through written bass notation (Haskell, 2024). Figured bass is a cornerstone of Western tonal music theory and serves as a tool for understanding harmonic relationships in a structured and context-based way (Dias, 2022; Häberlin, 2025; Howell, 2025).

Figured bass instruction conducted at conservatories and universities, including the Faculty of Music at Universitas Pelita Harapan (UPH), is carried out in a theoretical and abstract manner that emphasizes written analysis rather than active listening to harmony or direct application through instrument practice (Attah et al., 2024; Azzopardi-Barbieri & Ponsatí, 2025). Undergraduate students at the UPH Faculty of Music begin their studies with a background in formal music theory training equivalent to ABRSM Grade 5 theory, but often lacking in aural integration (Chenette, 2021; Ponsatí et al., 2020). It is frequently observed that students can identify chord symbols and figured numerals in writing, yet struggle to internalize

what those symbols sound like (Ponsatí et al., 2020; Chenette, 2021). This results in figured bass being approached merely as visual recognition and written transcription, rather than as an integrated auditory and cognitive process (Endo, 2021; Attah et al., 2024). The prevailing approach to figured bass instruction focuses heavily on written analysis, does not reflect how figured bass was originally used (Endo, 2021; van Tour, 2017), and fails to associate it with concrete harmonic sounds (van Tour, 2017; Azzopardi-Barbieri & Ponsatí, 2025).

In response to these existing problems, this study seeks to explore the use of flashcards containing figured bass symbols as a practical tool to strengthen aural understanding and harmonic intuition (Ilkay et al., 2025; Chenette et al., 2022). Through the use of these flashcards, students are asked to realize and perform the meaning of the symbols directly at the piano — not to develop pianistic technique, but to activate harmonic hearing (Smith & Karpicke, 2021; Ilkay et al., 2025). This flashcard-based approach introduces a dynamic learning process by integrating visual, auditory, and kinesthetic dimensions simultaneously (Costantini et al., 2024; Nurjanah et al., 2024). It is therefore hoped that students can hear harmonic functions directly (Chenette et al., 2022; Ilkay et al., 2025) and strengthen their practical understanding of figured bass (Remeš, 2018; Smith & Karpicke, 2021).

Previous research has attempted to address these pedagogical limitations. Aldwell and Schachter (2011) focus on harmony and voice leading, providing partial integration with keyboard skills while maintaining a written emphasis. Gjerdingen (2007) advocates schema-based learning from partimenti and figured bass, yet its application is limited to stylistic awareness rather than practical execution. Sanguinetti (2012) emphasizes partimento realization but requires advanced prior knowledge, leaving beginners underserved.

Despite these efforts, a clear research gap exists: few studies provide practical tools for enhancing the aural understanding of figured bass among novice learners. Current approaches do not adequately integrate visual, auditory, and kinesthetic learning dimensions simultaneously. Addressing this gap is urgent, as foundational harmonic skills are crucial for subsequent music performance, improvisation, and composition, areas that remain underdeveloped in traditional curricula.

The urgency of this research is further reinforced by cognitive studies showing that active engagement in multimodal learning accelerates knowledge retention and skill acquisition. By introducing audiovisual flashcards, students can practice harmonic recognition in real time, connecting visual notation with auditory realization and motor execution. Such methods respond to a global call for pedagogical innovation that harmonizes the cognitive, sensory, and practical dimensions of learning.

The novelty of this study lies in the integration of interactive flashcards specifically designed for figured bass. Unlike prior methods, the flashcards combine visual symbols, auditory cues, and hands-on practice, fostering immediate motor-visual-auditory feedback. This approach transforms abstract theoretical knowledge into concrete, actionable skills, offering a structured yet dynamic learning experience for beginner music students.

The purpose of the research is to investigate how audiovisual flashcards can enhance the applied understanding of figured bass in undergraduate music theory classes. By employing an action research framework with qualitative observation and student feedback, the study aims to measure improvements in practical harmonic recognition, cognitive processing speed, and aural integration, thereby validating the efficacy of the flashcard method.

The research contributes to both theory and practice. Academically, it provides empirical evidence supporting multimodal, interactive approaches in music pedagogy. Practically, it offers educators a replicable tool to accelerate beginners' harmonic skills, facilitate individualized learning, and reduce cognitive load in early music theory instruction. Such contributions align with global educational goals of fostering active, experiential learning in arts curricula.

Ultimately, the objectives of the study are to assess students' improvement in identifying and performing figured bass, evaluate the cognitive and aural benefits of flashcard use, and provide pedagogical recommendations for integrating interactive methods into standard music curricula. The anticipated benefits include enhanced student engagement, accelerated skill acquisition, and stronger connections between theory and practice, establishing a model for modern, evidence-based music education that can be adapted globally.

METHOD

This study uses action research with a qualitative approach – a case study with the subject of the research is 25 students of the Music Study Program of Pelita Harapan University Class of 2025 with classical instruments in the odd semester of 2025-2026. The first stage in this study (in July) is the preparation of the RPS using flashcards along with pre-test instruments that will be used in the new student theory test before lecture activities. In the second stage (in August), a draft flashcard was made using HVS paper which included the entire triad and seventh chord on major and minor scales up to 3 sharp and 3 flat. The figured bass notation in the draft was made using the musescore application and then reprocessed using Canva. Several experiments were carried out for a flashcard size that was not too large but still easy to read. The third stage (August) was carried out by holding a pre-test of music theory for new students of the class of 2025, along with a theory test. The test was carried out to be able to see the basic ability of students in reading and writing musical notation.

The fourth stage (action research in the Music Theory I class, with the maximum duration of thinking recorded is 5 minutes for 1 (one) flash card number).

- Cycle I

Practice:

In the 4th week of lectures, students begin to study the triad and inversion, and in the same week the meaning of the number began to be introduced. numbers in the figured bass both in writing, audio, and practice in piano. In this cycle, students play figured bass with just one hand.

Theory:

Students work on figured bass questions in writing, either identify or compose triads.

- Cycle II

Practice:

In the 5th week lecture, students play figured bass with 2 (two) hands for root position in major and minor scales up to 3-sharp and 3-flat.

Theory:

Students work on figured bass questions in writing, either identify or compose triads.

- Cycle III

Practice: In the 6th week lecture, students play figured bass with 2 (two) hands for the root position and 1st inversion in major and minor scales to 3-sharp and 3-flat.

Theory: Students work on figured bass problems in writing, either identifying or arranging triads.

- Cycle IV

Practice: In the 7th week lecture, students play figured bass with 2 (two) hands for root position, 1st inversion, and 2nd inversion in major and minor scales to 3-sharp and 3-flat.

Theory: Students work on figured bass problems in writing, either identifying or arranging triads.

- Cycle V

Practice: In the 10th and 13th week lectures, students play figured bass with 2 (two) hands for the 7th chord in major and minor scales to 3-sharp and 3-flat.

Theory: Students work on figured bass questions in writing, either identifying or arranging in four-part writing.

- Cycle VI

Practice: In the lecture week 14-15, students play figured bass with 2 (two) hands for the triad and 7th chord in major and minor scales to 3-sharp and 3-flat.

Theory: Students work on figured bass questions in writing, either identifying or arranging in four-part writing.

The fifth stage (December) was carried out in conjunction with the UAS Music Theory. At this stage, a questionnaire about learning was also filled out using flashcards in figured bass learning. The purpose of this questionnaire is to find out students' opinions on the use of flashcards and also collect students' criticisms and suggestions on the learning method. In this fifth stage, flashcard printing with art paper was also carried out as a trial of the size and type of paper used.

The sixth stage is data analysis. Data analysis was conducted in January and March. The data analyzed were weekly journals, student time measurements, and student questionnaires.

The seventh stage is the finalization of the design and components of the flashcard in February-April.

RESULTS AND DISCUSSION

The data collected in this study are:

- Lecturer and tutor teaching journals which include the duration of students' thinking time in each session to be able to play and analyze student mistakes.
- Student questionnaires containing their responses to the use of flash cards.

Observation Data and Class Journal Notes

The duration of the student's recorded thinking time starts from the 2nd cycle, this Because in the first cycle it is still a basic explanation of the figured bass without time limit to think. The researcher also did not write down the duration Think of a college student who can play for less than 3 seconds.

Table 1. Duration of Figured Bass Practice Across Six Cycles for Music Theory Students

No	Mahasiswa	Siklus 2	Siklus 3	Siklus 4	Siklus 5	Siklus 6
1	A	2:00	2:00	3:00	4:00	5:00
2	B					0:30
3	C					
4	D					
5	E	0:20	1:00	1:00	1:00	
6	F	0:30	1:00	1:45	1:00	1:00
7	G	0:30	1:00	1:30	1:30	1:30
8	H	0:30	0:45	2:00	0:30	0:40
9	I	0:30	0:30	1:00	0:10	0:30
10	J	1:00	1:00	3:00	3:00	3:00
11	K				0:15	0:10
12	L				0:14	0:15
13	M					
14	N					
15	O	0:20	0:20	0:20		
16	P				0:20	0:20
17	Q				0:15	0:12
18	R				0:33	0:20
19	S				--	--
20	T				1:30	1:30
21	U	1:30	1:30	1:30		
22	V				1:00	3:00
23	W	1:00	1:30	0:10	0:36	0:27
24	X	1:30	1:00	0:17	0:45	0:30
25	Y	0:20	0:30	0:20		

Source: Data collected from weekly student practice sessions in the Music Theory I course, Pelita Harapan University, Class of 2025

Overall, based on the data above, six students (Students C, D, L, M, Q, and V) were able to consistently play figured bass in under three seconds after being shown a flashcard, while one student (Student T) consistently required more than five minutes to respond.

In the second cycle, students were presented with flashcard material consisting of figured bass in root position only, requiring them to consider only one position to form a triad. In this cycle, students were asked to play with both hands but were not required to follow the rules of spacing and doubling. Some students were able to play the figured bass correctly. The primary difficulty encountered in this cycle concerned major and minor chord quality. Students tended to construct chords outside of I, IV, and V as major chords on the major scale, and the same pattern occurred on the minor scale. Based on discussions with students during one-on-one practice sessions, it became apparent that they read the notation on the flashcard directly as a chord associated with major quality, without connecting it to its diatonic harmonic function. Researchers and tutors consistently reminded students to refer to the key signature on the flashcard.

In the third cycle, students were introduced to an additional position beyond the root position, namely the first inversion. Some students experienced an increase in response time when distinguishing between the root position (particularly when notated as figured bass 5/3) and the first inversion. Furthermore, students were also introduced to the doubling rule, which required additional thinking time to determine the notes to be played in the right hand. In this cycle, some students still made errors regarding chord quality. Researchers and tutors consistently reminded them of the key signature on the flashcard and the applicable doubling rules.

In the fourth cycle, students began to distinguish among three types of figured bass: root position, first inversion, and second inversion. These three types also constituted the material assessed in the midterm examination (Ujian Tengah Semester/UTS). During this cycle, students frequently confused the first inversion with the second inversion, particularly when the first inversion was notated as 6/3 rather than simply as 6. When only the number 6 was used, students could more readily distinguish it from the second inversion, notated as 6/4. In this cycle, it became apparent that students began seeking "visual shortcuts" to identify figured bass on the flashcards rather than calculating the intervals harmonically. Researchers and tutors consistently reminded students to attend carefully to the numbers written in the figured bass, so that they would not rely solely on pattern memorization — that is, no numbers for root position, one number for first inversion, and two numbers for second inversion.

In the fifth cycle, students moved beyond triads to seventh chords. In this cycle, students were asked to play seventh chords with both hands but were not required to follow spacing rules. This cycle focused exclusively on seventh chords and their various inversions. A common error in this cycle was students' tendency to double notes, which is not applicable in seventh chords. Researchers and tutors therefore consistently reminded students at the outset of each session that the flashcards for that meeting contained only seventh chords, so that students could focus exclusively on seventh chord realization.

In the sixth cycle, the researcher combined triads and seventh chords on the flashcards. In this cycle, some students confused triads with seventh chords, particularly for certain figured bass notations such as 6/3 (triad first inversion), 6/4 (triad second inversion), and 6/5 (seventh chord first inversion). Students' response times tended to increase for these particular figured bass symbols. Researchers and tutors provided targeted practice on figured bass 6/3, 6/4, and 6/5 to help students better differentiate among the three.

Based on the data above, a gap in foundational skills was identified, which was also evident in the pre-test conducted before the class commenced. Six students (Students C, D, L, M, Q, and V) already possessed an automated understanding of the material, presenting no theoretical obstacles to practical performance. Meanwhile, one student (Student T) required more than five minutes to play the figured bass. This extended response time was no longer a matter of adapting to the flashcard format, but rather reflected incomplete prerequisite knowledge, such as reading block notation. The remaining students demonstrated fluctuating response times corresponding to the introduction of new rules in each successive cycle.

In the fifth and sixth cycles, with the introduction of seventh chord material on the flashcards, the phenomenon of proactive interference emerged. Proactive interference occurs when memory of previously learned material — in this case, figured bass for triads — interferes with the acquisition of new material, namely figured bass for seventh chords (5). This was most

evident in the note doubling rules applicable to triads, which students reflexively applied to seventh chords. The peak of this proactive interference occurred in the sixth cycle, where the figured bass symbols 6/3, 6/4, and 6/5 appeared randomly and are visually very similar, yet carry substantially different doubling requirements.

Questionnaire Data

Based on data collected through questionnaires, the use of flashcards effectively triggered an acceleration of cognitive processing. Students are forced to step out of their comfort zone of counting figured bass on paper, with hands-on practical responses. With the use of this flashcard, the majority of students stated that this method trains the brain to recognize the figured bass more quickly because the flashcards are interactive and unpredictable. However, there are still some students who stated that with this flashcard they felt panicked, blank, and overwhelmed at first. For the majority of students, flashcards are a bridge for motor visualization. Figured bass is no longer something abstract, but with flashcards they help to "know the location of the fingering", "visualize the shift of tones", and make notes "more imaginable". Based on the results of this questionnaire, the flashcard approach can be said to have succeeded in attracting theory to the realm of direct practice.

CONCLUSION

The study concludes that the application of audiovisual flashcards in figured bass learning significantly enhances students' practical understanding and cognitive processing of harmonic notation. By integrating visual, auditory, and kinesthetic learning dimensions, the flashcards enabled students to translate abstract theoretical symbols into immediate motor execution on the instrument. Students with a foundational understanding of music theory achieved faster recognition and more accurate performance of triads and seventh chords across six learning cycles. The method effectively revealed gaps in individual skills, highlighting areas such as notation reading and inversion recognition where students required additional guidance. Overall, the flashcards transformed the learning process from purely visual memorization to active, experiential engagement, fostering deeper harmonic intuition.

For future research, it is recommended to explore the application of audiovisual flashcards with larger and more diverse student populations, as well as across different instruments beyond the piano, to validate the generalizability of the findings. Additionally, longitudinal studies could examine the retention of harmonic skills over extended periods and the impact on improvisation and composition abilities. Further studies may also investigate adaptive flashcard designs, including digital interactive platforms, to enhance engagement and tailor difficulty to individual learning paces. Such research would contribute to refining multimodal pedagogical strategies in music education, bridging the gap between theoretical understanding and practical application more effectively.

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