

**Music Notation in Zheng Teaching:  
the Conversion from Numbered Musical Notation to Staff Notation**

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## Declaration

I, SO, Hoi Yi , declare that this research report represents my own work under the supervision of Dr. So, Ming Chuen Allison , and that it has not been submitted for examination to any tertiary institution.

So Hoi Yi

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## Abstract

This project aims to investigate the conversion from numbered musical notation to staff notation in Zheng teaching, which focuses on difficulties of conversion, Solfeggio system and the effectiveness of a specially designed teaching material. The project can be subdivided into two stages. In stage 1, interviews with students and teachers, who have faced difficulties in learning or teaching about converting to staff notation. Stage 2 is the design of teaching material and questionnaire. It was triangulated by observation and literature review. 2 teachers and 5 students were invited to have an interview in stage 1, while 15 participants were invited to try the teaching material and do the online test and questionnaire. In this project, the solution of difficulties on two concepts (numbered musical notation and staff notation, movable-do system and fixed-do system) was suggested. Questionnaire provided positive feedback on teaching material. The findings of the project were analyzed with literature on difficulties solving (both notation system and solfeggio system) and special needs of different age groups. At the end, there were recommendations for further development and for other researchers.

Keywords: Numbered musical notation, Staff notation, Solfeggio, Zheng teaching material

## Chapter 1: Introduction

### 1.1 Research Background

This project comes from problems that personally encountered in Zheng learning and teaching. As Zheng music notation is in different systems, being able to read different notations and play it accurately is one of the basic and essential skills for Zheng learning.

Several notation systems have been developed and two of them are still commonly used in Zheng music nowadays (Kwok, 1987). One of them is numbered musical notation, a system that uses Arabic numbers from 1 to 7 to indicate pitch. Similar to movable-do system in solfeggio, the tonic (1 or “Do”) of each key in numbered musical notation system will be on different strings (Chen, 1991). Another common system is staff notation, which represents pitch along a kind of graph (Chen, 1992). Pitch is notated on the vertical axis by means of five horizontally parallel lines, related to its intuitive perception of high or low (Kwok, 1987; Cole, 1974). It is similar to the fixed-do notation system with the twelfth string be the middle “do”.

Due to the different concepts of two notation systems, students find it difficult to convert between numbered musical notation to staff notation (李, 2013). In this CP project, the problem of conversion between two notation systems will be further discussed. A teaching material specifically focused on understanding of pitch notation will be designed and the result will be studied.

## 1.2 Research Questions

There are three research questions focusing on different aspects about conversion from numbered musical notation to staff notation.

- A. What are the difficulties students face when they convert numbered musical notation to staff notation?
- B. How solfeggio systems influence Zheng musical notation learning?
- C. How is the effectiveness of specially designed teaching material for Zheng learners with different backgrounds?



## Chapter 2: Literature Review

### 2.1 The History of Zheng Music Notation

In ancient times, Zheng music was generally transmitted by aural and oral. The compositions of Zheng were handed down directly from teachers to their apprentices (Chen, 1991). After people discovered how to use character script to record language, they found different ways to notate music by using symbols or characters (Yingshi, 1989).

The development of the Zheng music notation system has gone through many stages. The earliest existed Zheng score is a book of the Tang dynasty “The Essential of Being Benevolent and Wise”, written by a Japanese scholar Fujiwara Moronage (fig. 1<sup>1</sup>). It shows a collection of the Tang Zheng score with the use of word tablature, or called *wenzipu* (文字譜) (Cheng, 1991).

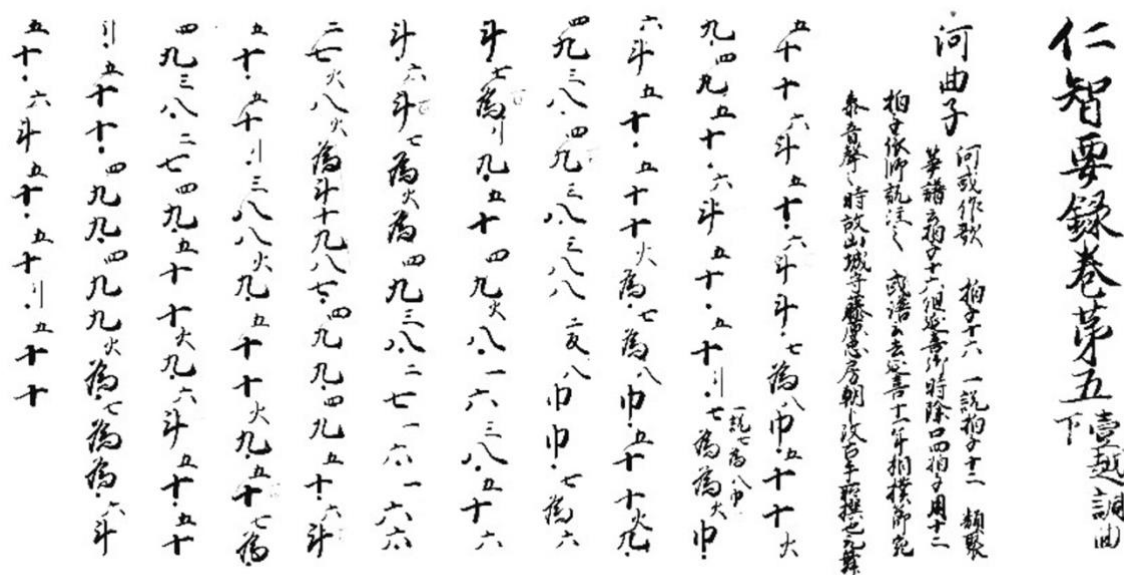


Fig. 1 The Essential of Being Benevolent and Wise, Vol. 5 *Hequzi* (河曲子)

<sup>1</sup> An example of Zheng *wenzipu*, volume 5 of the earliest Zheng score “The Essential of Being Benevolent and Wise”.

Until Yuen Dynasty, it was replaced by the *Gongche* Notation (工尺譜) (Gaywood, 1996).

*Gongche*, is a notation system that written in vertical lines and using abbreviated characters to indicate pitch: 合 *he* (sol), 四 *si* (la), 一 *yi* (ti), 上 *shang* (do), 車 *che* (re), 工 *gong* (mi), 反 *fan* (fa) and 六 *liu* (sol) (Cheng, 1991) (fig. 2<sup>2</sup>). In 1938, Liang Tsai Ping published the first official Zheng book in history, called “*Nizhengpu*” (擬箏譜), which contains 15 *gongche* notated scores (Zheng & Knobloch, 1983).

<i>Gongchepu</i>		
<i>he</i>	合	C
<i>si</i>	四	D
<i>yi</i>	一	E
<i>shang</i>	上	F
<i>zhi</i>	尼	G
<i>gong</i>	工	A
<i>fan</i>	凡	B
<i>liu</i>	六	c
<i>wu</i>	五	d
<i>yi</i>	乙	e

Fig. 2 retrieved from Gaywood, 1996, p. 62-63

Another system that has been used since Tang dynasty is *Ersi* notation (二四譜) (Han, 2001). It is mainly used in Chaozhou Zheng school. It uses Chinese numerals two to eight (二 *er*, 三 *san*, 四 *si*, 五 *wu*, 六 *liu*, 七 *qi* and 八 *ba*) to indicate pitches (Gaywood, 1996) (fig. 3<sup>3</sup>).

工尺譜：	合	士	乙	上	尺	工	凡	六	五
傳統的二四譜：	二	三	四	五	六	七	八		
輕三六調：	sol	la	do	re	mi	sol	la		
重三六調：	sol		ti ↓	do	re	fa ↑	sol	la	
活五調：	sol		ti ↓	do	re ~	fa ↑	sol	la	

Fig. 3 retrieved from 《華夏樂韻》白, 1998, p. 48

<sup>2</sup>This figure shows the singing words (唱字), notations and pitches of *gongche* notation.

<sup>3</sup>This figure shows the relationship of pitch between *gongche* notation and different “modal scale” (調式音階) of *ersi* notation.

After the introduction of staff notation in the Qing Dynasty and numbered musical notation in the early 20<sup>th</sup> century, they have become the most common Zheng notation from the first half of the 20<sup>th</sup> century to now (王, 2006). Numbered musical notation is also called “Galin-Paris-Chev  method”, which was based on the idea of Rousseau in 1742 and modified by Pierre Galin and his partners (Chen, 1992; 薛, 1983). Chen (1991) argued that it “is the most popular contemporary writing system used in Zheng music” (p. 201). This notation system was passed from Europe, via Japan, and prevailed in China (Chen, 1991). During Anti-Japanese war period, the use of numbered music notation increased sharply. Due to its easy to read, compile and publish, numbered music notation played a very important role in the composition of national music and compilation of folk music (王, 2006). In addition, the rise of *xuetangyuege* (學堂樂歌/ school song) also helped popularize numbered musical notation. This system was widely applied to traditional Chinese music. Therefore, most of the published Zheng scores are in numbered music notation (Chen, 1991). In 1946, Cao Zheng published “*Guzhengpu*”, which is one of the earliest numbered musical notation Zheng scores. Start from 90s, the collection of Zheng examination pieces was published in numbered music notation and today still in use (顾&刘, 2019).

Staff notation has been said that it was invented by an Italian monk Guido d’Arezzo in the 11<sup>th</sup> century (Chen, 1992). Although staff notation was introduced to China earlier, it was limited to missionary activities and the court. Until the popularity of *xuetangyuege* in the early 20<sup>th</sup> century, staff notation began to be popularized in China (王, 2006). In 1932, the use of staff notation in elementary and secondary school music was recommended by the Ministry of education, Republic of China (王, 2006). The popularization of staff notation in school education helps people to understand the system and apply it to their composing.

Furthermore, the influence of western music style also caused a trend to use staff notation system in traditional Chinese instrumental music composing, especially a new music genre in Chinese instruments: Concerto. Until 1990s, some Zheng scores started to be published in staff notation. For instance, *Zhengyixintan-xianpuguzhengjiaocheng* (箏藝新探 – 線譜古箏教程) (Ju Aihua wrote in 1991) and Zheng concerto: *linanyihen* (臨安遺恨) (He Zhanhao composed in 1992). Han (2001) stated that “Staff notation has gradually become popular over the last thirty years, especially with conservatory trained musicians” (p. 23).

## 2.2 Two Solfège System (Movable-do system & Fixed-do system)

Two solfège systems are commonly used by most music educators: the movable-do system and fixed-do system. Both systems apply solfège syllables (do, re, mi, fa, sol, la, ti) onto the musical notes (Hung, 2012).

In general, movable-do system is mostly used in the United States and the United Kingdom (Hung, 2012). Movable-do system is based on relative tonal relationships (tone, tone, semitone, tone, tone, semitone) and requires adjustment according to the key signature. As a result, solfège syllables in the movable-do system are moved and changed according to the key signature, but the intervals between syllables remain unchanged. It has been argued that this system is only for pure diatonic music, but not able to handle more complex music, especially for notes which are not contained in the key (Hung, 2012). For example, in diatonic music, after determining “do” by any key signature, the rest of the syllables: re, mi, fa, sol, la and ti, fall exactly on the remaining diatonic tones. Therefore, movable-do users only need to learn one set of the relationship between syllables and can be applied to all diatonic keys. This can foster a strong sense of association between syllables and scale degrees and help to teach unfamiliar diatonic scales efficiently (e.g., pentatonic or

modal scale). However, the advantage of the movable-do system will be diminished when chromatic notes appear in music. Users may also face difficulties with accidentals, modulations and key changes (Casarow, 2002).

Fixed-do system is most common in continental Europe and Russia (Hung, 2012). Briefly, the fixed-do system is based on the absolute frequency of the notes. The particular lines or spaces of each staff are always associated with the same syllable (Casarow, 2002). For instance, music notes “C, D, E...” are always sung as “do, re, mi...”, independent of the key signature of the music. Therefore, solfège syllables do not change with the key signature, but the intervals between syllables may change according to key signature. Consequently, it makes little influence on users whether a tone is diatonic or chromatic. It has less impact on the addition of chromatic notes, like key changes and modulation. As a result, it is usable for all genres of music. Bentley (1959) argued that the fixed-do system “is much more cumbersome and hazardous operation” (p. 165). For example, when key signatures contain many sharps and flats, users may encounter a higher level of difficulty than movable-do users (Hung, 2012).

### **2.3 Problems Encountered in Zheng Teaching and Learning**

Because of its simple and convenience, numbered musical notation still plays a dominant role in Zheng learning, especially in examination and traditional pieces (阎, 1992; 韦, 2021). On the other hand, staff notation mainly uses in music composing, music academy learning and ensembles (顾&刘, 2019). Many learners claim that two notation systems are very difficult to convert (韦, 2021). This doesn't just happen in Zheng learning. Other Chinese instruments learners also face difficulties when converting two notation system, for

instance, stringed instruments (Erhu, Zhonghu and Gaohu) and wind instruments (Dizi, Dongxiao and Suona) (李, 2013; 胡, 2016). In addition, Japan Zheng encounters similar problem in converting between string notation (弦名譜) and staff notation (李, 2016).

Traditional Chinese music mainly uses first tune (movable-do) for instrument learning (李, 2013). The arrangement of Zheng strings is based on pentatonic scale, every 5 strings for an octave: do, re, mi, sol and la. It is easy to visually distinguish with relative numbers in numbered musical notation (fig.4). However, since the staff notation is in heptatonic scale, it is not visually well connected with the arrangement of the Zheng strings.

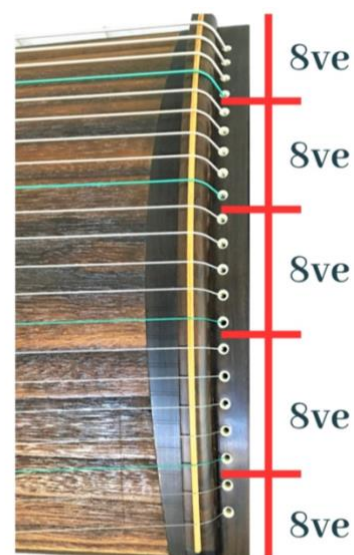


Fig. 4 The arrangement of Zheng strings in C major

As movable-do is a relative relationship, Zheng players require tuning and use specific playing positions for every key signature. Pitches are indicated by numbers 1 to 7 (1=do, 2=re, 3=mi...etc.) and dots are added above or below numbers to indicate octave(s) higher or lower (齐, 1997). The following (fig. 5) shows 3 common Zheng tunings with its middle-do position. User of numbered musical notation can easily play music in different key

		Numbered musical notation		
String	Letter name	C major	D major	G major
13	A	6̇	5̇	2̇
12	C	1	6̇	3̇
11	D	2	1	5̇
10	E	3	2	6̇
9	G	5	3	1
8	A	6̇	5̇	2̇

Fig. 5 3 common Zheng tunings with its middle-do position in an octave (string 8 to 13)

as long as they master a set of scale and the position of each tonic note (顾&孟, 1998). On the other hand, Fixed-do is on string 12 as middle-do no matter which key is used.

Furthermore, Zheng score needs both treble clef and bass clef for Staff notation. In the score, the direction of the notation and the arrangement of the Zheng strings are exactly upside down (fig. 6), making it more difficult to read.

Figure 6 illustrates the reversed arrangement between Zheng strings and staff notation in Treble clef and Bass clef. The left side shows a Treble clef staff with notes C, D, E, G, A, C, D, E, G, A, C, D. Below it, a photograph of a Zheng instrument shows strings numbered 1-12 from top to bottom. The right side shows a Bass clef staff with notes D, E, G, A, C, D, E, G, A, C. Below it, a photograph of a Zheng instrument shows strings numbered 1-12 from top to bottom. Vertical dashed lines connect the notes in the staff notation to the corresponding strings on the instrument, illustrating the reversed arrangement.

**Treble Clef:**  
 Letter name: C D E G A C D E G A C D  
 Solfeggio: do re mi sol la do re mi sol la do re

**Bass Clef:**  
 Letter name: D E G A C D E G A C  
 Solfeggio: re mi sol la do re mi sol la do

Fig. 6 The reversed arrangement between Zheng strings and staff notation in Treble clef and Bass clef.

## Chapter 3: Project Design

### 3.1 Methodology

The main purpose of this teaching material was to assist Zheng learners in staff notation learning. This project can be further subdivided into two stages. The first stage is mainly about searching for information and evidence to test the validity of the topic. Through interviews with 2 Zheng teachers and 5 students (all adults) who have faced difficulties in learning staff notation before, it can be further proved this problem exists and is of research value (For the interview questions, please refer to Appendix 8.1 & 8.2). There is a risk in this process if Zheng teachers or students deny the problem encountered in learning staff notation.

In stage two, after consolidating the research questions, a related teaching material will be designed and released (Please refer to Appendix 8.3 & 8.4). Its content is based on literature review and personal experience and is approved by other professionals. The teaching material includes explanation of words and diagrams, etudes, videos, an online game and a questionnaire. This teaching material can be used as a self-study or teacher teaching material. It is recommended to be divided into three 20-minute learning sections. At the end of each section, etudes are provided for further practice with videos for reference (please refer to Appendix 8.5). At the end, an online game with different levels is added to test users' performance (For the details of Quizizz, please refer to Appendix 8.6) and an online questionnaire to collect opinions (For the questions of questionnaire, please refer to Appendix 8.7). 15 numbered musical notation Zheng learners, aged 12 or above, were invited voluntarily by oral suggestion to use the teaching material for two weeks. Four of them are invited for observation to in depth study their actual usage and experience.



Both stages are conducted under the mixed research approach. As quantitative research uses a “narrow-angle lens” for focusing one or a few factors, while qualitative research uses a “wide-and-deep-angle lens” for multiple dimensions and layers, mixed research is beneficial to understand both general characteristics and in-depth viewpoints (Johnson & Christensen, 2012).

STAGE	Methodology	Participants
<b>I</b>	Interview with Teachers	<ul style="list-style-type: none"> <li>● 2 teachers</li> <li>● 1 from mainland China &amp; 1 from Taiwan China</li> </ul>
	Interview with Students	<ul style="list-style-type: none"> <li>● 5 students</li> <li>● All adults</li> </ul>
<b>II</b>	1. Invited to try the teaching material	<ul style="list-style-type: none"> <li>◇ 15 participants</li> <li>◇ All learned Zheng in numbered musical notation</li> </ul>
	2. Participate in an online game (Quizizz)	<ul style="list-style-type: none"> <li>◇ 9 adults</li> </ul>
	3. Participate in an online questionnaire	<ul style="list-style-type: none"> <li>◇ 5 secondary school students</li> <li>◇ 1 primary school student</li> </ul>
	Invited for observation	<ul style="list-style-type: none"> <li>◇ 4 participants</li> <li>◇ 2 adults</li> <li>◇ 1 secondary school student</li> <li>◇ 1 primary school student</li> </ul>

Fig. 7 The summary of participants' details in the project

### 3.2 Research Schedule

The study period covered from 1<sup>st</sup> November 2023 to March 2024. The project can be further subdivided into four stages: data collection, teaching material design, teaching material release and testing and comments collection.

Stage	Time	Activities
<b>I</b>	Dec 2023	Data collection and literature review
<b>II</b>	Jan 2023	Interviews and teaching material design
<b>III</b>	Feb 2024	Teaching material release and testing
<b>IV</b>	Mar 2024	Data collection and analysis Report writing

Fig. 8 Actual research schedule of the project

## Chapter 4: Result and Analysis

### 4.1 Quizizz<sup>4</sup> (online game)

There are a total of 10 questions in Quizizz and the average correct rate of the questions are 77% (fig. 9). For the easy level, 100% participants recognised the bass clef, while two participants (13%) confused the treble clef and the alto clef. Participants did well in the general level which is about naming musical notes in both treble clef and bass clef (93% correct rate). In the hard level about solfeggio on fixed-do system, 80% participants can label it right in bass clef, while 73% in treble clef. There are only 63% of participants who can get the devil's level questions right.

Level	Question no.	Content	Question Type	Correct Rate
Easy	1	Which clef is it? (Treble clef)	MC	87%
	5	Which clef is it? (Bass clef)	MC	100%
General	2	List the name of the following musical note (Treble clef)	MC	93%
	3	List the name of the following musical note (Treble clef)	MC	93%
	6	List the name of the following musical note (Bass clef)	MC	93%
Hard	4	List the Solfeggio in fixed-do system of the following musical note (Treble clef)	MC	73%
	7	List the Solfeggio in fixed-do system of the following musical note (Bass clef)	MC	80%
	8	List the Solfeggio in fixed-do system and name of the following musical note (Bass clef)	MC	80%
Devil	9	List the name of the following musical note (Treble clef & Bass clef)	MC	73%
	10	List the Solfeggio in fixed-do system of the following musical note (Treble clef & Bass clef)	MC	53%
			<b>Average</b>	<b>77%</b>

Fig.9 General correct rate for Quizizz

<sup>4</sup>Quizizz is a learning platform (apps) that offers multiple tools to make quizzes, assessments and homework for teachers and students.

All 15 participants have completed the online game, including 9 adults, 5 secondary school students and 1 primary school student. The average correct rate of adults is approximately 90%, while secondary students are around 80% and the only primary school student gets 40% correct. In summary, 14 participants (93%) answered half or more of the questions correctly. They are all adults and secondary school students. 9 participants (60%) answered all questions correctly, 5 of them were adults and two were secondary school students.

Level	Question no.	Content	Adult	Secondary School	Primary School	Average Rate
Easy	1	Which clef is it? (Treble clef)	100%	80%	0%	87%
	5	Which clef is it? (Bass clef)	100%	100%	100%	100%
General	2	List the name of the musical note (Treble clef)	89%	100%	100%	93%
	3	List the name of the musical note (Treble clef)	100%	100%	0%	93%
	6	List the name of the musical note (Bass clef)	100%	80%	100%	93%
Hard	4	List the Solfeggio in fixed-do system of the musical note (Treble clef)	78%	60%	100%	73%
	7	List the Solfeggio in fixed-do system of the following musical note (Bass clef)	100%	60%	0%	80%
	8	List the Solfeggio in fixed-do system and name of the musical note (Bass clef)	78%	100%	0%	80%
Devil	9	List the name of the musical note (Treble clef & Bass clef)	78%	80%	0%	73%
	10	List the Solfeggio in fixed-do system of the musical note (Treble clef & Bass clef)	78%	40%	0%	53%
<b>Average Rate</b>			<b>90%</b>	<b>78%</b>	<b>40%</b>	<b>77%</b>

**Fig. 10 Details correct rate for each group**

Adult group performs better than the other two groups. They are more likely to make mistakes in labelling fixed-do solfeggio and confuse in the use of treble clef and bass clef. In the group of secondary school students, they also showed a tendency to be relatively weak in labelling fixed-do solfeggio, especially when using both treble clef and bass clef. Since there is only one participant in the primary school student group, her performance may not generally reflect the true situation. The game reflects that she has only basic knowledge for identifying clef, musical note's name and is very weak in the fixed-do solfeggio system.

## 4.2 Questionnaire

There are a total 23 questions in the questionnaire, which focus on participants' background, effectiveness of teaching material and opinions on design (For all results of the questionnaire, please refer to Appendix 8.8).

For the background of all 15 participants, nearly half of them had studied Zheng for less than one year, one-fourth had studied for 2 to 5 years, one-fifth for more than 9 years and the rest studied between 6 and 8 years (fig. 11). Two-third of them had learned numbered musical notation before and one-third knew staff notation before. Most of the participants (about 87%) have learned numbered musical notation for more than 2 years. They mostly learn or use staff notation through school music lessons

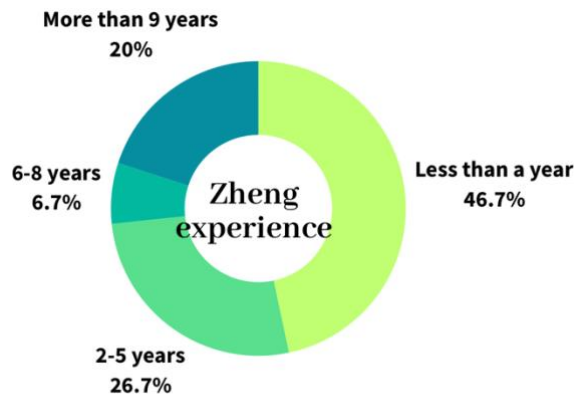


Fig. 11 The years of Zheng learning

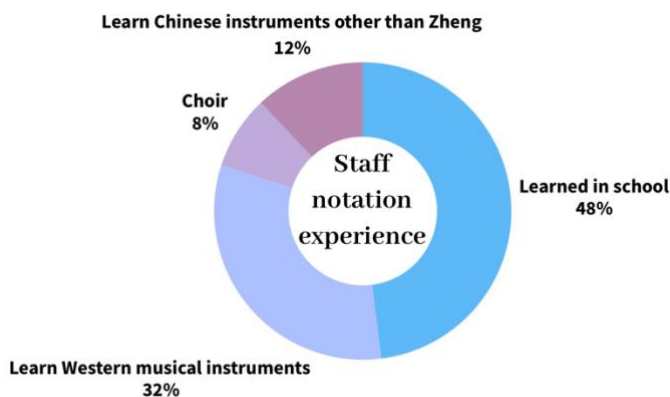


Fig. 12 Experience on using or learning Staff notation

(80%), learning western musical instruments (53%), other Chinese musical instruments (27%) and Choir (13%) (fig. 12).

For the effectiveness of each section (Treble clef, Bass clef and Fixed-do system), no one thought they had a complete lack of understanding of the topics. Their knowledge of treble clef, bass clef and field-do solfeggio has increased to a similar level, around 46% for highly or fully understood, 30% for half understood and 20% for slightly understood (fig. 13).

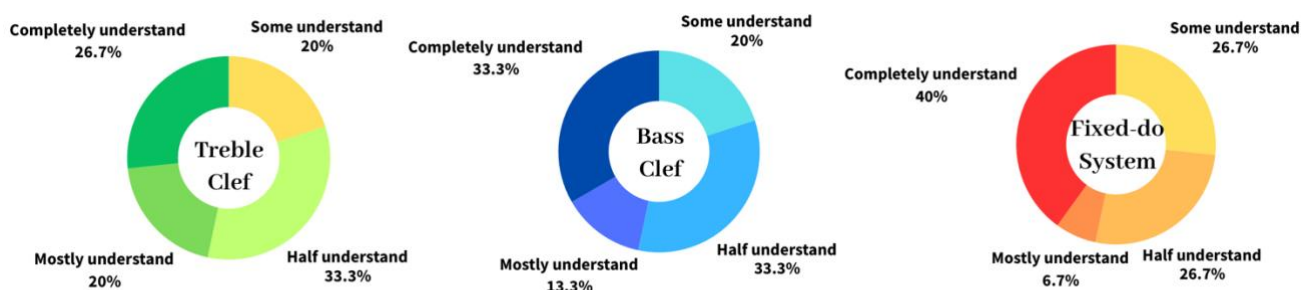


Fig. 13 The effectiveness of Treble clef, Bass clef and Fixed-do system sections

In the comments about the teaching material, 8 of them (53%) thought the study time of 20 minutes per class was moderate, while the rest (47%) thought that the time was not enough. In general, the majority of participants highly agreed that the design of the teaching material is concise and easy to use (fig. 14). Some recommended to add a

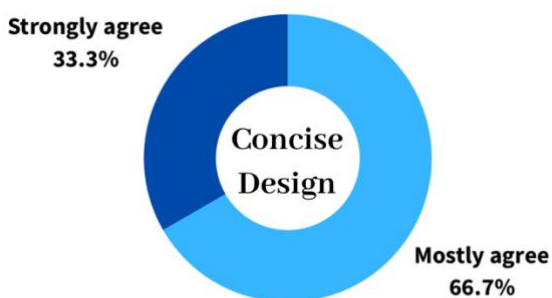


Fig. 14 The degree of agreement for the conciseness of teaching material design

content page and fingerings of etudes for reference. Participants found that the video clips provided in the teaching material were helpful, about 40% participants thought it was good help and the rest thought the help was adequate. They believe that video clips not only can help participants map the solfeggio to the note positions of staff notation, but also help to

understand the correct melody whether they can check by hearing. On the other hand, more than 67% of participants highly agreed that the level of staff notation etudes is appropriate (fig. 15). Only 7% of participants less agree on the appropriateness of the level of practice. They recommended etudes can be

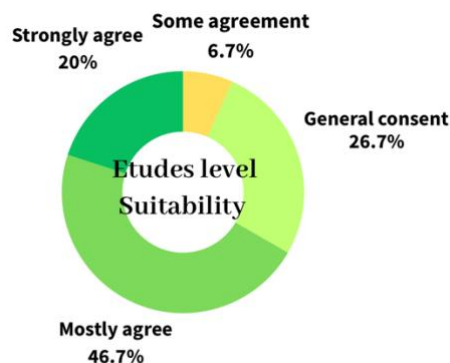


Fig. 15 The suitability of Etudes level

some familiar or simple melodies, which can reduce distractions from rhythm. For the online game Quizizz (fig. 16), all participants generally agreed it is helpful for recognising staff notation, and two-thirds of them highly and completely agreed with it. They thought the explanations after each question helped them for further understanding. But they claim that the time limit mechanism may make them nervous and anxious, and it is easy to make mistakes. Most of them thought that the game was interesting and only 7% found it less interesting. In addition, 73% highly believe that the mechanism of redemption is a good aid in consolidating knowledge.

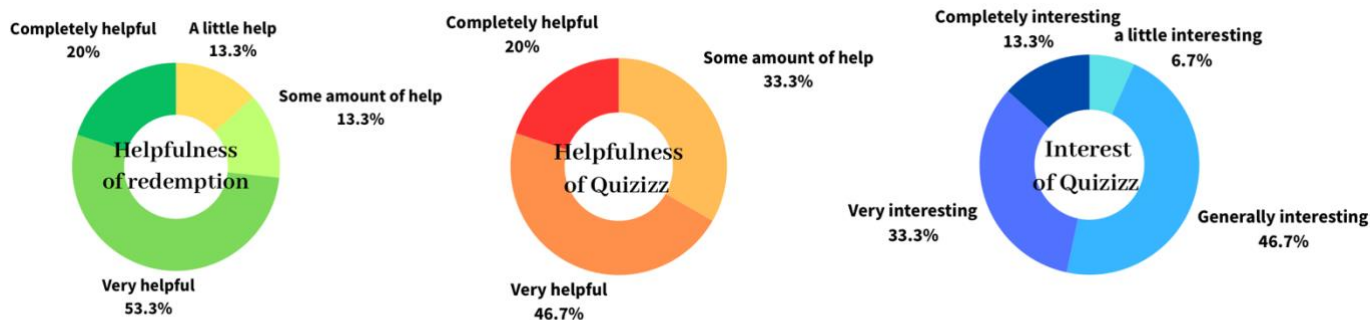


Fig. 16 The opinions about Quizizz

In conclusion, 67% highly satisfied with the teaching material, while the rest (33%) completely satisfied (fig. 16). The reason why it is rated so highly is because they think the teaching method is simple and direct, with clear graphics

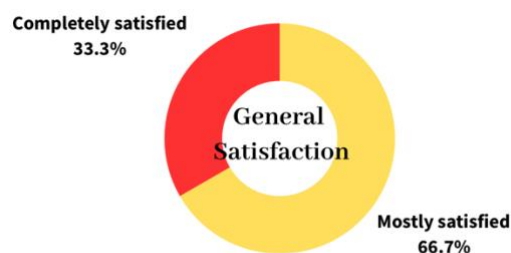


Fig. 16 The degree of general satisfaction of the teaching material

and text with a lot of interaction. Most of them prefer the learning method of illustrations (73%) and Online game (73%). 47% like the text explanation part and etudes (40%) is at least participants preference. For the whole set of teaching material, participants recommended some adjustments: more progressive exercises can be added, the number of questions of online game can be increased and a teacher's guideline can be made to improve the effectiveness.



## Chapter 5: Findings

### 5.1 Difficulties encountered between two notations

Through literature review and interviews with teachers and students in stage 1, the difficulties learners encountered in converting numbered musical notation to staff notation can be listed out. The first thing is about the arrangement of numbers in numbered musical notation and octaves of strings in Zheng design. As Zheng was originally designed for the pentatonic scale, five strings in an octave, so it does not perfectly match heptatonic scale, resulting in the inability to systematically connect lines and spaces in staff notation. In addition, the upside-down direction between string arrangements and staff notation makes it more confusing.

This problem has existed for a long time but still has not been solved, mainly because there is lack of textbooks and supporting learning materials and also lack of systematic learning procedure.

### 5.2 Influence of Solfège System

As Zheng players use solfeggio to label strings, the influence of the solfeggio system in Zheng learning is great. Although fore-mention of the differences on movable-do system and fixed-do system, it is said that “using both numbered musical notation and staff notation in Zheng teaching is feasible” (陶, 1992). In addition, Gu and Meng argued that regardless of the fixed-do or movable-do system, it should be taught in C major first. It is because C major is played the same way in both systems. This method can help to enhance both relationships on the scale degrees in the movable-do system and the tonality of the fixed-do system.

### 5.3 Effectiveness of Different Background Participants

The result of this project shows that adults have the best performance, followed by secondary school students and primary school students. Adults can learn on their own, but younger people may need more support and guidelines. Through the online game and questionnaire, it has been found that participants who have experience in staff notation have a better performance. The years of learning Zheng also influence the effectiveness of learning staff notation, as participants will get less distraction on the rhythm and fingerings. Furthermore, they can also recognise the solfeggio and the correct melody in videos through hearing. Lastly, the learning method of teaching material also influences the effectiveness of learning. There are two participants whose Zheng teachers use this teaching material to teach them. Both of them get full marks in the online game and have better feedback on questionnaires.

## Chapter 6: Conclusion

To sum up, the teaching material has positive feedback. However, there are some parts that require modifications, such as the level design of etudes and online games.

There are some recommendations for further development. Firstly, about Exercise, for example, etudes can be added more and should be careful on the step-by-step learning design. Secondly, teaching material can include more information, like mini games after every section and fingerings for etudes. The time limit mechanism in Quizizz can be canceled, as participants reported that this mechanism makes them nervous and anxious, and easy to make mistakes. Lastly, a teacher guideline is recommended for learners who are at a young age.

For the recommendations for other researchers who may continue further study on this project. It is better to conduct a study in a separate age group as different age groups have different learning needs. In addition, this project can be moved to an advanced level, such as in other majors, like common majors used in Zheng, D major and G major. Last but not least, as this project only focuses on recognising pitch notation, it can be further developed with other music elements, for instance, rhythm and harmony.

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44.

## Chapter 8: Appendix

### 8.1 Interview questions for Teachers (Stage 1)

As the interview was conducted in Cantonese, the questions were written in Chinese.

1. 請簡述您學習古箏樂譜的過程，學習什麼樂譜先？什麼後？
2. 您認為這是（內地/臺灣）普遍的教學方法嗎？
3. 在您來香港之後，教學方式有變得不一樣嗎？有什麼不一樣？
4. 您認為在香港普遍學習古箏用簡譜還是五線譜？為什麼？
5. 您認為學生在學習五線譜時會遇到甚麼難題？
6. 請問您如何幫助學生解決轉譜的問題？
7. 您因為兩種樂譜對於學習古箏有什麼優缺點？

### 8.2 Interview questions for Students (Stage 1)

As the interview was conducted in Cantonese, the questions were written in Chinese.

1. 請問你學習古箏的年資？
2. 請問你剛開始學習古箏，是用五線譜或簡譜學習？（簡譜續答第3題，五線譜續答第5題）
3. （簡譜）請問你學習多久後才開始接觸五線譜？
4. 請問你接觸五線譜的原因？
5. 請問你學習五線譜時，有沒有使用額外輔助工具？
6. 你認為學習五線譜的主要困難是什麼？
7. 請問你如何解決困難？

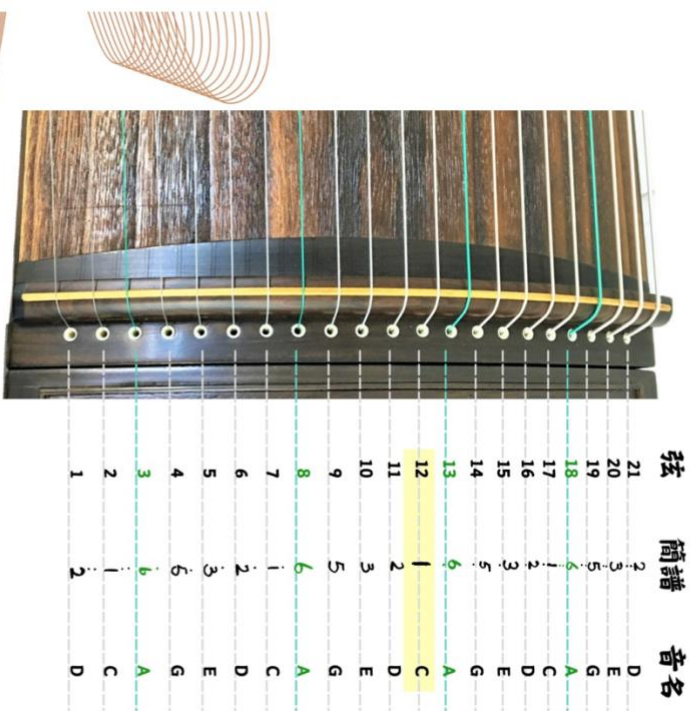


## 8.3 Teaching Material (Chinese version)



## 簡譜 C大調

學習五線譜之前，應該先熟悉簡譜C大調的彈奏位置。中音1應定在12弦，定弦請參照下圖。

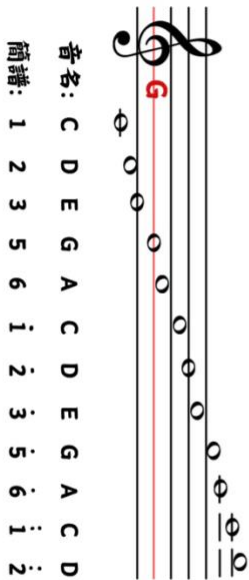


弦	簡譜	音名
21	?	D
20	3	E
19	5	G
18	4	A
17	1	C
16	2	D
15	3	E
14	5	G
13	6	A
12	1	C
11	2	D
10	3	E
9	5	G
8	6	A
7	1	C
6	2	D
5	3	E
4	5	G
3	6	A
2	1	C
1	2	D

## 課節 (一)

### 五線譜 高音譜號

高音譜號，又稱為G譜號，是以開始畫譜號的第一線為名。和古箏弦線排列次序相反，是往上高音，往下低音的記譜法，主要用於右手記譜。



音名: C D E G A C D E G A C D

簡譜: 1 2 3 5 6 i 2 3 5 6 i 2

## 固定唱名

學習固定唱名，能更好地學習五線譜演奏。固定唱名是指唱名：do, re, mi, fa, sol, la, ti 與音名C, D, E, F, G, A, B 一一對應，無論使用哪一個調，唱名都是絕對的。

以C大調為例，C=do, D=re, E=mi... 如此類推。而到了D大調就會從D=re開始，然後E=mi, F#=fa(fe), A=la 和B=ti, E大調則由mi開始唱。整體來說，彈句調對唱名並沒有影響，但唱音音高必須與真實音高一致。

音名：C D E F G A B C D E F G A B C D  
唱名：do re mi fa sol la ti do re mi fa sol la ti do re

非空弦音，需要按音

### C調練習曲-高音譜號

#### 練習曲（一）右手練習

d d d d r d l s    l l l l d l s m  
 s s s s l s m r    m m m m s m r d  
 r r r r m r d l    d d d d r d l s

蘇凱兒編

掃碼或  
點擊看示範

#### 練習曲（二）右手練習

l s m r d d    m r d l s s  
 s l s l d r m s    l s m r d d

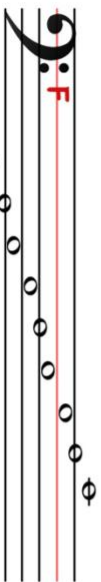
參考自〈滄海一聲笑〉



課節 (二)

# 五線譜 低音譜號

低音譜號，又稱為F譜號，是以開始畫譜號的第四線為名。次序與古箏弦線排列相反，主要用於左手記譜。

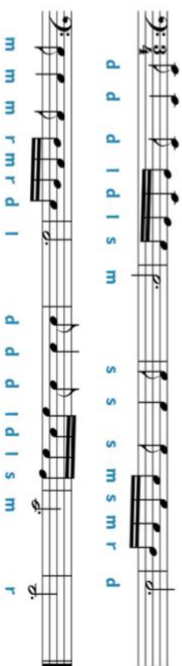


音名: D E G A C D E G A C  
唱名: re mi sol la do re mi sol la do



## C調練習曲-低音譜號

### 練習曲 (三) 右手練習



蘇凱兒編

掃碼或  
點擊看示範



### 練習曲 (四) 右手練習



參考自〈將軍令〉



### 課節 (三)

分譜號練習後，現在試試雙手彈奏。右手在彈上五線，多以高音譜號標記，左手則彈下五線，多以低音譜號標記。

#### 練習曲 (五) 雙手練習

參考自〈小城故事〉

### 測試時間

相信大家對五線譜有了一定程度的認識，現在我們玩一個小遊戲去測試大家的學習程度，請掃描或點擊以下QR code 開始遊戲~



感謝各位抽空嘗試使用此教材，請各位掃描或點擊以下QR code 並填寫問卷，讓我收集數據，以幫助教材修改，謝謝。



## 8.4 Teaching Material (English version)



# Zheng Easy Staff Notation

Hoi Yi So

## Preface

Since the 1980s, Zheng performance has entered a new stage. To fulfill the need of contemporary music composing and ensemble with western musical instruments, Zheng music is becoming more and more common to use staff notation system. In Hong Kong, numbered musical notation is mostly used in Zheng teaching. Due to the different requirements of numbered musical notation and staff notation, Zheng students often encounter problems when converting from numbered musical notation to staff notation. This teaching material is compiled as a study of Zheng learning in staff notation. Through texts, diagrams, videos and games, I hope it can help users to learn basic knowledge of staff notation.

This teaching material can be divided into three lessons, each lesson takes about 20 minutes, totaling 1 hour. All content is based on C major, supplemented by learning of Fixed-do solfeggio system. There are etudes and online games after lesson. It can help to consolidate the knowledge of staff notation through various aspects of learning.

Hoi Yi So



## Numbered Musical Notation C Major

Before learning staff notation, you should first be familiar with the playing positions of C major. Middle “Do” should be set on the 12th strings. Please refer to the figure below for tuning.

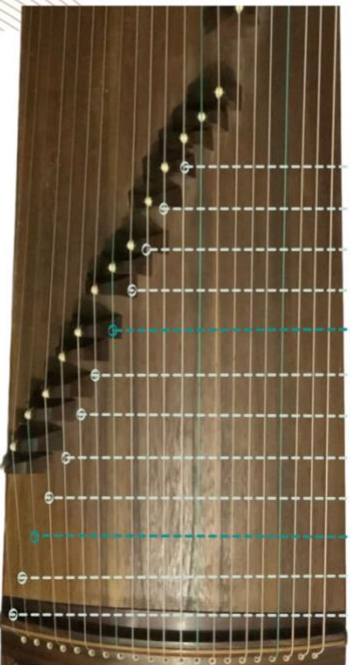
String	Numbered musical notation	Letter name
21	2	D
20	3	E
19	5	G
18	6	A
17	1	C
16	2	D
15	3	E
14	5	G
13	6	A
12	1	C
11	2	D
10	3	E
9	5	G
8	6	A
7	1	C
6	2	D
5	3	E
4	5	G
3	6	A
2	1	C
1	2	D

## Lesson 1

### Treble Clef

The treble clef, also known as the G clef, is named by first line which the clef begins. Contrary to the arrangement of the Zheng strings, the notation is for high notes going up and bass notes going down. It is mainly used for right-hand playing.

Letter name: C D E G A C D E G A C D  
 Numbered musical notation: 1 2 3 5 6 1 2 3 5 6 1 2





# Fixed-do System

Learning Fixed-do system can help you play better with the staff notation. Fixed-do system refers to the **Solfeggio**: do, re, mi, fa, sol, la, ti, corresponds one to one with the **Letter name**: C, D, E, F, G, A, B. No matter which keys is used, the solfeggio will be absolutely the same.

For example, in C major, C=do, D=re, E=mi...and so on. When it comes to D major, it starts with D=re, then E=mi, F#=fa(ffe), A=la and B=ti. In E major, it starts with E=mi. Generally speaking, the key played has no effect on the solfeggio, but the pitch of singing must be consistent with the real pitch.

Letter name: C D E F G A B C D E F G A B C D  
 Solfeggio: do re mi fa sol la ti do re mi fa sol la ti do re

Non-open string, require pressing



## Treble clef: C major etude

### Etude 1 (Right Hand Version)

### Etude 2 (Right Hand Version)

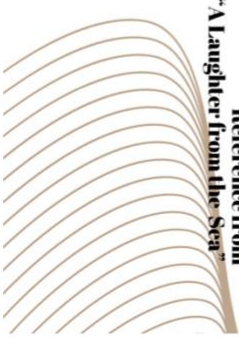
Scan it or  
Click it for Demo



Arranged by  
Ho Yi So



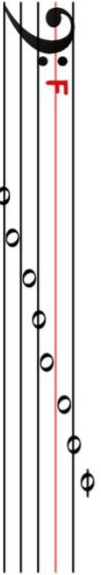
Reference from  
"A Laughter from the Star"



## Lesson 2

### Bass Clef

The bass clef, also known as the F-clef, is named by the fourth line which the clef begins. The order is opposite to that of the Zheng strings, and it is mainly used for left-hand part.

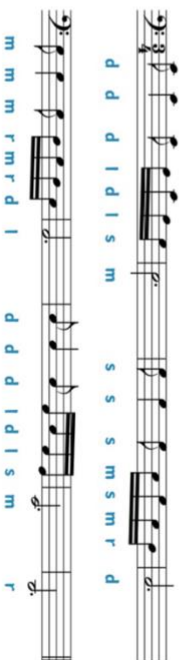


Letter name: **D E G A C D E G A C**  
 Sofegáio: **re mi sol la do re mi sol la do**



### Bass clef: C major etude

#### Etude 3 (Right Hand version)



Scan it or  
Click it for Demo



Arranged by  
Hoi Yi So

#### Etude 4 (Right Hand version)



Reference from  
"The General's Mandate"



## Lesson 3

Now that you have practiced the Clef respectively, try playing with both hands. The right hand plays the upper five lines, usually marked in treble clef, while the left hand plays the lower five lines, mostly marked in bass clef.

### Etude 5 (Both Hands version)

The musical score for Etude 5 consists of five systems of two staves each. The first staff of each system is in treble clef and the second is in bass clef. The music is written in 2/4 time and features a simple melodic line in the right hand and a supporting bass line in the left hand. The systems are numbered 6, 11, 16, and 20.

Reference from  
"The Story of a Small Town"

## Quiz Time

I believe everyone has a certain understanding of staff notation. Now let's play a small game to test your learning level. Please **Scan** or **Click** the following QR code to start the game~



Thank you for taking the time to try this teaching material. Please [Scan](#) or [Click](#) the QR code below and fill out the questionnaire so that I can collect data to help modify the teaching material. Thank you.



## 8.5 YouTube videos

All YouTube videos are made by my own for support the etude exercise. Videos' subtitle is all written in Chinese.

Etude 1: [https://youtu.be/h-Dk\\_WcSopE?si=z30hxi3AT1w9Cy66](https://youtu.be/h-Dk_WcSopE?si=z30hxi3AT1w9Cy66)


Etude 2: <https://youtu.be/91Z9x761mYE?si=NRy8xVEn67BZeMc2>

Etude 3: <https://youtu.be/CUPadcgIUlA?si=G7uQHAlpelng8qA->

Etude 4: <https://youtu.be/RLGWqhRuGts?si=rOjruD7Sy4YFZC-->

### 8.6 Questions and details in Quizizz

js8esj1zst  
apple\_user



Easy: What clef is this?


程度：簡單  
請問左圖是哪個譜號？

Tenor clef 次中音譜號	Treble clef 高音譜號	Alto clef 中音譜號	Bass clef 低音譜號
---------------------	---------------------	-------------------	-------------------

js8esj1zst  
apple\_user

2

js8esj1zst  
apple\_user



Easy: What clef is this?

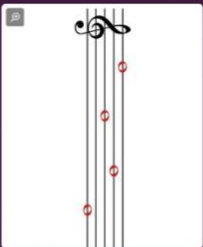
程度：簡單  
請問左圖是哪個譜號？

Tenor clef 次中音譜號	Bass clef 低音譜號	Alto clef 中音譜號	Treble clef 高音譜號
---------------------	-------------------	-------------------	---------------------

js8esj1zst  
apple\_user

1

js8esj1zst  
apple\_user



General: Please list the letter names from left to right

程度：普通  
請從左至右列出左圖音名。

A D F G	B G F D	D G C A	F B D E
---------	---------	---------	---------

js8esj1zst  
apple\_user

4

js8esj1zst  
apple\_user



General: Please list the letter names from left to right

程度：普通  
請由左至右列出左圖音名。

D G C A	G B D C	F B E C	D G F A
---------	---------	---------	---------

js8esj1zst  
apple\_user

3

General: Please list the letter names from left to right

程度：普通  
請從左至右列出左圖的音名。

A E D C F

A E F E C

C G F E A

A C G B D

5

Less hard: Please list the solfeggio from left to right

程度：較難  
請從左至右寫出左圖的固定唱名。

re sol mi do la mi

do sol mi sol re fa

mi la fa re ti re

fa ti sol mi do sol

6

Less hard: Please list the solfeggio from left to right

程度：較難  
請從左至右寫出左圖的固定唱名。

mi la do fa ti

sol do mi la re

la do mi sol re

mi sol la sol do

7

Hard: Please list the letter name and solfeggio from left to right

程度：難  
請從左至右列出左圖的音名及唱名。

G D E A B F  
sol re mi la ti fa

B F G A D A  
ti fa sol la re la

B F E A B F  
ti fa sol la re fa

B F E A B F  
ti fa mi la ti fa

8

js8k5j125t  
apple\_user

0/0 0:00 遊戲時間

名稱：A G E B C

程度：簡單級別  
請按左圖音名找出相對應的樂譜。

Devil: Please find the corresponding score by the letter name on the left

9

js8k5j125t  
apple\_user

0/0 0:00 遊戲時間

唱名：do mi la sol re do

程度：簡單級別  
請按左圖唱名找出相對應的樂譜。

Devil: Please find the corresponding score by the solfeggio on the left

10

js8k5j125t  
apple\_user

0/0 0:00

重啟遊戲會獲得額外分數，請嘗試選擇。

Redemption

11

js8k5j125t  
apple\_user

0/0 0:00

排名	題目	分數
1	Mr. Paperman	8750
2	Isabelle Keener	8300
22	The Dude	4980
23	Natural Mess	4980
24	js8k5j125t apple_user	1760

Ranking system

12



## 8.7 Questions in online questionnaire

**古箏：輕鬆學習五線譜 Zheng: Easy staff notation**

感謝各位抽空嘗試使用此教材，並填寫問卷，以幫助數據收集和教材修改，謝謝！

未共用

Thank you for taking the time to try to use this teaching material and fill out the questionnaire to help with data collection and design modification, thank you!

\*表示必填問題

1. 請問你屬於哪個年齡層？\*

A. 小學生

B. 中學生

C. 成年人 (19-59 歲)

D. 60歲或以上

1. Which age group do you belong to?

A. Primary school students

B. Secondary school students

C. Adults (19-59 years old)

D. 60 years old or above

2. 請問你學習古箏多久了？\*

A. 初學不到一年

B. 2年至5年

C. 6年至8年

D. 9年或以上

2. How long have you been learning Zheng?

A. Less than a year

B. 2-5 years

C. 6-8 years

D. 9 years or more

3. 請問你曾經接觸過的記譜系統？\*

A. 簡譜

B. 五線譜

C. 工尺譜

D. 二四譜

3. Which notation system have you ever been used?

A. Numbered musical notation

B. Staff notation

C. Gongche notation

D. Esi notation

4. 請問你學習簡譜多久了？\*

A. 初學不到一年

B. 2年至5年

C. 6年至8年

D. 9年或以上

4. How long have you been studying numbered musical notation?

A. Less than a year

B. 2-5 years

C. 6-8 years

D. 9 years or more

5. 請問你在哪些方面接觸過五線譜？\*

A. 從來沒有

B. 在學校學過 (例如音樂堂)

C. 學習西樂樂器

D. 學習合唱團

E. 學習除古箏以外的中樂樂器

其他: \_\_\_\_\_

5. In which ways have you used staff notation?

A. Never

B. Learn in school (such as music lesson)

C. Western musical instruments

D. Choir

E. Chinese instruments other than Zheng

6. 你認為每課節20分鐘學習時長是否適中？\*

A. 時間太短

B. 時間適中

C. 時間太長

6. Do you think 20 minutes of study time per lesson is enough?

A. Too short

B. Enough

C. Too long

7. 使用教材後，你認為你對簡譜認識的使用及其位置認識程度增加了多少？\*

A. 很少，不理解

B. 增加少量認識

C. 增加一半認識

D. 增加大部份的認識

E. 已經全部認識

7. After using the teaching material, how much do you think you have understand on the use of treble clef and its position?

A. Very little, don't understand

B. Some understand

C. Half understand

D. Mostly understand

E. Completely understand

8. 使用教材後，你認為你對低聲閱讀的使用及其位置認識程度增加了多少？\*

8. After using the teaching material, how much do you think you have understand on the use of **Bass clef** and its position?
- A. 很少，不理解
- B. 增加少量認識
- C. 增加一半認識
- D. 增加大部份的認識
- E. 已經全部認識
- A. Very little, don't understand
- B. Some understand
- C. Half understand
- D. Mostly understand
- E. Completely understand

9. 使用教材後，你認為你對固定唱名認識程度增加了多少？\*

9. After using the teaching material, how much do you think you have understand on the use of **fixed-do system**?
- A. 很少，不理解
- B. 增加少量認識
- C. 增加一半認識
- D. 增加大部份的認識
- E. 已經全部認識
- A. Very little, don't understand
- B. Some understand
- C. Half understand
- D. Mostly understand
- E. Completely understand

10. 你認為視聽額外提供的影片 (紅色QR code) 有對學習有幫助嗎？\*

10. Do you think the videos (Red QR code) provided for etudes are helpful for learning?
- A. 完全沒有幫助
- B. 有少許幫助
- C. 有適量的幫助
- D. 有很好的幫助
- E. 非常有幫助
- A. Not helpful at all
- B. A little help
- C. Some amount of help
- D. Very helpful
- E. Completely helpful
- others: \_\_\_\_\_

11. 承上題，請問你對影片的看法？\* 11. Continuing with the previous question, what is your opinion on the videos?

您的答案 \_\_\_\_\_

12. 你認為教材設計簡潔，文字精煉嗎？\* 12. Do you think the design of teaching material is concise?

- A. 非常不同意
- B. 有一些同意
- C. 一般同意
- D. 大部份同意
- E. 非常同意
- A. Strongly disagree
- B. Some agreement
- C. General consent
- D. Mostly agree
- E. Strongly agree

13. 承上題，請問你對教材設計的看法？\* 13. Continuing with the previous question, what is your opinion on the design of teaching material?

您的答案 \_\_\_\_\_

14. 你認為五線譜視奏練習程度合適嗎？\* 14. Do you think the level of etudes is appropriate?

- A. 非常不同意
- B. 有一些同意
- C. 一般同意
- D. 大部份同意
- E. 非常同意
- A. Strongly disagree
- B. Some agreement
- C. General consent
- D. Mostly agree
- E. Strongly agree

15. 承上題，請問你對五線譜視奏練習的看法？\* 15. Continuing with the previous question, what is your opinion on the design of etudes?

您的答案 \_\_\_\_\_

16. 你認為線上小遊戲是否能夠幫助你增加對五線譜的認識？\*

16. Do you think online games can help you increase your understanding of staff notation?
- A. 非常不同意
- B. 有一些同意
- C. 一般同意
- D. 大部份同意
- E. 非常同意
- A. Strongly disagree
- B. Some agreement
- C. General consent
- D. Mostly agree
- E. Strongly agree



17. 承上題，請問你對線上小遊戲的意見？ \* 15. Continuing with the previous question, what is your opinion on the online game?  
您的答案 \_\_\_\_\_

18. 在遊戲中，把答錯的題目再重做一次 (Redemption) 的機制，你認為有幫助嗎？ \* 18. In the game, do you think the redemption mechanism is helpful?  
 A. 完全沒有幫助  
 B. 有少許幫助  
 C. 有適量的幫助  
 D. 有很好的幫助  
 E. 非常有幫助  
 其他： \_\_\_\_\_

19. 承上題，這個機制你認為有趣味嗎？ \* 19. Continuing with the previous question, do you think this mechanism is interesting?  
 A. 完全沒有趣味  
 B. 有少許趣味  
 C. 一般有趣味  
 D. 比較有趣味  
 E. 非常有趣味  
 其他： \_\_\_\_\_

20. 在使用教材時，你比較喜歡哪種學習方式？ \* 20. When using teaching material, which learning method do you prefer?  
 文字解釋  
 圖示  
 視聽練習  
 線上小遊戲  
 A. Text explanation  
 B. Diagrams  
 C. Etudes  
 D. Online game

21. 你認為這個教材做得最好的地方是？ \* 21. Which part do you think is the best of this teaching material?  
您的答案 \_\_\_\_\_

22. 你認為這份教材最需要改進的地方是？ \* 22. Which part do you think needs the most improvement of this teaching material?  
您的答案 \_\_\_\_\_

23. 總體來說，你滿不滿意這份教材？ \* 23. Overall, are you satisfied with this teaching material?  
 A. 非常不滿意  
 B. 有些滿意  
 C. 一般滿意  
 D. 大部份滿意  
 E. 非常滿意  
 A. Very dissatisfied  
 B. Somewhat satisfied  
 C. Generally satisfied  
 D. Mostly satisfied  
 E. Very satisfied

提交

請勿透過 Google 表格提交密碼。

這個表格是在 seahki.hk of The Education University of Hong Kong 內建立。 刪除表格

Google 表格

Thank you everyone for completing the questionnaire

