https://doi.org/10.36007/4973.2024.23

DIFFICULTIES OF CHINESE VOWEL FINALS - A STUDY ABOUT HUNGARIAN LEARNERS AND TEACHERS

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Abstract
Until now there are very few studies on difficulties of Chinese vowel finals from the perspective of Hungarian learners of Chinese, and no significant analysis on difficulties of Chinese vowel finals from the perspective of Chinese teachers. Therefore, this paper aims to fill that gap. Questionnaire had been used to investigate views of Hungarian learners of Chinese, and interviews in case of Chinese teachers. This study found that Hungarian learners of Chinese do not think Chinese vowel finals are difficult, but their teachers think some vowel finals are difficult for them like [ɤ]/[ɿ]/[ʅ] and round vowel finals [y, uo, ou]. Chinese teacher's attitudes to their students' errors may cause differences in perceptions. The general factors behind the difficult vowel finals might be the interactions between native Hungarian and target Chinese orthography, native Chinese input and individual differences.
Keywords
Chinese language learning, Chinese vowel finals, Hungarian learners of Chinese

1. INTRODUCTION

Mandarin Chinese (Chinese will be used hereafter) has been the official language of the People's Republic of China for a few decades, which is used in schools and universities and on national radio and television broadcasts (Duanmu, 2007:4). Chinese teaching was introduced to Hungary in the 1950s (Józsa, 1987), and Chinese education is getting more and more important among foreign languages in Hungarian language education. In 2011, as a possible second foreign language, Chinese officially has been introduced to the Hungarian secondary school graduation examination system (Li *et al.*, 2021). In 2016, Chinese in Hungary was promoted from an optional second foreign language to a possible first foreign language (Li, 2020). The number of Chinese learners in Hungary has also experienced a change from single digits to thousand digits over the decades (Simay & Fan, 2020), so Chinese phonetics and phonology related research in Hungary is becoming more and more important. The present research aims to investigate difficulties of Chinese vowel finals for adult Hungarian learners of Chinese, using a questionnaire to Hungarian learners of Chinese and interviews with their Chinese teachers. The results of the interviews and the questionnaire could build on the potential initial results for further empirical research and help to create a more focused perception test and production test later.

1.1 Chinese vowel system

Chinese is typically classified as an analytic or isolating language in which each morpheme is usually a word (Lin, 2007, p.4). In modern Chinese, 95 percent of morphemes are monosyllabic (Chen, 1999, p.138-9). There is almost a one-to-one relationship between morphemes

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and syllables, and it is sometimes said that conditions for syllable structure and for morpheme structure are hard distinguish (Battistella, 1987).

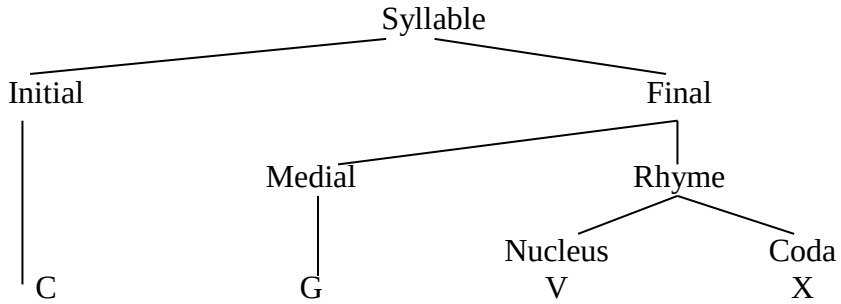
1.1.1 Chinese syllables

Syllable boundaries are clear in Chinese, while the possible inventory of syllable types is small.

Table 1: The syllable inventory of Chinese (disregarding tone) (Examples in the table are from Lin 2007, p. 107)

V	[ɤ] ‘hungary’	GV	[ja] ‘duck’	CGV	[two] ‘many’	CGVG	[xwai] ‘bad’
		VG	[aj] ‘love’	GVG	[jɑu] ‘medicine’		
		CV	[ma] ‘horse’	GVC	[jɛn] ‘salt’		
		VC	[an] ‘peace,safe’	CVG	[lai] ‘come’	CGVC	[xwan] ‘to exchange’
				CVC	[lan] ‘blue’		

I have made one minor adjustment in the symbols: Lin used GVV, CVV and CGVV - I have changed it to GVG, CVG and CGVG respectively. In Table 1, V refers to vowel, G refers to glide, and C refers to consonant. In traditional Chinese phonetic or phonological analysis, the initial and the final are regarded as the main constituents of syllables. In this research I retain the syllable as a convenient way of referring to the combination of an initial and a final (Figure 1). A syllable tree is always used to represent Chinese syllables.



(V is vowel, G is glide, C is consonant, X = C or G)

Figure 1 The traditional analysis of the Chinese syllable (Lin 2007, p.107)

The initial is the beginning of non-glide consonant of a syllable, and the final is the rest of the syllable after the initial consonant. In Chinese syllables only nucleus V is compulsory. Prevocalic glide is limited to [j], [w] and [ɥ] and postvocalic glide is limited to [j] or [w]. Vowels are associated with nuclear position, and glides are associated to some non-nuclear position. Medial is preceding nucleus, and a rhyme can be filled by a single nuclear vowel with an optional coda which can be a consonant or a glide. There is an alternative way to represent three glides, in the following sections [i], [u] and [y] will be used to represent [j], [w] and [ɥ] respectively. The reason to use the initial and the final like this is that Chinese textbooks for non-native speakers also follow this model to introduce Chinese sound system. The present

study only focuses on vowel finals: monophthongs V, diphthongs GV, VG and triphthongs GVG.

1.1.2 Chinese vowels

In addition to the so-called retroflex vowel and apical vowels, the vowel inventory of Chinese phonemes seemed to be generally accepted as /a, ə, i, u, y/ (e.g. Duanmu, 2007, p. 47; Lin, 2007, p. 82), at least as the basis for further discussions on controversial details. The most difficult problem in any appropriate description of the Chinese vowel system lies in the treatment of allophones of these phonemes. There is a jumbled phonetic realization of Chinese vowel phonemes. The possible variants of the mid vowel /ə/ have been proposed to be the following (Table 2): [o], [ə], [ɤ], [e], [E] (Xu, 1980, p. 33). ([E] denotes a vowel that is higher than [ɛ], but lower than [e], i.e. [e̝]).

Table 2: variants of the mid vowel /ə/ in Chinese

Variants	Examples	Environment
[ɤ]	[kɤ] *'song'*	In open syllables, not after a labial or a palatal
[e]	[kei] *' give'*	Before [i]
[ə]	[mən] *'door'*	Before [u], [n] or [ŋ]
[o]	[uo] *'I'*	In open syllables, after labials
[E]	[iE]	In open syllables, after palatals

However, most scholars do not distinguish [E] and [e] (Chao, 1968; Cheng, 1973; Lee & Zee, 2003; Zhu, 2010, p. 307), and they write [e] for both cases. Second, the allophone [ə] before [u], which is generally transcribed as [o] (e.g., Duanmu, 2007, p. 55; Lin, 2007, p. 71), since nucleus and coda have the same feature [back] in Chinese. Duanmu (2007, p. 60) proposed a constraint for this phenomenon:

Rhyme Harmony: Nucleus and Coda cannot have opposite values in [round] or [back].

*[+back][-back], *[-back][+back],
*[+round][-round], *[-round][+round]

Thus, the present study assumes that there are four variants [o], [ə], [ɤ], [e] for the mid vowel phoneme.

Then the possible variants of the low vowel have also been proposed (Table 3): [a], [ɑ], [A], [ɐ], [æ] (Xu, 1980, p. 33).

Table 3: variants of the low vowel /a/ in Chinese

Variants	gloss	Environment
[a]	[k^{h}ai] *'open'*	In closed syllables, before [n] or [i], and not after a palatal
[ɑ]	[lɑu] *'old'*	In closed syllables, before [u] and [ŋ]
[A]	[pA]'eight'	In open syllables
[æ]	[iæn] 'salt'	In closed syllables, before [n] and after [j]
[ɐ]	[yɐn] 'round'	In closed syllables, before [n] and after [ɥ]

Chao (1968) wrote about [æ] as [ɛ]. However [A], [ɐ], [æ] and [ɛ] are not shared by other studies (e.g., Lee & Zee, 2003; Zhu, 2010, p. 307), all these four variants are written as [a]. The present study also assumes that there are two variants [ɑ] and [a] for the low vowel phoneme.

As for high vowels, three distinct phonemes /i/, /u/ and /y/ have three corresponding semivowels (glides) respectively. Meanwhile there are debates about variants of /i/. Cheng (1966) assumed that the two apical segments [ɿ] and [ʅ] are derived from the underlying high front

vowel /i/. Since [ɿ] and [ʅ] are in complementary distribution with the high front vowel [i], [ɿ] only occurs after dentals [ts,ts^{h},s], [ʅ] only occurs after retroflexes [tʂ, tʂ^{h}, ʂ, ɻ], and [i] occurs in other environments. However, the phonological category and behavior of the two apical segments [ɿ] and [ʅ] are still subject to debate. Some scholars regard them as syllabic fricatives [z] and [ʐ̩] (Chao, 1968; Wiese, 1997; Duanmu, 2007). The other proposal is the approximant account, in that [ɿ] and [ʅ] are written as [ɹ] and [ɻ] respectively (Lee-Kim, 2014). In this study, I adhere to the traditional Chinese phonological analysis, so I treat them as apical vowels (Cheng, 1966; Cheng, 1973).

In addition to the vowels mentioned above, in Chinese there is a so-called retroflex vowel final [ɚ], which has been variably transcribed as [əɹ], [ɹ], or [ɚ] (Lin, 2007, p. 80) and [əɚ] (Lee & Zee, 2001). I follow the transcription of Lee & Zee (2001), since it has been proved that the formant trajectories for this so-called retroflex vowel in the V syllables is a sequence of [ə] and [ɚ]. [əɚ] is not allowed to spell with any consonant initials, such as [əɚ]"son". It can also be combined with a syllable before it, forming a retroflex syllable, for example [paɚ] 'handle' is combined by [pa] and [əɚ]. [əɚ] is not included in vowel finals in the present study.

1.1.3 Chinese vowel finals

Considering in 1.1.2, the Chinese vowel finals' transcription of the present study are shown in Table 4.

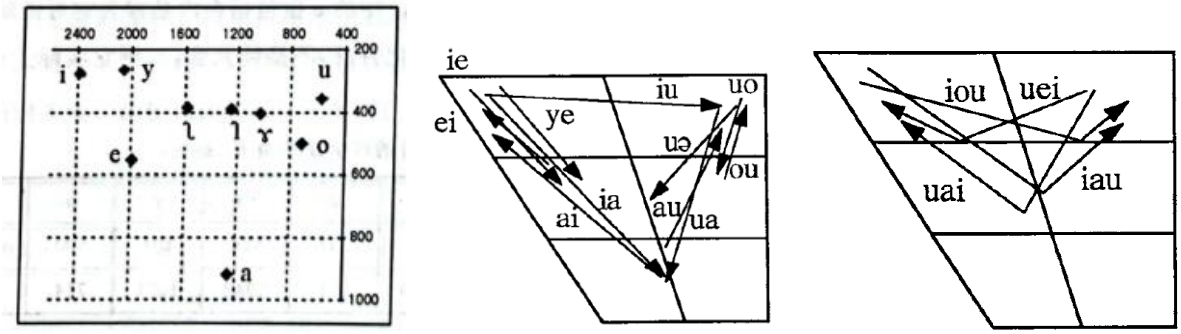
Table 4: Chinese vowel finals

a	ia	uɑ	*ya
ai	*iai	uai	*yai
ɑu	iɑu	*uɑu	*yɑu
ɤ	ie	uo	ye
ei	*iei	uei	*yei
ou	iou	*uou	*you
[ɿ] ,[ʅ]	i	u	y

Duanmu (2007, p. 55) argues that there is one more vowel final [iai] "cliff" in Chinese, which is a literary word and sometimes being pronounced as [ia] or [ai]. But this final is not tested by other scholars (e.g., Lin 2007, p. 288; Liu, 1958, Lee & Zee, 2003). The present study does not include [iai]. Furthermore, [uo] after labial consonant is transcribed as [o] by Zhu (2010, p. 268), but when Chinese phonetic alphabet (Pinyin) was formulated and published, it was clearly explained that [o] after labial consonants is the province of [uo] (Lin & Wang, 2013, p. 233). Thus, the actual pronunciation of <o> is [uo]. Words or letters inside <> are graphemes.

In conclusion, there are altogether 20 vowel finals in Chinese, and their acoustic patterns are shown in the vowel charts (Figure 2).

Figure 2: acoustic patterns of Chinese vowel finals (left: Zhu, 2010, p. 268; mid and right: Lee and Zee, 2003)



There is only one minor adjustment between Table 4 and Figure 2: the low vowel occurs before or after round back vowel [u] is transcribed as [a] by Lee and Zee (2003) however I have used [ɑ] instead. [uə] and [iu] in Figure 2 only occur in nasal finals, thus these two sounds are not included in present study.

In Chinese vowel systems, there is a regular nonoccurrence of certain types of finals like /iai, uao,jəi, uəu, yai , yau , yəi, yəu/, they are all interpretable as the result of dissimilation of the medial and the ending vowels. OCP (Obligatory contour principle) was applied to these triphthongs by Wiese (1997). There can be no adjacent identical feature specifications for at least the so-called melodic features, which is proposed by Leben (1973). Based on this assumption, it turns out that a violation of the OCP occurs not only for those triphthongs with two identical vowels, but also triphthongs including /y/, since /y/ is marked underlyingly both for labiality and for front position. Then if one excludes high vowels in Table 4, we can see the almost complete complementary distribution of sounds with respect to finals, the clear parallelism of occurrence between finals with the low vowel phoneme /a/ and those with the mid vowel phoneme /ə/. The only exception is <ya>, and its nonoccurrence is due to historical change (Hashimoto, 1970).

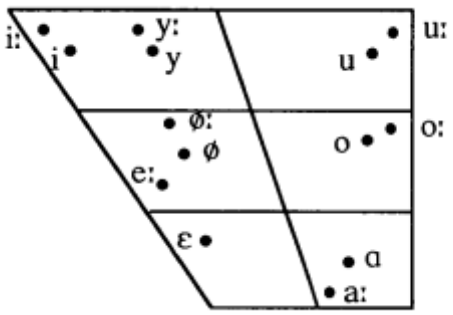
1.1.4 Comparison between Chinese and Hungarian vowels

In comparison to Chinese, Standard Hungarian (Hungarian will be used hereafter) has fourteen vowels, which can be characterized as:

i[i]	e[ɛ]	ü[y]	ö[ø]	u[u]	a[ɑ]	o[o]
í[i:]	é[e:]	ű[y:]	ő[ø:]	ú[u:]	á[ɑ:]	ó[o:]

Basing on the acoustic data of Szende (1994), we can see the distribution of Hungarian basic vowels in Figure 3.

Figure 3: Acoustic features of Hungarian vowels



First, compared to Chinese, Hungarian vowels are distinguished by length which is different from Chinese. Moreover, Hungarian has no mid vowel [ɤ] and apical vowels [ɿ], [ʅ].
Second, there are no diphthongs and triphthongs in Hungarian. But Hungarian is rich in hiatus, Hungarian vowel sequences are not constrained by [+high][-high] or [-high][+high], because [+high][+high] like ui, iu and [-low][low] like eá are all well-formed. Furthermore, Hungarian is rich in round vowel sequences like [yɔ], [oɔ], [uo], [uɔ] etc. (Siptár & Törkenczy, 2000, p. 123-124).
Ye & Bartos（2017）did a phonetic comparison between Chinese and Hungarian vowel sequences, and they distinguish two kinds of vowels: continuous vowel and compound vowel (Table 5).

Table 5: Vowel Sequences of Hungarian and Chinese

Name	Tongue-position feature	Type	Loudness/Strength
continuous vowel (Hungarian)	fixed	VV	equal
compound vowel (Chinese)	slide	Vv	not equal
		vV	
		vVv	

Lower case "v" is used to represent glides. Table 5 mainly shows the phonetic differences between Chinese and Hungarian vowel sequences. Ye (2013) states that a compound vowel is a part of a syllable and cannot be divided, and a continuous vowel occurs when two vowels appear side by side in a sequence with their own characteristics. The duration of the two sides is the same, they can be divided into two syllables. In other words, a continuous vowel means a hiatus, a compound vowel means a diphthong or a triphthong.
Table 5 does not show the phonological differences between Chinese and Hungarian. In addition to the parallelism of occurrence between finals with the low vowel phoneme /a/ and with the mid vowel phoneme /ə/. Phonologically Chinese imposes certain restrictions on the way segments are distributed. [ɿ] only occurs after [ts,ts^h,s], [ʅ] only occurs after [tʂ, tʂ^h, ʂ, ɻ]. Chinese high back vowel [u] only co-occur with [k, k^h, x], [ts, ts^h, s] and [tʂ, tʂ^h, ʂ, ɻ]. But a high front vowel [i, y] are only allowed to co-occur with palatals [tɕ, tɕh, ɕ]. Chinese high vowels [i, u, y] and corresponding high glides show similar distributional effects. Mid vowel [ɤ] is not allowed to occur after labials [p, p^h, m, f] and palatals [tɕ, tɕ^h, ɕ]. In contrast, phonologically there are no special restrictions between an initial consonant and the following vowels in Hungarian, generally a single initial consonant does not need to relate to the nature of the vowel that occurs in the following position, an initial position almost displays a maximal inventory of contrasts. Thus, syllables like [ki, tsi, sy, fy, ty] are all well-formed in Hungarian. Siptár & Törkenczy (2000, p. 9) state that 'Principle of Free Cooccurrence' appears to be true in Hungarian phonology, and constraints on the formation of syllables seem to apply to subsyllabic constituents but do not to the constituent syllable itself. 'Principle of Free Cooccurrence' means that a syllable is composed of any well-formed onset followed by any well-formed rhyme.

1.2 Theoretical background

The native language (L1) has an influence over the way in which second language (L2) learners perceive the speech sounds of the target language (TL), especially among those who acquired it in their late years (Barrientos, 2023). Adults consistently faced challenges in perceiving and producing many foreign phonetic segments (Strange, 1995). In the Contrastive Analysis Hypothesis (CAH) framework, Lado stated this clearly: individuals tend to transfer the forms and meanings, and the distribution of forms and meanings of their native language and

culture to the foreign language and culture. Those elements that are similar to the native language will be simple - and those elements that are different will be difficult. (Lado, 1957, p. 2, cf: Gass *et.al*., 2020). A few studies have examined the production of L2 vowels by adults who were first exposed to their L2 either in childhood or in late adolescence or early adulthood. These studies have shown that an influence of the first language (Ll) vowel system is often readily apparent in late learners' production of L2 vowels, especially in early stages of learning (Major, 1987; Munro, 1993, cf: Flege, 2004).

Contrastive Analysis between L1 and L2 lacks any explanation of order of acquisition because it lacks theoretical foundation to predict which areas might cause greater challenges than others. Investigators have invoked markedness to explain different levels of proficiency and order of acquisition. Eckman (1977) proposed the Markedness Differential Hypothesis (MDH), which was based on a phonological theory of markedness, progressing from the least marked (easiest) language types to most marked (most difficult). In the Markedness Hypothesis Framework, the focus lies not in denying the significance of transfer, but in determining the principles that form the basis of its utilization.

Eckman (1977) states that: The areas of difficulty that a second language learner will have can be predicted on the basis of a comparison of the L1 and target language (TL). Those areas of the TL that are different from the native language (NL, which is equal to L1 in this context) and are relatively more marked than in the NL will be difficult, and the degree of difficulty associated with those aspects of the TL that are different and more marked than in the NL corresponds to the relative degree of markedness associated with those aspects.

Thus, the MDH assumes that L2 learners can apply or transfer those structures that has been already acquired in the native language to the target language, and the level of difficulty will correspond to the relative degree of markedness of that structure.

CAH and MDH did not involve the effect of orthographic input on speech perception and speech production. Previous psycholinguistic research has illustrated that word recognition can be influenced by orthography (Perre & Ziegler, 2008; Taft, 2001) and that orthography plays a role in phonemic awareness (Cheung *et.al*., 2001; Tyler & Burnham, 2006). L2 orthographic input interacts with the acoustic input, shaping learners' mental representations of L2 phonology, and for instructed learners, orthography-induced pronunciations might form a component of the acoustic input (Bassetti, 2008). A crucial aspect of written information involves orthographic depth, which differs among the alphabetic writing systems of the world's many languages. Orthographic depth can be defined as the degree how much an alphabetic system deviates from simple one-to-one grapheme-to-phoneme correspondences (Van den Bosch *et.al*., 1994). It is conceptualized along a transparent-to-opaque continuum. The transparent end of this continuum features languages with unambiguous and simple phoneme-to-grapheme correspondences, thus the ideal case of this is when each phoneme (sound) corresponds to a singular grapheme (letter or combination of letters) (Erdener *et.al*., 2005).

In Hungarian, the writing system of vowels is based on the Latin system and has very regular phoneme-to-grapheme correspondences. Each letter corresponds to a single sound, and the phonemic interpretation of a letter does not vary with context. Hanyu Pinyin, often just abbreviated to Pinyin, is the foremost romanization system for Chinese. Pinyin in contrast is characterized by its deviation from relatively consistent phoneme-to-grapheme correspondences. Thus, compared to the Hungarian writing systems, Chinese is opaque. Hungarian learners are assumed to rely more on the orthographic input.

Contrastive analysis hypothesis (CAH) predicts difficulties about native language influences mainly based on L1 phonological distinctions, Markedness Differential Hypothesis (MDH) also takes into account markedness differentials. Comparable to the CAH and MDH, the re-

vised Second Language Speech Learning Model (SLM-r) have been characterized as not only being based on L1 phonological distinctions, but predictions about native language of this model have considered the importance of non-contrastive phonetic similarities and dissimilarities between L1 and nonnative L2 phones as well (Flege, 2021). The revised SLM-r aim to provide a better understanding of how the phonetic systems of individuals reorganize in response to the phonetic input. According to the SLM-r, the quantity and quality of L2 input obtained for the sound in meaningful conversations is an important factor for the formation of a new phonetic category for an L2 sound. Individual differences also may modulate phonetic category formation for an L2 sound by affecting how much L2 phonetic input is needed to pass from one stage to the next.

The present research attempt to investigate how each of the predictions can match the perceptions of Hungarian learners of Chinese and their teachers.

1.3 Previous research on Chinese vowel finals of non-native Chinese learners

In previous literature about Chinese language learning by non-native Chinese learners, Wei (2021, p. 4-5) states that [ɿ], [ʅ] and [y] are the most difficult monophthongs for Nigerian students. Nigerian learners of Chinese are more likely to mix hiatus with Chinese diphthongs except [uo]. While Japanese students also have problems with high vowels. [i] is often pronounced as [y], and [ɿ], [ʅ] are pronounced as [i] (Zhao, 2003). Mongolian students also have the same problems with [ɿ], [ʅ], [i], and they also mix Chinese [y] with Chinese [u] and [iou]. Besides high vowels, Mongolian students also have problems with other vowels, for example, mid vowel [ɤ] and [o] are pronounced as Mongolian [θ] and [ɔ] respectively (Zhang, 2008). Yang (2005) states that [y] is difficult for Vietnamese students because of the mouth shape, and they couldn't distinguish [ou] and [uo] as well.

Like other non-native Chinese language learners, Hungarian learners of Chinese also have difficulty in pronouncing Chinese vowel finals. There are several studies on this matter. Zhang (2015) conducted a study on the pronunciation of Hungarian learners of Chinese in which 18 (5 male + 13 female) Chinese learners from Károli Gáspár University participated. Another research about the pronunciation of Hungarian learners of Chinese was Jia's (2017) study. Participants were 42 Chinese learners from ELTE Confucius Institute. In their research, all the participants are university students, and according to their data, Hungarian learners of Chinese made most mistakes for [ɤ] sound, the error rate was 71.67% and 70.26% respectively. Furthermore Zhang (2015) also produced a questionnaire for her students, and learners mentioned in the questionnaire that the most difficult Chinese vowel final for them to pronounce correctly were [ɤ] sound as well. Juhász (2020) comparing formant patterns between 5 native Chinese speakers and 10 native Hungarian speakers of Chinese, 10 Hungarian particiapates are divided into two groups, a beginner group and an advanced group. She tested the production of [ɤ], [ɿ] and [ʅ]. The results show that the velar [ɤ] Hungarian learners produced is significantly different from Chinese native speakers. However [ɿ] and [ʅ] were close to the native pronunciation without significant difference between native Chinese speaker and native Hungarian speaker of Chinese.

Therefore, in the previous studies on Hungarian learners of Chinese, it was found that [ɤ] was commonly recognized as the vowel final which learners made most mistakes in their pronunciation. And from learners' point of view, [ɤ] was also the most difficult vowel final to be pronounced for them. However, in these previous studies, the sample range was only limited to two institutes, and the sample sizes of questionnaires were small which raises issues about the generalization of these findings. In addition, there has not been further investigations of

the problems with vowel finals of Hungarian learners of Chinese from the perspective of teachers. Therefore, I would like to fill the gap.

1.4 Research questions

The research questions in this research are the followings:

I. To what extent is the perception of Hungarian learners of Chinese of their ability to pronounce Chinese vowel finals different from the perception of their teachers?

I.1 What are the vowel finals Hungarian learners of Chinese think most difficult to pronounce?

I.2 What are the vowel finals Chinese teachers think most difficult to pronounce?

II. What can be the general factors behind the difficulty of Chinese vowel sounds?

2 RESEARCH DESIGN

In order to know the views of Hungarian learners of Chinese, an adapted version of the questionnaire from Fan & Myintzu (2022) was designed based on the 20 vowel finals (See the questionnaire in Appendix A). In the questionnaire, <o> is listed, since in Chinese textbooks [puo, p^huo, muo, fuo] is shown like <bo, po, mo, fo>. I assume that Hungarian learners' specific experience with the transparent orthography primed them to pay more attention to orthography signals.

There was an assumption in this study that the views of Hungarian learners of Chinese on their ability to pronounce Chinese vowel finals is different from their teachers. Qualitative interviews could provide a better understanding to this topic. I have conducted interviews with Chinese and Hungarian teachers who are teaching Chinese from all the major education institutes of Hungary where students learn Chinese. This sample provides an understanding of similarities in the Chinese language learning process. The qualitative interviews can help to understand which types of problems may occur and especially what kinds of pronunciation issues teachers face more often. Interviews may also illustrate which kinds of problems are felt to be more general, and what types of interference that teaching professionals feel significant between Hungarian and Chinese languages, if they feel any. However, both the questionnaire and the qualitative interview research do not allow generalizations about the experimental data, but they can provide a more detailed picture about the research topic.

2.1 Participants

107 respondents completed the questionnaire from 8 universities and 4 Confucius Institutes in Hungary providing Chinese courses. The respondents' Chinese language level ranges from HSK 1 (A1) to HSK 6 (C2). A data set was constructed for the responses received from the Hungarian learners of Chinese.

20 teachers (10 native Chinese and 10 Hungarian teachers of Chinese) participated in the interviews. Thus, there were altogether 127 participants (107 learners and 20 teachers) in the sample. Among the 10 native Chinese teachers, two of them could speak Hungarian fluently, and another four had basic proficiency of Hungarian, but the others could not speak Hungarian. Among the Hungarian teachers of Chinese, five of them did not have a degree of second language teaching, but they had many years of Chinese teaching experience. All these teachers had at least 4 years' teaching experience of Chinese language to non-native Chinese learners. All the interviews were conducted in Chinese.

2.2 Materials and Methods

After designing the questionnaire (Appendix A), it was distributed online or within physical classrooms to the Hungarian learners of Chinese. After collecting learners' responses to the

questionnaire, factor analysis was used to categorize the difficulty groups. Factor analysis of perceived difficulty of Chinese sounds was supported by both Bartlett's test and the KMO measure of sampling adequacy. The sample size was the 107 respondents who filled the questionnaire.

Mean score was used to measure the perceived difficulty level. In the questionnaire, a seven-point Likert scale has been used, in which 1 = "no difficulty at all", 2 = "very easy", 3 = "somewhat easy", 4 = "neutral", 5 = "somewhat difficult", 6 = "very difficult", 7 = "extremely difficult"), was used to investigate to what extent each vowel final was considered to be difficult by learners to pronounce.

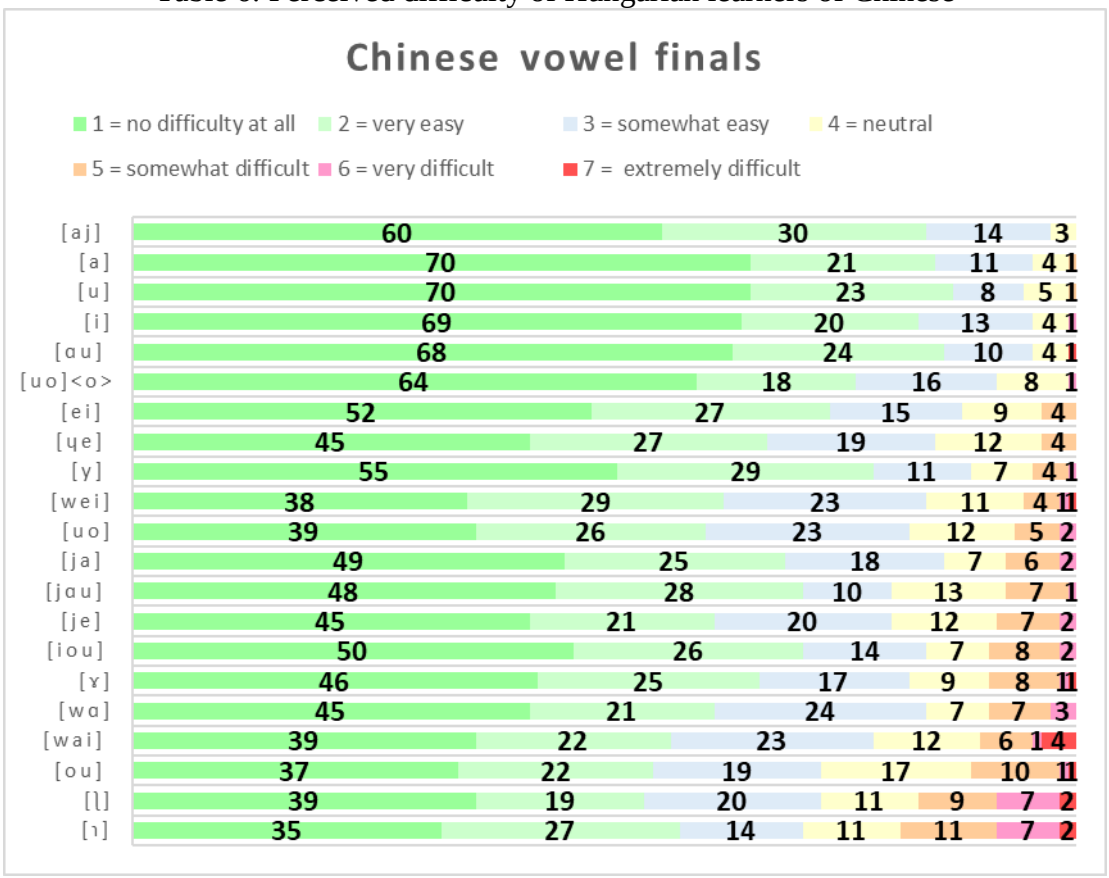
Then, semi-structured interviews were conducted with teachers to investigate of the teachers' points of view on Hungarian learners' ability to pronounce Chinese vowel finals. The interview questions were based on teachers' experiences on Chinese language teaching to Hungarian learners of Chinese and teachers' educational background (See the English translation of the interview guide in Appendix B.). The vowel finals which teachers thought Hungarian learners of Chinese were most likely to mispronounce were from the interview notes.

3 RESULTS

3.1 Perspectives of Hungarian learners of Chinese on their ability to pronounce Chinese vowel finals

Hungarian learners' responses about their perceived difficulties in learning the pronunciation of Chinese vowel finals can be seen in Table 6.

Table 6: Perceived difficulty of Hungarian learners of Chinese



Based on the results of the questionnaire, among Chinese vowel finals 21 out of 107 (20%) learners in the study thought that [ou] was difficult to pronounce. 20 out of 107 (19%) learners thought that [ɿ] and [wai], 19 out of 107 (18%) learners thought that [ɤ], and 18 out of 107 (17%) learners thought that [ɻ] was difficult to pronounce. The factor analysis of the questionnaire showed that Hungarian learners of Chinese divided Chinese vowel finals into four difficulty groups: (i) [ɤ]/[ɿ]/[ɻ]; (ii) four triphthongs and diphthong [ye]; (iii) monophthongs [a, i, u, y] and diphthongs [uo] (occurs after labials), [ai], [ɑu]; (iv.) the remaining diphthongs [ou], [wo], [ja], [wɑ], [ei], [je]. The analysis was supported by Bartlett's test which showed significance, and the analysis was also supported by the 0,887 KMO value, which can be considered very good. The 4 factors (groups) explained 72% of the total variance, and it is not worth adding more factors to explain a higher level of total variance, as any additional factors' Eigen values would have been less than 1.
In Table 6 considering mean scores among the 20 Chinese vowel finals, there were no vowel finals that Hungarian learners of Chinese found difficult to pronounce. All of them had a mean score which was less than 3.5, and most of them are less than 3. Thus, the mean score is not shown here.

3.2 Perspectives of Chinese teachers on Hungarian learners' ability to pronounce Chinese vowel finals

First, from teaching professionals' point of view, fifteen out of twenty participating teachers mentioned that [ɤ] has different kinds of problems. Two teachers mentioned that some learners pronounce Chinese [ɤ] as Hungarian [e], for example, when the students saw德[tɤ] 'Germany', they pronounce it as [te]. Five teachers mentioned that students always confused [ɤ] with [ɿ]/[ɻ], for example: one teacher participant said the students cannot distinguish [tʂɻ] and [tʂɤ]. As for [ɿ]/[ɻ], another three teacher participants also mentioned that learners pronounce them as Hungarian [i]. For example, one teacher participant said:
"[ɤ] is very difficult. Also, when the students start learning [ɤ], [ɤ] is pronounced as Hungarian [e]. But after the beginning period, this substitution problem will no longer exist. However, the problem of confusion with the Chinese apical sound [ɿ]/[ɻ] is more serious. This problem still exists after the primary stage."
Second, fourteen out of twenty teacher participants mentioned [ou] and [uo] have mixed problems, for example, when the students would like to say [kou] 'dog' and [xəntuo] 'many', they pronounce them like [kuo] and [xəntou] respectively. One teacher said "confusion of [uo] and [ou] is common in sentences, e.g. [wo tou xen ɕixwan] 'I like them all' is said as [wo tuo xen ɕixwan]. And one teacher said "The problem of [tuo] and [tou] is obvious, many times they pronounce [tou] as [tuo], because they misremember them, misremember is their problems". Another teacher participants also said:
"There is a problem with [tuo] 'many' and [tou] 'all'. I think there is something wrong with the connection between Chinese characters and Pinyin. I don't know why, and I don't know the reason, but they often change [tou] 'all' to [tuo] 'many'. On the one hand students mix [uo] and [ou], sometimes they cannot differentiate between them very obviously, but on the other hand, sometimes they can't tell the difference between them, and I don't know the reason. I really do not know. I do not think our mother tongue is the reason. I think it's the Pinyin and Chinese characters in the mind. Because we learn them at the same time. But it's a mystery to me."
Therefore, it seems that Hungarian learners of Chinese generally pronounce Chinese [ou] as [uo]. But several teachers emphasized this problem is only serious for beginners.

Third, four teacher participants reported [y] has some problems. Three of them said "they mispronounce [y], because they did not grasp the spelling rule of Pinyin" and one of them said "they mispronounce [y] because the mouth shape is not good."
In the study another interesting result is the teachers' attitudes towards students' pronunciation errors. Seven out of twenty teacher participants mentioned that they are more tolerant while correcting pronunciation errors. One teacher said:
"I usually do not correct the students individually. When the students repeat what I said and answer the questions, I will not interrupt the students because of pronunciation problems. I will not tell the problem of my students' pronunciation, because I believe an adult knows where their problems are, and I don't need to correct those. And I don't think that perfect pronunciation exists, so I don't do anything if it isn't necessary to correct it."
Seven other teachers mentioned that they would correct the learners if there were pronunciation problems. But after correcting them, if the same errors are made by the same student, they would still use the positive words like "it has become much better". Thus, these Chinese teachers' feedback to students' pronunciation problems is positive and affirmative.
Only six teachers mentioned they are strict about pronunciation errors. They would correct the errors until the student could pronounce the sound correctly. But they also emphasized the importance of self-esteem and self-confidence of students.

4. DISCUSSIONS

4.1 Difficulty of Chinese vowel finals from perspectives of Chinese teachers and their students

First, in the study, it was found that the teachers' views on the Hungarian learners' ability to pronounce Chinese vowel finals was different to some extent from the learners' views on their own difficulties to pronounce Chinese vowel finals. Based on the results of the questionnaire, all vowel finals had the mean score less than 3.5, in most cases less than 3. Thus, generally Hungarian learners of Chinese do not think Chinese vowel finals are difficult to pronounce. However, their teachers mentioned that [ɤ] is easy to be mixed with [ɳ] or [ɭ] by their students, round vowels [uo] and [ou] are always mixed by the learners, and the students generally pronounce [ou] as [uo] etc. Fifteen out of twenty participating teachers mentioned that [ɤ] has different kinds of problems, but only 18% of Hungarian learners thought that [ɤ] was difficult to pronounce. Fourteen out of twenty participating teachers said that round vowel sequences [ou] was problematic to Hungarian learners of Chinese. In contrast, only 21 out of 107 Hungarian learners thought that [ou] was difficult to pronounce. In addition, eight out of twenty participating students said that [ɳ] and [ɭ] can be problematic for Hungarian learners of Chinese and two Chinese teachers also mention [y] and [u] are mixed by these learners. As for the discrepancy between Hungarian learners of Chinese and their teachers, it may be explained by the teachers' attitudes towards students' pronunciation errors. In pronunciation, if the teachers do not correct errors or they avoid negative words for their students' pronunciation problems, then the students might think that it is the correct pronunciation, or they do not think Chinese sounds are difficult for them. Therefore, different views of Chinese vowel finals between Hungarian students and their Chinese teachers can be explained to some extent.
Second, the views of [ɤ] from Chinese teachers are in line with the previous literature review. Hungarian learners of Chinese do not think Chinese vowel finals are difficult, but they treat [ɤ], [ɳ] and [ɭ] as the same difficulty group.
Third, some teachers mentioned that [ɳ] and [ɭ] are reported to be mixed with [ɤ], so this result strengthened the results of Juhász (2020). She states that Hungarians produced the [ɤ] in a

more acoustically palatalized manner than Chinese native speakers, in other words, they may mix the mid vowel [ɤ] and the high vowels [ɿ]/[ʅ].
Fourth, the present study also found that round vowels are mentioned by Chinese teachers to be difficult for Hungarian learners of Chinese. Based on previous literature, Chinese round vowel finals are difficult for Vietnam students as well.

4.2 General factors behind the difficulty of Chinese vowel sounds

First, it is apparent that the phonology of the native Hungarian language comes to exert substantial influence on the perception and production of Chinese vowels by Hungarian learners of Chinese.
It is reasonable that [ɤ] and [ɿ], [ʅ] make problems for Hungarian learners of Chinese, since Hungarian doesn't have these sounds in its vowel systems, and these three sounds are marked vowels. Furthermore [ɤ], [ɿ] and [ʅ] have no phoneme-to-grapheme correspondences in Chinese as well. In Chinese, <e> represents /ə/, therefore [ə], [ɤ], [e], and <i> represent /i/, therefore [j], [i], [ɿ] and [ʅ], but in Hungarian <e> represents /ɛ/, therefore [ɛ], and <i> represent /i/, therefore [i]. This result can be explained both by CAH and MDH, and it can also be predicted by orthographic depth.
In addition, one native Chinese teacher who could speak Hungarian mentioned that even though students know apical vowels [ɿ] and [ʅ] are not high front vowel [i], they still use [i] to pronounce [ɿ] and [ʅ]. Another reason of confusion of [i], [ɿ] and [ʅ], may be because of that in Hungarian syllables, CV sequence is relatively freer than Chinese, it is reasonable that Hungarian learners make these kinds of sounds like [tsi], [ty], [ki], etc. which are not well formed in Chinese.
Chinese teachers also mentioned that Hungarian learners substitute [ou] with [uo], it may be because the Hungarian language is rich in round vowel hiatus, but there is no [ou]. Furthermore, Hungarian language has no diphthongs. Thus, it is reasonable that Hungarian learners of Chinese substitute [ou] with [uo].
Hungarian has no triphthongs, it is reasonable that Hungarian learners of Chinese regarded triphthongs as the same difficult group. Chinese [ai], [ɑu] are accessed as the same difficulty group with monophthongs [a, i, u, y]. Based on previous research, there is a tendency that [ai] and [au] become monosyllables in Chinese (Wang, 2008), and Hungarian has no diphthongs, thus it is predictable that these two vowels are preferred to be assessed as the same difficult group with monophthongs.
Second the phonological/phonetic similarity/dissimilarity between Hungarian and Chinese based on CAH and MDH analysis cannot explain the difficulty [y] by Hungarian learners of Chinese. But it could be explained by the interactions of orthography input between native Hungarian and target Chinese. There are no phoneme-to-grapheme correspondences for round vowel finals [y] and [uo] in Chinese, both <o> and <uo> can represent [uo], both <u> and <ü> can represent [y], but in Hungarian <o>, <uo>, <u> and <ü> represent [o], [uo], [u] and [y] respectively. Thus, the same letters represent different vowel sounds in Chinese and Hungarian, because of this, Hungarian learners of Chinese need to reinterpret them. [y] in Chinese after palatals [tɕ, tɕ^h, ɕ] are written as <u>, but in Hungarian <u> is transparently spelled as [u]. Several participating tutors mentioned these spelling rules of Pinyin created pronunciation problems for Hungarian learners of Chinese. The same sound [uo] received different marks in Table 6, and diphthong [uo] <o> occurred after labials is accessed as the same difficulty group with monophthongs [a, i, u, y]. From these results, we can infer that Hungarian learners very likely treat Chinese [uo] <o> as [o] in Hungarian. If the student did not grasp the special spelling Pinyin rules of [buo, puo, muo, fuo] <bo, po, mo, fo>, it can be expected that Hun-

garian learners of Chinese regard [buo, puo, muo, fuo] as [bo, po, mo, fo]. Thus, this result proved the interaction between Hungarian language and Chinese orthography.
Finally, the assumptions of SLM-r are in line with the opinions of Chinese teachers. All ten Hungarian teachers of Chinese admitted the importance of native teachers of Chinese input for Pinyin learning, in other words the quality of the input is needed. And all teachers suggested the students should do different kinds of listening practice to experience varied pronunciation from different kinds of Chinese speakers. Two Hungarian teachers of Chinese also said that in order to get adequate input, the students should study in China for a while. So, the quantity of native input is also needed. In addition to the quantitative and qualitative input, the Chinese teachers also mentioned individual differences can influence Chinese Pinyin learning, "language aptitude, language sense, personality" were all mentioned.

5 CONCLUSIONS

In the study I found that there are different views about difficulty of Chinese vowel finals between Hungarian learners of Chinese and their teachers. Most Chinese teachers mentioned that [ɤ] is difficult for their students, and [ɤ] is often mixed with [ŋ]/[ɳ], the round vowel [ou] is generally pronounced as [uo] especially when the students start to learn Chinese. However Hungarian learners of Chinese think that they do not have any difficulty to pronounce Chinese vowel finals, the discrepancy can be explained by the lack of feedback provided by their teachers on their pronunciation errors. Also, the general factors behind the difficulty of Chinese vowel sounds for Hungarian learners of Chinese can be the interactions between native Hungarian and target Chinese orthography, native Chinese input and individual differences.
All the findings concerning this research can be used for teaching Chinese vowels and learning for Hungarian students. The most efficient materials are those that are based upon a scientific description of the language to be learned, carefully compared with a parallel description of the native language of the learner (Fries, 1945). Hopefully some further empirical research will enable the better analysis of the possible effects, for example to form a perceptional vowel test or a production vowel test.

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Appendix A

Questionnaire to investigate the perception of Hungarian learners of Chinese for their ability to pronounce Chinese vowel finals.

Amikor a kínai nyelvet tanulja, akkor az alábbi hangok megtanulása általában mennyire szokott nehéznek bizonyulni? Kérem, minden piros hanghoz ill. hangkapcsolathoz adja meg az Ön tapasztalata szerinti nehézségi fokot számértékkel egy 1-7 skálán, ahol 1 = "egyáltalán nem jelent nehézséget", 2 = "nagyon könyű",3= "kicsit könyű",4 = "semleges",5= "kicsit nehéz",6= "nagyon nehéz",7= "rendkívül nehéz"

Nem:	□Férfi □Nő
Mennyi ideje tanul kínaiul (hónap):	

When you learn Chinese, how difficult is it to learn the following sounds in general? For each red sound please choose the degree of difficulty based on your experience, the scale is from 1 to 7, where 1 = "very, very easy", 2 = "very easy",3= "easy",4 = "not easy not difficult",5= "difficult",6= "very difficult",7= "very, very difficult"

Sex:	□Male □Female
How long have you learned Chinese (months):	

1.	b/p/g/k/d/t/zh/ch/z/c + **ɑ**	1	2	3	4	5	6	7
2.	b/p/m/f + **o**	1	2	3	4	5	6	7
3.	g/k/h + **e**	1	2	3	4	5	6	7
4.	b/p/g/k/d/t/j/q/y + **i**	1	2	3	4	5	6	7
5.	j/q/x/d/t/n/l + **ie**	1	2	3	4	5	6	7
6.	j/q/x/d/t/n/l + **iɑ**	1	2	3	4	5	6	7
7.	b/p/g/k/d/t/zh/ch/z/c/w + **u**	1	2	3	4	5	6	7
8.	d/t/n/l/g/k/h/zh/ch/sh/r/z/c/s + **uo**	1	2	3	4	5	6	7
9.	g/k/h/zh/ch/sh/r/z/c/s + **uɑ**	1	2	3	4	5	6	7
10.	j/q/x/l/n/y + **ü**	1	2	3	4	5	6	7
11.	j/q/x/y + **üe**	1	2	3	4	5	6	7
12.	n/l/g/h/zh/sh/b/p/m/f/z + **ei**	1	2	3	4	5	6	7
13.	d/t/n/l/g/k/h/zh/ch/sh/r/z/c/s + **ou**	1	2	3	4	5	6	7
14.	d/t/n/l/g/k/h/zh/ch/sh/r/b/p/m/f/z/c/s + **ɑi**	1	2	3	4	5	6	7
15.	d/t/n/l/g/k/h/zh/ch/sh/r/b/p/m/f/z/c/s + **ɑo**	1	2	3	4	5	6	7
16.	j/q/x/d/t/n/l + **i(o)u**	1	2	3	4	5	6	7
17.	j/q/x/d/t/n/l + **iɑo**	1	2	3	4	5	6	7
18.	d/t/g/k/h/zh/ch/sh/r/z/c/s + **u(e)i**	1	2	3	4	5	6	7
19.	g/k/h/zh/ch/sh/r/z/c/s + **uɑi**	1	2	3	4	5	6	7
20.	zh/ch/sh/r + **i**	1	2	3	4	5	6	7
21.	z/c/s + **i**	1	2	3	4	5	6	7

Appendix B

Sample interview questions for the semi-structured interviews with teachers

1. 请问，您在匈牙利教汉语教多长时间了？您是否会说匈牙利语？
How long have you taught Chinese in Hungary? And do you know Hungarian?
2. **您的学**历及专业是什么？
What is your educational qualification and major?
3.**您是怎么教授**语音的？音节到声韵母到字母，还是声韵母到音节，还是字母到声韵母到音节？还是其他？为什么？
How do you teach Pinyin? On a syllabic basis, or from initials and finals to syllables, or from letters to initials and finals to syllables? Or any other way? Why? For example, “ge” is a syllable, “g” and “e” are an initial and a final respectively.
4.
您觉得哪些元音韵母或者字母对学生来说最难，换句话说，学生最容易出错？为什么？**您能具体描述一下**吗？(**比如找不到**发音位置，混淆，或者发得不好)
Which vowel finals are the most difficult to teach, in other words, which are the ones learners always make mistakes? And why, how would you describe the problems and difficulties? (For example, they miss the articulation place, or they mix them up, or they pronounce something inappropriately)
5. **您**对纠音怎么看？
Do you think the pronunciation errors by learners should be corrected? Why or why not?
6.
您觉得哪些因素会影响到学生的汉语语音学习？比如学生的专业、学生知道更多语言等。为什么？
Which factors could influence the students' Chinese learning, particularly on their perception and pronunciation?
7. Do you teach Pinyin together with a Hungarian（Chinese） teacher? How to influence Pinyin learning of the students (perception and production)?
您和匈牙利老师或者中国老师一起教学生语音？您觉得会对学生的语音学习产生哪些影响(**听辨与**发音)**？**
8. Do you have any further suggestion on Chinese language teaching and learning for pronunciation?
对于汉语语音教学与语音学习您是否还有其他建议？