PHONETIC FLOODING: IMMERSING L2 MANDARIN LEARNERS IN TONE MINIMAL PAIRS/QUADRUPLES WITH AMBIGUOUS CONTEXT TO FORCE NOTICING AND ENHANCE LEXICAL ENCODING OF TONE

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L2 learners perceive and produce tones with above-average accuracy (Hao, 2012) but still demonstrate difficulties in recognizing words due to toneless word representations in their mental lexicon (Pelzl, Lau, Guo, & Dekeyser, 2020). L2 learners appear to rely on the interpretability of "toneless words" through semantic or grammatical contexts (Patel, Xu, & Wang, 2010). To promote lexical tone encoding, in this Teaching Tip, beginning L2 Mandarin learners are completely immersed early on in tone minimal pairs (e.g., hua1 *flower* : hua4 *picture*; song1shu3 *squirrel* : song1shu4 *pine tree*). Input is flooded with tone minimal pairs or quadruples of common words with similar frequencies and identical grammatical categories, while simultaneously reducing or completely eliminating contextual clues. This approach forces learners to focus on tones to understand meaning where successful accomplishment of tasks hinges on target-like tones (Gatbonton & Segalowitz, 1988). Furthermore, the input features High Variability Phonetic Training (e.g., phonetic environment, multiple speakers, Logan, Lively, & Pisoni, 1991) and contextual variation (passages vs words/minimal pairs, Labov, 1972). Listening activities include modified children's games and TPR, while production activities feature games, information gaps, and more, centered on tone minimal pairs/quadruples. These activities are scaffolded with explicit instruction about pitch height, pitch direction, and secondary cues (e.g., length).

Keywords

Tone, lexical encoding, pronunciation pedagogy, phonetic flooding, repetition with meaning, tone minimal pairs/quadruples

INTRODUCTION

Mandarin Chinese features minimal tone quadruples or quintuples (cf., minimal pairs). There are four tones in Mandarin: High-level tone: 八 bā "eight"; rising tone: 拔 bá "to pull out"; dipping tone: 把 bǎ "handle"; and falling tone: 爸 bà "father". Additionally, Mandarin has a "toneless" syllable (e.g., neutral or light tone 轻声/輕聲 *qīngshēng*) as in 吧 ba "sentence-final particle offering a suggestion" as in "let's VERB." As such, given the high functional load of tones in Mandarin, learners cannot avoid hearing tones nor producing them. We, however, suggest a more controlled exposure to help L2 learners to perceive, produce, and encode L2 Mandarin tones, particularly for learners whose L1 phonological system does not feature tones. Specifically, we advocate a pronunciation pedagogical approach we call "phonetic flooding"

or "tone flooding" early in the learning process. That is, learners should be flooded with minimal tone quadruples/quintuples in ambiguous contexts, requiring learners to be aware of and focus on accurate perception and production of tones in order to understand meaning.

The following teaching tip aims to support instructors and learners of Mandarin Chinese as a second language in understanding and implementing tone flooding by covering the following:
      1) Mandarin tones and their characteristics
      2) Impact of tones in Chinese culture
      3) Second language perception and production of tones
      4) Approach to the tone flooding pronunciation pedagogical framework

TEACHING GUIDELINES

Mandarin tones and their characteristics

Mandarin tones can be designated by tone numbers, description, tone type, diacritics and Chao (1948) numbers as seen in Table 1.

Table 1
Common references to Mandarin tones (adapted from Chao, 1948, p. 25)

Tone number	Description	Tone type	Diacritics	Number
Tone 1	High-level	Flat	ō̇	55
Tone 2	Rising	Contour	ó̇	35
Tone 3	Falling-rising, dipping	Contour	ǒ̇	214
Tone 4	Falling	Contour	ò̇	51
Tone 0	Neutral tone, toneless	NA	ȯ	NA

However, the four Mandarin tones can vary in their phonology from their phonetic characteristics. That is, simply put, how the tones are thought to be pronounced and thereby, represented (i.e., phonology in Table 1) can vary from how the tones are actually pronounced (i.e., phonetics in Figure 1). We see an example of the character "ba" [pa] produced with the four Mandarin tones (high, rising, falling-rising, and falling) and the fifth tone/neutral tone in Figure 1. The pitch contours stand for the actual phonetic realization of Mandarin. We see, for example, the high tone is not completely flat even when spoken in isolation, while the falling tone can have an initial and final rise; in connected speech, the phonetic realizations may vary even more due to the influence of the preceding and following tone.

Figure 1.
Phonetic realization of Mandarin tones and toneless syllables spoken in isolation by a male speaker (one of the authors).
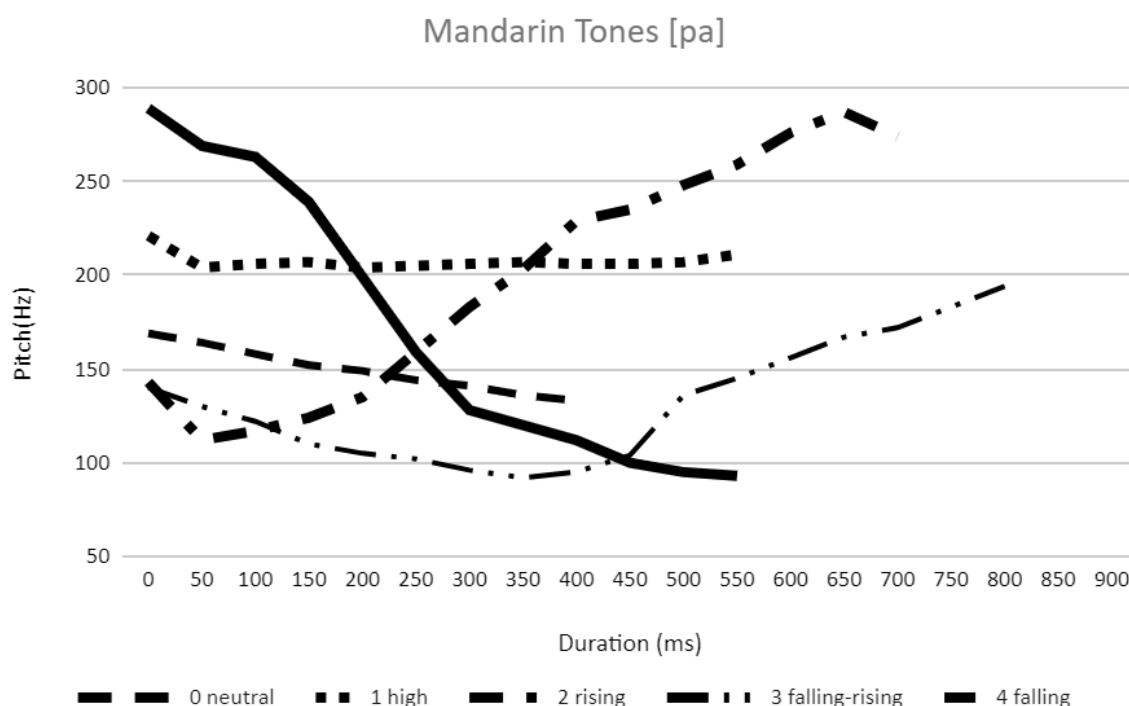
Mandarin tone realizations may differ for various reasons. For instance, there are linguistic causes. First, tones have secondary durational features where tone 3 > tone 2 > tone 1 > tone 4 (Shih & Ao, 1997). Second, tones may be fully realized in careful speech, but less so in connected speech. For example, there is tone sandhi, which produces allotones: 3+3=2+3, 1+4=2+4; this is apparent on day one of learning Mandarin when *ni3* 'you' + *hao3* 'good' results in *ni hao* (2+3) 'hello.' Also, a syllable in the final position of a word/phrase is longer, allowing for the tone to fully realize its pitch height and shape, whereas a syllable in non-final position in a word/phrase is shorter, potentially reducing the tone: LH+HH → LL+HH or represented in Chao numbers as 214 + 55 → 21 + 55 in lao3ying1 *eagle* (Lin, 2007, pp. 196-197). Third, combining tones results in a form of assimilation where, for example, a falling tone followed by a high tone may not have as steep a fall. The neutral tone also bears a pitch height, which (along with a potential contour) is determined by the preceding tone: 55+2, 35+3, 21+4, 53+1 (Lin, 2007, pp. 98-99). Segments (e.g., within the syllable, preceding) can also influence tone realization (Ho, 1976).

Moreover, Mandarin tone realization may vary due to geographically determined dialectal differences. The neutral tone resulting from a lack of stress on the final or second syllable is less frequent in Taiwanese standard Mandarin as compared to Beijing standard Mandarin, e.g., *thing* 東西 dōngxī 55 in Taiwanese standard Mandarin versus dōngxi 50 in Beijing standard Mandarin (Lin, 2007). There are lexical differences, as in Fàguó 法國 *France* (Taiwanese standard Mandarin) versus Fǎguó 法国 (Beijing standard Mandarin).

Furthermore, individual differences may impact Mandarin tone realization. Gender and adult-child differences result in different pitch ranges where the overall height of a tone may differ;

however, the shape remains the same, and the tones in any individual's speech remain relative to one another in the overall pitch range. Regardless, native speakers of Mandarin can still understand these individual differences influenced by gender (Lee, 2009).

In addition, context can play a role in how Mandarin tones are realized. Intonation patterns can interact with lexical tone where the overall pitch height may be higher for a question than a statement (Shen, 1989, in Lin, 2007, p. 229). Casual spoken speech compared to reading passages aloud in school or saying words in isolation can differ where in the latter cases each tone may be exaggerated in its full realization (see Labov, 1972). Even for native speakers of Mandarin, some tones are more difficult. Children appear to acquire tones in a given order: high and falling tones before rising and dipping tones (Li & Thompson, 1977); furthermore, the latter two tones have been noted to be confused by native speakers due to similarities in their realization (Shen & Lin, 1991). In short, tones demonstrate within-tone-category variation which is shaped by the surrounding phonetic environment, speaker background, or speaking contexts.

Impact of tones in Chinese culture

L1 Mandarin speakers are very aware of tones and may play with tones much like English speakers play with rhyming minimal pairs. First, Mandarin speakers may ignore tones and rely on segments (vowels, consonants), somewhat similar to when English speakers rely on consonants when texting words without vowels (e.g., pls = please, pg = page). For example, August eighth is father's day in Taiwan because bàba 爸爸 father sounds like bā bā 八•八 (eighth month, eighth day), or fourth floors are non-existent in Chinese hospitals given sì 四 *four* sounds too close to sǐ 死 *death*. Additionally, to avoid censors and/or to be less crass, Mandarin speakers may write cǎonímǎ 草泥馬 (*grass-mud- horse) llama* for cào nǐ mā, 肏你 媽 *eff' your mother (*cf., English *f**k* or *brother pucker*).

Conversely, L1 Mandarin speakers are very aware of the difficulty of understanding the meaning of decontextualized near minimal tone pairs. For example, to humorously emphasize the importance of tone to convey meaning, there is the poem shī shì shí shī shǐ 施氏食狮史/施 氏食獅史 or *Lion-Eating Poet in the Stone Den*. The poem as seen written in the title uses only the segment shi [ʂɻ] with approximately 32 meanings discriminated by 32 different Chinese characters in written form but only four tones in spoken form. As such, the poem is not intelligible to a Mandarin speaker when heard although it should be noted that the poem is written in Classical Chinese.

Lastly, intelligibility of tones figures in using pithy four-morpheme/character *chengyu* sayings traced to historical or literary sources, e.g., hǎo-jiǔ-bú-jiàn 好久不见 *long time, no see*; rén-shān-rén-hǎi 人山人海 *many people*; luàn-qī-bā-zāo 乱七八糟 *in total disorder*; ěr-tīng-wèi-xū 耳听为虚 *Believe it, when (you) see it. Chengyu* are exemplars of "embedded cultural references" with "economy of expression" that mark an ACTFL distinguished level speaker, i.e., "often using cultural and historical references to allow them to say less and mean more" (ACTFL, n.d.). While tone is important in *chengyu*, L2 learners may be able to rely on segments alone to understand these sayings, potentially highlighting non-native tonal perceptual issues.

Second language perception and production of tones

Tones have a functional load equal to that of vowels in Mandarin (Surendran & Levow, 2004); therefore, they are crucial in the perception, production, and lexical encoding of Mandarin. According to Chao (1948), "A word pronounced in a wrong tone or inaccurate tone sounds as puzzling as if one said 'bud' in English, meaning 'not good' or 'the thing one sleeps in'" (p. 24). However, tones constrain word recognition less than segments as they provide less information due to their limited number as compared to segments and therefore, exhibit greater frequency of occurrence (Zou, Liu, & Zhong, 2022).

Although L2 learners perceive and produce tones with above-average accuracy (Hao, 2012), they still demonstrate difficulties in recognizing words due to toneless word representations in their mental lexicon (Pelzl, Lau, Guo, & Dekeyser, 2020). L2 learners appear to rely on the interpretability of "toneless words" through context as supported by the intelligibility of whispered monotone words through semantic or grammatical contexts (Patel, Xu, & Wang, 2010). L2 Mandarin learners also apply knowledge-based processing of tone (e.g., probability of occurrence as a word) in addition to acoustic-based processing of tone to word recognition through exposure to multi-talker input (Wiener & Lee, 2020).

However, not all tones are equally easy or difficult. The most difficult tones for L2 learners are tones 2 and 3 (Kiriloff, 1969). Context (environment) influences the perception and production of tones. For example, while L1 English/L2 Mandarin learners can produce tones in isolation, they experience more difficulty in producing tones in disyllabic words, phrases, or connected sentences or speech (Guo & Tao, 2008). While learning L2 tones appears to be more difficult when exposed to disyllabic over monosyllabic words, this observation is mediated by learner characteristics and stage of acquisition (Chang & Bowles, 2015).

Other issues complicate tone perception, production, and encoding. Tone-intonation clash is a potential difficulty for L2 learners (Yang & Chan, 2010) where the direction of the tone may conflict with the direction of intonation: falling tone 4 with rising question intonation or rising tone 2 with statement intonation (cf., tone harmony: tone 2 + question intonation, tone 4 + statement intonation).

Other issues include the pitch range which appears to differ at a 1.5x wider range for L1 Mandarin speakers over L1 English/L2 Mandarin learners (Chen, 1974), impacting production. Also, secondary cues like duration are accessed more than pitch patterns by L2 learners with L1 English (Liu & Samuel, 2004). Mandarin tone perception and production can be further impacted by the different realizations of tone due to the differences noted in the previous section: tone sandhi, tone assimilation (e.g., allotones), dialectal and sociolectal differences, combining tones in low + high registers, context (i.e., minimal pair lists, word lists, reading passages), and more. Naturally, experience (whether L1 or L2) with lexical pitch (e.g., word stress, pitch accent, tone) shapes tone perception, production, and encoding of non-native Mandarin tones (see Schaefer & Darcy, 2020). Furthermore, the (dis)similarity between lexically contrastive pitch in the L1 shapes the mapping between native and non-native lexically-contrastive pitch as in the case of non-native Mandarin tones (So & Best, 2010).

Approach to tone flooding pronunciation pedagogical framework

Taking advantage of the high functional load of tones, we propose tone flooding as an effective pedagogical approach to treat L2 Mandarin learners' tonal perception and production issues.

By tone flooding, we mean a type of phonetic flooding where learners receive massive exposure early on in their learning to minimal quadruple/quintuple tone pairs with ambiguous semantic contexts. Such a situation forces L2 learners to focus on the differences in Mandarin tones in order to understand and/or express meaning. This type of exposure might potentially help learners to more robustly and/or quickly encode tone, particularly when supported by other teaching techniques and scaffolding activities.

Our approach is shaped by the following theoretical frameworks. First, noticing is crucial in enhancing perception (Schmidt, 1990). Second, the quality of the input factors into ameliorating nonnative-like pronunciation (Flege, 2018; Moyer, 2013). Also, learners must perceive and produce correct tones in Mandarin minimal tone quintuples through repetition with meaning in order to accomplish activities successfully (e.g., task-based activities, Gatbonton & Segalowitz, 1988), enhancing perception and production (Gordon, 2021). Moreover, learners must understand the differences in the meaning of minimal pairs without context or with limited context when doing activities. Additionally, learners should be gradually exposed in a controlled manner to tone variation: context (e.g., reading minimal quintuples, words, passages, (Labov, 1972)), different phonetic environments (e.g., isolated, in phrases, various tonal combinations, genre), multiple speakers (e.g., varying by age, gender, regional dialects, registers, sociolects) (cf., High Variability Phonetic Training, Logan, Lively, & Pisoni, 1991; Wiener, Chan, & Ito, 2020).

Learners should not be able to "avoid tones." That is, contextual and other clues should be controlled as learners can generally differentiate the intended meaning without intelligible tone perception and production. For example, hearing a sentence such as *The squirrels ate the nuts* does not necessarily force learners to hear the tones of *squirrel* (sōngshǔ) versus those of *pine tree* (sōngshù) as learners normally do not expect to hear *The pine trees ate the nuts.* Instructors might try mixing it up and defying reality with nonsensical meaning. Importantly, instructors must also support learners in forging a categorical prototype of tones in their mental lexicon through repetitive, contextualized exposure in addition to decontextualizing minimal tone pairs/quadruples through flooding. Instructors likely need to balance contextual, expected exposure and ambiguous, decontextualized, unexpected exposure.

We summarize considerations for tone flooding as follows:
- Learners are completely flooded with tone minimal pairs (最小對立體) or quadruples. Instructors might incorporate some tone flooding activities or exercises into their daily courses. Ideally, instructors might adopt a tone flooding approach for the entire course for several weeks; however, this would require much work as the instructors would potentially need to rework entire course materials (i.e., textbooks, assignments).
- Learners should be exposed to tone flooding early on in the learning process in a controlled manner and continue using tone flooding at times up to advanced levels.
- The words should be common words with similar grammatical categories.
- Learners must understand the difference in the meanings of minimal pairs/quadruples without context or limited context when doing activities. There should be a balance or a progression from contextualized to decontextualized tone minimal quadruples in activities.
- Learners require exposure to different phonetic environments (various tone combinations), multiple speakers (gender, generation, register, regional dialects, sociolects, etc.), and context (speaking, reading passages vs words/minimal pairs, reading pinyin versus Chinese characters, genre).

- Learners must perceive and produce correct tones in order to accomplish activities successfully.
- Oracy skills (speaking, listening) are emphasized given the spoken nature of tones although literacy skills must also be considered given the interaction of tone (i.e., pronunciation) with reading skills such as subvocalization during reading quietly.
- Tone learning is integrated into other language skills: vocabulary, grammar, oracy skills, reading, Chinese characters, and more, i.e., wherever pronunciation may play a role.
- Tone flooding is supported by scaffolding activities such as metalinguistic explanations, non-task-based activities, and more. Scaffolding techniques might include employing visual cues: color-coded tones, arrows, numbers, hand or body gestures, etc. Also, online activities can provide more learning support and practice.

In a tone flooding approach, instructors might adopt-adapt activities within the 5-step pronunciation framework of analysis & description, listening discrimination, controlled practice, guided practice, and communicative practice (Celce-Murcia, Brinton, Goodwin, & Griner, 2010). In Table 2 we exemplify the teaching/learning of pitch accent to/by L2 Japanese learners within this 5-step framework (Schaefer & Darcy, 2019) to inform activities in a tone flooding approach. A more detailed collection of sample activities can be found in Appendix A-F.

Table 2.
Activity samples using tone minimal pairs

Listening	Games (Bingo) (see Appendix C), Total Physical Response (see Appendix B), intensive listening, extensive listening, short interactive TikTok lessons
Speaking	Go Fish (see Appendix E), Information Gap (see Appendix F), Short responses (recording), shadowing, dubbing, Q&A, short talks, *chengyu* sayings, cognates
Reading	extensive reading (see Appendix D)
Homework (online activities)	Identification tasks, oddball tasks, AB tasks, matching, dictations, recordings, dubbing scenes

CONCLUSION

In conclusion, we hope L2 Mandarin instructors using reflective teaching or action research and researchers in pronunciation pedagogy might consider studying 1) the effect of tone flooding on the perception, production, and encoding of tone, and 2) how to best implement tone flooding. In the meantime, given the ongoing daily need to learn tones by L2 Mandarin learners and the need to increase the efficacy of tone teaching and learning and the robustness of tone in lexical representations, we hope instructors might consider implementing phonetic flooding for tones in their classrooms.

Acknowledgement

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APPENDIX A - Sample activities based on a tone flooding approach

1. **Explicit instruction teaching tones and words**	Use photos, pinyin, Chinese characters, etc. to show and use tone minimal quadruples/quintuples for words. Offer tone explanations using visuals and controlled practice (i.e., see if learners can hear tones, have learners try to repeat words to see if they can produce the tones, provide feedback in various ways, etc.). Photos or pictures should easily be recognized by learners as depicting the intended word. Again, words should be common high-frequency words and when possible be of the same word category (e.g., noun, verb) to create ambiguous contexts. Sample words: - mǎi3 (買) to buy vs maì4 (賣) to sell - huā1 (花) flower vs huà4 (画) picture - sōng1shù4 (松树) pine tree vs sōng1shǔ3 (松) squirrel
2. **Classroom and/or online scaffolding activities**	Sample activities: a) Learners say whether the two words they hear are the same or different: same word of a minimal pair/quadruple or both different words of a minimal pair/quadruple. b) Learners choose the word they hear among minimal pairs/quadruple. c) Learners identify the tone of the word they hear. d) Learners determine which word out of the many words has a different tone. e) Learners match words with other words.
3. **Total physical response (TPR)** 全身反应 **(see Appendix B)**	The instructor says one word from a tone minimal quadruple of words written on the board, shown as pictures on the classroom walls, or written as words or shown as pictures on cards or on a handout. Students touch the word they hear or go to the written word or picture they hear or lift up the card of that word. Additionally, during TPR the instructor may indicate tone using body language (e.g., arms to indicate tone shape, fingers to indicate tone number) and/or ask students to indicate tones with body language as well. For example, both arms out perpendicular to the body = high flat tone (tone 1), both arms up making a V-shape = falling-rising tone (tone 3), both arms out making the ↗ shape = rising tone (tone 2), both arms out making the ↘ shape = falling tone (tone 4).

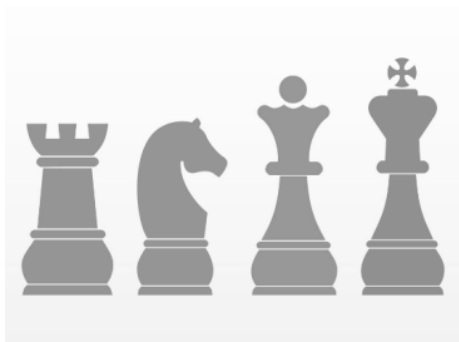|	
4. **Bingo** 宾果游戏 **(see Appendix C)**	The bingo cards can use a more traditional 5x5 square format or a smaller 3x3 format. The items can be written in pinyin or for advanced learners in Chinese characters. Pictures could also be used instead for any level. See sample cards below.
5. **Extensive listening** **(see Appendix D)**	Instructors create long reading passages containing many minimal tone quadruples. Learners read the passages silently or read silently with audio/instructor.
6. **Go Fish** 釣魚 **(see Appendix E)**	Like Bingo, the cards can write the words in pinyin, or Chinese characters for advanced levels, or in simple characters for lower levels. Again, pictures on the cards can be used. This exercise allows the learners to focus on learning with very basic language production. Learners need to ask and answer simple questions. Sample dialogue: A: Do you have 'squirrel'? B: Yes, I do. Here you go. A: Thanks. A: Do you have 'squirrel'? B: No, I don't. A: Okay, thanks anyway. ------------------ A: Do you have 'squirrel'? B: Yes, I do. Here you go. A: No, this is 'pine tree'. B: Oh, I thought you said 'pine tree'/Oh, I made a mistake. The student who finds all the matches to their cards and/or runs out of cards is the winner. This could be done using a handout with a list of words as well.
7. **Information gap** 信息缺口 **(See Appendix F)**	Minimal pairs are used for the actions (verbs, nouns) and for the persons being discussed. Accomplishing the task requires an intelligible level of pronunciation and creates repetition in a meaningful context. The questions are written and so, there is limited need to think about lexicon or grammar, allowing students to concentrate on pronunciation in both listening and production (controlled practice). See sample cards below in Appendix F. Sample dialogue: A: Who sells flowers? (B: Sorry, did you say: Who buys pictures?)

		B: Mr. Jiang1 sells flowers. (A: Excuse me, who?)
8. Q&A		Have learners record answers out of class to questions with tone minimal pairs: - Are there more *squirrels* or *pine trees* on campus? - Do you like *chemistry* (huàxué 化學) or *skiing* (huáxuě 滑雪) more?
9. Variability exposure		We recommend early gradual exposure to various Mandarin speakers in a controlled manner: accents beyond standard Mandarin on Mainland China or in Taiwan, different genders, ages, sociolects, contexts, etc., and different phonetic environments. This is reflective of the reality of both Chinese-speaking communities and Mandarin instructors.

APPENDIX B - Total Physical Response (TPR) samples used in Activity 3

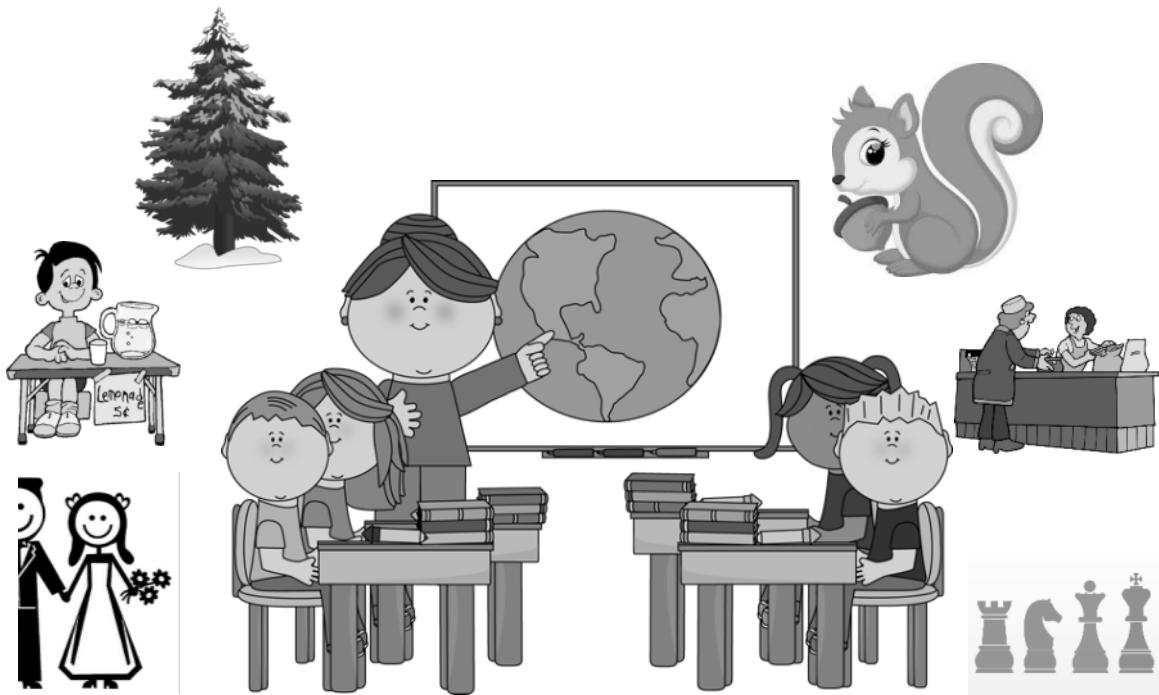| 全身反应	
Total Physical Response (TPR)	
• Please **touch X/go to X** (pictures/objects around the classroom or pictures on handout) • Please **show** me (pictures, objects on group or individual table) • Please **draw** (at the board, or at desk)	
qízǐ（棋子）chess piece(s)	qīzi（妻子）wife
sōngshù（松树）pine tree	sōngshǔ（松鼠） squirrel

măi（買）	mài （賣）

Source of artwork: http://clipart-library.com/

APPENDIX C - Bingo card samples used in Activity 4

宾	果	游戏
song1shu3 squirrel	mai3 to buy	hua1 flower
xie1zi0 scorpion	中	song1shu4 pine tree
mai4 to sell	hua4 picture	xie2zi0 shoes

宾	果	游戏
song1shu4 pine tree	mai4 to sell	hua4 picture
xie2zi0 shoes	中	song1shu3 squirrel
mai3 to buy	hua1 flower	xie1zi0 scorpion

B	I	N	G	O
	hua4 picture	北京 Beijing		教室 classroom
十一 eleven	韩语 Korean language	qi1zi0 wife		差距 gap
会议 meeting		中		
石油 oil	mai3 to buy	过奖 to flatter		
	xie2zi0 shoes	压力 pressure	同时 same time	好吗 Okay?

Source of artwork: http://clipart-library.com/

Use pictures, pinyin, characters or a combination.

Bingo minimal pairs					
Character(s)	Pronunciation	Meaning	Character(s)	Pronunciation	Meaning
花	huā	flower	画	huà	picture
北京	Běijīng	Beijing	背景	bèijǐng	background
眼睛	yǎnjīng	eye	眼镜	yǎnjìng	glasses
教室	jiàoshì	classroom	教师	jiàoshī	teacher
十一	shíyī	eleven	十亿	shíyì	billion
韩语	Hányǔ	Korean language	汉语	Hànyǔ	Chinese language
妻子	qīzǐ; qīzi	wife	棋子	qízǐ	chess pieces
水饺	shuǐjiǎo	dumpling	睡觉	shuìjiào	sleep
差距	chājù	gap	茶具	chájù	tea set
会议	huìyì	conference	回忆	huíyì	memory
蝎子	xiēzi	scorpion	鞋子	xiézi	shoe
树	shù	tree	书	shū	book
货车	huòchē	truck	火车	huǒchē	train
石油	shíyóu	oil	室友	shìyǒu	roommate
买	mǎi	to buy	卖	mài	to sell
过奖	guòjiǎng	to flatter	果酱	guǒjiàng	jam
滑板	huábǎn	skateboard	画板	huàbǎn	drawing board
松树	sōngshù	pine tree	松鼠	sōngshǔ	squirrel

APPENDIX D - Extensive listening sample used in Activity 5

Passage

姜先生和蒋先生以前是大学室友，他们学习开采石油。姜先生住在火车站附近，蒋先生住在货车站附近。姜先生喜欢滑雪，蒋先生喜欢化学。姜先生的妻子是山西人，她在大学教汉语。蒋先生的妻子是陕西人，她在大学教韩语。一天，姜先生家的松树引来很多松鼠，可是姜太太不喜欢松鼠，但是喜欢松树。姜先生既不喜欢松树也不喜欢松鼠。所以，姜先生请蒋先生来帮他砍树。那天，姜先生一边听音乐，一边看书；蒋先生一边听音乐，一边砍树。

Pinyin Transcription

Jiāng xiānshēng hé **Jiǎng** xiānshēng yǐqián shì dàxué **shìyǒu**, tāmen xuéxí kāicǎi **shíyóu**. **Jiāng** xiānshēng zhùzài **huǒchē**zhàn fùjìn,**Jiǎng** xiānshēng zhùzài **huòchē** zhàn fùjìn. **Jiāng** xiānshēng xǐhuān **huáxuě**, **Jiǎng** xiānshēng xǐhuān **huàxué**. **Jiāng** xiānshēng de qīzi shì **Shānxī** rén, tā zài dàxué jiāo **Hànyǔ**. Jiǎng xiānshēng de qīzi shì **Shǎnxī** rén, tā zài dàxué jiāo **Hányǔ**. Yītiān, **Jiāng** xiānshēng jiā de **sōngshù** yǐn lái hěnduō **sōngshǔ**, kěshì **Jiāng** tàitài bù xǐhuān **sōngshǔ**, dànshì xǐhuān **sōngshù**. **Jiāng** xiānshēng jì bù xǐhuān **sōngshù** yě bù xǐhuān **sōngshǔ**. Suǒyǐ, **Jiāng** xiānshēng qǐng **Jiǎng** xiānshēng lái bāng tā **kǎn shù**. Nèitiān, **Jiāng** xiānshēng yìbiān tīng yīnyuè, yì biān **kàn shū**; **Jiǎng** xiānshēng yìbiān tīng yīnyuè, yìbiān **kǎn shù**.

Translation

Mr. **Jiang** and Mr. **Jiang** are former college **roommates**, they study **oil** extraction. Mr. **Jiang** lives near the **train** station, and Mr. **Jiang** lives near the **truck** station. Mr. **Jiang** likes **skiing**, and Mr. **Jiang** likes **chemistry**. Mr. **Jiang**'s wife is from **Shanxi**, and she teaches **Chinese** in college. Mr. **Jiang**'s wife is from **Shaanxi**, and she teaches **Korean** in college. One day, Mr. **Jiang**'s **pine tree** attracted many **squirrels**, but Mrs. **Jiang** doesn't like **squirrels**, but she likes **pine trees**. Mr. **Jiang** neither likes **pine trees** nor **squirrels**. So, Mr. **Jiang** asked Mr. **Jiang** to help him **cut down trees**. That day, Mr. **Jiang** was listening to music while **reading**; Mr. Jiang was **cutting trees** while listening to music.

Minimal pairs Summary

姜先生（Mr. Jiang；Jiāng xiānshēng） 蒋先生（Mr. Jiang；Jiǎng xiānshēng）

室友（roommate；shìyǒu） 石油（oil; shíyóu）

火车(train; huǒchē) 货车（truck; huòchē）

滑雪（skiing；huáxuě） 化学（chemistry；huàxué）

山西（Shanxi；Shānxī）陕西（Shaanxi；Shǎnxī）

汉语（Chinese; Hànyǔ） 韩语（Korean；Hányǔ）

松树（pine tree；sōngshù） 松鼠（squirrel；sōngshǔ）

看书（reading；kàn shū） 砍树（cutting trees；kǎn shù）

Short sentences with minimal pairs

1.王先生是文学**大师**，也是文化交流的**大使**。

Wáng xiānshēng shì wénxué **dàshī**, yěshì wénhuà jiāoliú de **dàshǐ**.
Mr. Wang is a **master** of literature and an **ambassador** of cultural exchange.

大师（master；dàshī） 大使（ambassador；dàshǐ）

2. 你的**夹子**在**架子**上。
Nǐ de **jiāzi** zài **jiàzi** shàng.
Your **clip** is on the **shelf**.
夹子（clip；jiāzi） 架子（shelf；jiàzi）

3. 你的**眼睛**不好，你应该戴**眼镜**。

Nǐ de **yǎnjīng** bù hǎo, nǐ yīnggāi dài **yǎnjìng.**
Your **eyes** have some problems, so you should wear **glasses**.

眼睛（eye；yǎnjīng） 眼镜（glasses；yǎnjìng）

4. 我的一只**鞋子**旁边有一只**蝎子**。

Wǒ de yìzhī **xiézi** pángbiān yǒu yīzhī **xiēzi**.
There is a **scorpion** next to one of my **shoes**.
鞋子（shoe；xiézi） 蝎子（scorpion；xiēzi）

5. 这个**牌子**的**拍子**怎么样？

Zhège **páizi** de **pāizi** zěnme yàng?
How is the **racket** of this **brand**?
牌子（brand；páizi） 拍子（racket；pāizi）

Short sentences with minimal pairs

6. 不要把**鱼食**放到**浴室**里。
Bùyào bǎ **yúshí** fàng dào **yùshì** lǐ.
Do not put **fish food** in the **bathroom**.
鱼食（fish food；yúshí） 浴室（bathroom；yùshì）

7. **中药**很**重要**。
Zhōngyào hěn **zhòngyào**.
Chinese medicine is very **important**.
中药（Chinese medicine；zhōngyào） 重要（important；zhòngyào）

8. 这是给年轻**教师**用的**教室**。
Zhè shì gěi niánqīng **jiàoshī** yòng de **jiàoshì**.
This is a **classroom** for young **teachers**.
教师（teacher；jiàoshī） 教室（classroom；jiàoshì）

9. 我的**牙医**是**亚裔**。
Wǒ de **yáyī** shì **yàyì**.
My **dentist** is **Asian**.
牙医（dentist；yáyī） 亚裔（Asian ；yàyì）

10. 那家**超市**很**潮湿**。
Nà jiā **chāoshì** hěn **cháoshī**.
That **supermarket** is very **damp**.
超市（supermarket；chāoshì） 潮湿（damp；cháoshī）

*The extensive reading passage should be longer and recycle words to provide greater exposure to listeners (i.e., extensive listening). Some non-ambiguous contexts are needed here and there to help students understand the meaning and thereby, allow learners to associate the correct tones to words. The passage can also be preceded by sample sentences and other scaffolding exercises to help students to associate the correct tones to right words. Otherwise, minimal pairs should be presented in ambiguous contexts as much as possible and in a natural manner to force learners to note the tones in order to understand meaning. Repetition of minimal pairs is needed for reinforcement. Unknown or difficult vocabulary, grammar, sentence structure, etc. should be avoided so that listeners can focus attention on tones. Students should not be overwhelmed by too many minimal pairs, or at least many new minimal pairs. More work by instructors and researchers is naturally needed to determine the efficacy of tone flooding in extensive listening and how minimal pairs might be optimally used.

APPENDIX E - Go Fish card samples used in Activity 6

钓鱼 **Go Fish**

* Also, concentration

A: Do you have 'squirrel'?

B: Yes, I do. Here you go.

A: Thanks.

A: Do you have 'squirrel'?

B: No, I don't.

A: Okay, thanks anyway.

A: Do you have 'squirrel'?

B: Yes, I do. Here you go.

A: No, this is 'pine tree'.

B: Oh, I thought you said 'pine tree'/Oh, I made a mistake.

松鼠

hua1
flower

松树

hua4
picture

Source of artwork: http://clipart-library.com/

APPENDIX F - Information gap card samples used in Activity 7

CARD A ACTION	Mr. Jiǎng3 (蒋)	Mr. Jiāng1 (江)
buys (mai3) flowers (hua1)	O	
sells (mai4) flowers (hua1)		✔
draws (hua4) squirrels (song1shu3)		O
draws (hua4) pine trees (song1shu4)		
sells (mai4) hua1 (flowers)		
sells (mai4) hua4 (pictures)	O	

O = answers you know
BLANK = answers you need to find out and ask a partner
✓ = answers you found out by asking a partner

CARD B ACTION	Mr. Jiǎng3 (蔣)	Mr. Jiāng1 (江)
buys (mai3) flowers (hua1)	✓	
sells (mai4) flowers (hua1)		◯
draws (hua4) squirrels (song1shu3)		
draws (hua4) pine trees (song1shu4)		◯
sells (mai4) hua1 (flowers)	◯	
sells (mai4) hua4 (pictures)		

O = answers you know
BLANK = answers you need to find out and ask a partner
✓ = answers you found out by asking a partner