An Investigation on Instructional-Level Reading Among Chinese L2 Learners

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Abstract

This study investigates oral reading speed and accuracy rates, silent reading speed and comprehension rates, and the relationship between oral reading fluency and reading comprehension at the instructional level of reading among Chinese-as-a-second-language (Chinese L2) adult learners across four learning levels. 80 students from three U.S. universities participated in the study. The results showed that when reading a material at the instructional level, oral reading speed increases as learning level increases for Levels 1-3, but not for Level 4, and silent reading speed increases across learning levels, but not synchronizing with reading-comprehension rate. A mid-to-high correlation was found between oral-reading fluency and reading comprehension for Levels 1-3, but not Level 4. However, a trend was observed, in that correlation strength decreases as learning level increases. Based on the findings, a scale for selecting instructional-level reading material for Chinese L2 was proposed, along with pedagogical suggestions.

Keywords: *reading fluency; reading in Chinese; oral reading; silent reading; reading levels*

Introduction

Reading fluency includes oral reading fluency and silent reading fluency, which is defined as "a level of reading accuracy and rate where decoding is relatively effortless, where oral reading is smooth and accurate with correct prosody, and where attention can be allocated to comprehension" (Wolf & Katzir-Cohen 2001, p. 219). The relationship between oral reading fluency and silent reading comprehension has been studied for decades in English-language learning and has yielded a general conclusion that both context-free and context-based oral reading fluency has a strong association with reading comprehension (Hudson, Lane, & Pullen, 2005; Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003; Kim, Petscher, Schatschneider, & Foorman, 2010; Klauda & Guthrie, 2008; Stanovich, 1991; Roehrig, Petscher, Nettles, Hudson, & Torgesen, 2008; Schilling, Carlisle, Scott, Zeng, 2007; Spear-Swerling, 2006). This observation also holds true in learning a second language (Shen & Jiang, 2013; Xue, Shu, Li, Li, & Tian, 2013; Jiang, 2016). In recent decades, educators have been interested in how observed research results can be applied to classroom reading instruction to improve reading efficiency. For English, a model of three reading levels predicated on oral reading fluency and reading comprehension was proposed. A corresponding scale for the three reading levels also

was developed to serve as benchmarks for informal reading assessment (IRA) (Gillet & Temple 1994; Gillet, Temple, Temple, & Crawford, 2012). Classroom instructors can use the IRA to place students at appropriate grade levels and to provide level-appropriate reading material for instruction.

Chinese, being a character-based orthography, lacks sound-to-spelling correspondence, posing great challenges to U.S. students trying to learn to read Chinese as a second language (Hu, 2010; Ke; Wen, & Kotenbeutel, 2001). It is crucially important for classroom teachers to understand the role of oral reading in silent reading comprehension and to develop a scale for assessing students' oral reading and reading-comprehension levels at different grades so that appropriate reading materials can be chosen to fit learners' levels, and corresponding classroom interventions can be implemented for students in need.

This study's purpose is to investigate oral reading speed and accuracy rates at the *instructional level* and their relationship with silent reading comprehension across four learning levels (first-year Chinese to fourth-year Chinese, also referred to as Levels 1-4 in this study) in U.S. college classrooms. It is hoped that this study's results will: 1) provide a theoretical understanding of the relationship between oral reading and silent reading in Chinese L2; 2) contribute to constructing a Chinese L2 reading fluency scale for both oral and silent reading; and 3) yield insights into how pedagogical interventions can be used to improve Chinese L2 reading efficiency.

Studies on oral reading fluency and reading comprehension

In English reading education, studies on the relationship between oral reading fluency and reading comprehension began in the 1990s. Oral reading fluency was identified as a reliable predictor for reading comprehension (Burns; Silberglitt, Christ, Gibbons, & Colong-Chaffin, 2016; Fuchs, Fuchs, Hosp & Jenkins, 2001; Stanovich, 1991; Shinn, Good III, Knutson, Tilly III., & Collins, 1992). It also is considered to be one of the defining characteristics of good readers, demonstrating higher reading fluency (Hudson, Lane, & Pullen, 2005).

The assessment of oral reading fluency takes two formats: context-free reading fluency and context-based reading fluency. For context-free reading fluency, speed (words per minute; "wpm" hereafter) and accuracy (rate of words read accurately in one minute) are major indicators. For context-based oral-reading fluency, in addition to accuracy and speed, in some

studies, *prosody*, a component of fluency that includes intonation, stress, and appropriate pauses (Kuhn & Stahl, 2003) also is used as an indicator to measure "proper expression," which is considered another important factor of context-based oral reading fluency in addition to speed and accuracy (National Reading Panel, 2000). Most extant studies have focused on the relationship between oral reading fluency and reading comprehension since the 1990s.

In recent decades, studies along these lines have confirmed and refined these earlier findings further. One study (Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003) examined common and distinct contributions by context-free and context-based oral reading to reading comprehension among 113 fourth-graders from six U.S. schools. The results showed that both context-free and context-based oral reading had strong associations with reading comprehension, but context-based reading fluency accounted for more unique variance in reading comprehension than context-free reading fluency. However, for less-fluent readers, their context-free word-reading fluency made a larger contribution to context-based reading fluency than that of more fluent readers. The author concluded that contextual influence tended to play a smaller role in affecting oral reading speed for more fluent readers because of their relatively higher level of word-recognition skills, while less-fluent readers relied more on individual word-recognition skills when reading a passage. A similar study (Klauda & Guthrie, 2008) tried to pinpoint the relative contributions of three components of oral reading fluency (context-free word reading, sentence-level reading, and passage-level reading). Participants included 278 English-speaking students from 13 classrooms. The results showed that all three levels of oral reading fluency contributed to performance on a standardized reading-comprehension test: Word reading explained 10% variance in reading comprehension, sentence-level reading added 5%, and passage-level reading added an additional 2%. It should be noted that passage-level reading yielded a high correlation with word- and sentence-level oral reading. This confirmed that paragraph-level oral reading fluency contributed unique variance to reading comprehension. It also indicated that oral reading fluency for context-based materials also was a dynamic indicator for reading comprehension, as students' initial performance on oral reading fluency in the first grade could predict their reading comprehension in subsequent grades (Kim, Petscher, Schatschneider, & Foorman, 2010).

The studies on oral reading fluency and reading comprehension in second languages did not emerge until this century. Several studies have been conducted, with most focused on English as a second language. Jeon (2012) focused on the relationship between English learners' oral

reading fluency in Korean high schools and their English reading comprehension. Participants included 267 10th-grade high school students in South Korea. Three factors were used to measure oral reading fluency: a pseudo-word reading test, a word reading test, and a passage-reading test. Prosody was not included in the passage-reading test. The results showed that all three factors collectively explained 21.2% of variance in silent reading comprehension, among which, oral passage-reading fluency accounted for 12.4% of the variance in silent reading comprehension. Jiang (2016) investigated 149 adult ESL learners from four language backgrounds: Arabic, Chinese, Japanese, and Spanish. Participants were required to read a short passage and complete a reading test orally. The oral reading was measured using wpm, efficiency (accurate word reading per minute), and prosody. The results showed that oral reading efficiency contributed most to reading comprehension for Arabic and Spanish learners, while prosody was a strong indicator for reading comprehension among learners from Chinese and Japanese language backgrounds. In conclusion, speed, accuracy, and prosody in oral reading all contribute to reading comprehension.

However, extant studies on the connection between oral reading and reading comprehension in Chinese are sparse. One study (Xue, Shu, Li, Li, & Tian, 2013) examined cognitive factors contributing to reading comprehension among native Chinese-speaking elementary students in Beijing. Character naming (character reading) was included as one cognitive factor, and reading comprehension was measured at the sentence level. Each participant was required to read a sentence, then judge whether the statement is true. Participants included students in second, fourth, and sixth grades. The results showed that character naming was the largest-magnitude contributor to sentence-level reading comprehension across all learning levels. As reading comprehension for this study was not measured at a paragraph level, we sought further evidence on the connection between oral reading fluency and paragraph-level reading comprehension. Shen and Jiang (2013) investigated the relationship between lower-level processing and general reading comprehension among 86 adult Chinese L2 beginners from two groups: one comprising U.S. students from a U.S. university who had been introduced to about 688 Chinese characters and 1,016 non-repeated words, and the other comprising international students from a Chinese university who had been introduced to 1,620 characters and 2,834 non-repeated words. Participants were required to complete one-minute, context-free oral reading and two-minute word-segmentation exercises, as well as a reading-comprehension test containing five short essays. The results showed that context-free oral-character-reading accuracy, measured by character reading per minute (cpm), had a moderate-to-high correlation

with general reading comprehension (r = .64 for the US site and r = .79 for the China site). Character-reading speed had a low-to-moderate correlation with reading comprehension (r = .55 for the U.S. site and r = .31 for the China site). Regression analysis showed that character-reading accuracy was the strongest predictor, followed by character-reading speed. Word segmentation showed a moderate correlation with character-reading accuracy. Thus, the study concluded that oral reading fluency predicted reading comprehension in Chinese L2, but this study did not provide data for more advanced learners.

Three levels of reading

In classroom learning, reading teachers often face problems determining whether sample texts' difficulty level is suitable for instruction in the class, gauging students' current level of reading fluency, and determining whether students are making normal progress in reading. To answer these questions, the *Informal Reading Inventory* (IRI) was developed to assess classroom reading (Gillet &Temple, 1994; Gillet, Temple, Temple, & Crawford, 2012). The IRI's core concept for gauging students' reading performance comprises three levels of reading: independent, instructional, and frustration. According to Gillet and Temple (1994), on the independent level, students can read text easily without help, comprehension is excellent and silent reading speed is rapid. Almost all words are recognized and understood on sight. At the instructional level, the reading material is not easy for students, but is comfortable, albeit challenging, so they can benefit the most from instruction. Silent reading rate is fairly rapid, and most words are recognized on sight. At the frustration level, the reading material is too difficult in terms of vocabulary and concepts. Reading is slow and labored because the reader frequently must stop to analyze unknown words, often failing in these efforts. Based on this three-levels-of-reading model, a scale for differentiating each level is proposed below:

Table 1. *Three levels of reading model* (Gillet & Temple, 1994, p 127)

	Oral reading fluency (words accurately read per minute)	Comprehension
Independent level	97% and up	90% and up
Instructional level	90%-96%	70%-89%
Frustration level	Below 90%	Below 70%

The three levels of reading, as well as the scale for differentiating reading levels, are practiced only among English-speaking learners. Thus far, it remains unknown how to adapt this template and its assessment scale for Chinese-as-a-second-language students.

Current study

The current study intended to investigate oral reading fluency rate and its connection to reading comprehension in Chinese L2 among adult college English-speaking learners by answering three research questions: 1) What is the silent reading speed across four learning levels when the comprehension rate falls within the range of *instructional-level* reading? 2) What are corresponding oral reading speed and accuracy rates across four learning levels when the comprehension rate falls in the range of *instructional-level* reading? 3) What is the relationship between oral reading fluency and silent reading comprehension across four learning levels?

Before answering the above questions, it is necessary to define terms used in this study and explain term-related issues.

- *Oral reading rate*: the speed of sounding out known characters in a given text per minute. Traditionally, in English, words-per-minute (wpm) reading rate is used to measure reading speed (Good & Kaminski, 2002). It has been reported that no statistically significant difference in reading rate exists between reading only one minute of a text and reading three minutes of a text by averaging across three minutes of words read (Valencia, Smith, Reece, Li, Wixson, & Newman, 2010). Thus, in this study, participants were required to read two minutes of a given text, and characters per minute (cpm) were calculated by averaging characters read within two minutes. By using two-minute reading instead of one minute, we could ensure that each participant would read at passage level for a given text, rather than at word or sentence level. We used cpm to measure reading speed instead of wpm because no word boundary exists for Chinese text in print. Word segmentation is a rather complicated issue, so using cpm is a simpler and more straightforward measure than wpm.

- *Oral reading accuracy*: the accuracy rate of sounding out characters in a given text per minute. To calculate oral reading accuracy for this study, the accuracy rate for sounding out the characters within two minutes was obtained first, then converted into average character-reading accuracy per minute. To calculate character-reading accuracy in the

given text, a miscue-analysis approach was used, which is detailed in the Method section.

- *Oral reading fluency*: the combination of verbal reading speed and accuracy, calculated by counting the number of accurately read characters in one minute, then converting the total into a percentage of all characters.

- *Silent reading rate:* the speed of reading the text calculated by characters read per minute (cpm).

- *Silent reading comprehension rate*: the percentage of correctly answered reading-comprehension questions within a specified reading time.

Method

Participants

We randomly selected 80 students enrolled in first-year to fourth-year Chinese classes from three public U.S. universities to participate in the study, with each level containing 20 participants. The total population of the three institutes for first-year Chinese students was 251, second-year 145, third-year 95, and fourth-year 52. This study recruited participants in natural Chinese class levels (i.e., first- to fourth-year Chinese), rather than classifying them into beginning, intermediate, and advanced levels, because we wanted the results to be applied to regular-class levels (Levels 1-4), a common practice among U.S. universities. The curriculum arrangement for the three universities was similar. Credit hours for completing four years of Chinese were 32 in total. Hereafter, learning Levels 1-4, groups of first-year to fourth-year, or grade Levels 1-4 are interchangeable. Each participating site used different textbooks, which was what we expected, as we did not wish for the results of this study to be bound to using a certain textbook or teaching method, which would limit the scope of the study results' pedagogical implications.

Instruments

Two instruments were developed for this study: the *Reading Task*, to measure students' rate at *instructional level* reading (for both oral and silent reading), and the *Reading Comprehension Test*. We use the Italic *instructional level* to refer to the instructional level specified in the aforementioned three-levels-of-reading model.

The Reading Task. As one major purpose of this study was to define reading rate at the *instructional level* for students at each level of college Chinese classes, thus, the selected materials for the *Reading Task* must meet students' reading proficiency at their grade levels. This means we must use different difficulty-level reading materials to match students at different learning levels. Reading difficulty is affected by readers' word knowledge, measured by unknown words in the text; word frequency; and sentence-structure complexity, measured by sentence lengths in the text (Shen, 2005). Therefore, the material selection followed these three criteria:

The first was to control word frequency, which means that mean word frequency should be decreased incrementally across learning levels to maintain *instructional-level* text difficulty for different learning levels. The online *Xiandai hanyu yulaoku cipingbiao* (*Modern Chinese Word Frequency Table*) was used to compute word frequency for initial selection of reading materials. This online word-frequency corpus was completed in 2012 with a list of 14,637 word entries. Only words that appeared at least 50 times out of 20 million characters of reading materials were included in the list.

The second criterion was to control sentence length. The mean sentence length of selected reading materials increases incrementally across learning levels to maintain grade-appropriate text difficulty and complexity. We initially selected three lessons randomly from the textbooks used in these first- to fourth-year Chinese classes from the participating universities to compute the average sentence length in lessons for each level, then used this to select reading materials.

The third criterion was to establish *instructional-level* reading difficulty for each learning group. We used Gillet and Temple's (1994) reading comprehension scale of 70%-89% for *instructional level* reading materials in this study. Thus, the reading materials selected for each group should generalize an average reading comprehension rate within the range of 70%-89%. To meet this criterion, a pilot study was conducted at one of the three data-collection sites. Five students from each group with mid-level reading-grade standing were recruited to complete the reading materials and tests intended for use in this study. Only those materials yielding a 70%-89% comprehension rate from each group were used, and the materials were selected from the online reading website *The Chinese Reading World* (Shen & Tsai, 2010). The obvious

advantages of using this website were that the site provided 900 text samples of reading material for beginning to advanced college Chinese learners with a wide variation in topics, and it has a built-in clock to time students' silent reading speed and automatically calculate reading-comprehension rates. The format for reading-comprehension questions was consistent across all reading materials. Each text sample was accompanied by six reading-comprehension questions to check two levels of reading comprehension: literal and interpretive. Literal-level comprehension entails being able to answer factual questions, i.e., readers can find the answers directly from the text, while interpretive-level comprehension entails being able to answer questions about embedded, implicit text information.

Based on the pilot study, adjustments and calibrations were made in selecting reading materials, and finally, two reading materials for each group were selected (see Table 2).

Table 2. *Reading Materials used for the Reading Task*

Group	Reading Materials
First-Year	你家里有谁? 我的星期三 **"Who is in your family?" "My Wednesday"**
Second-Year	我的 13 岁生日 电脑问路 **你家里有谁?** **"My 13th birthday" "Ask directions by using a computer"**
Third-Year	是"报"还是"抱"? 运动会 **我的 13 岁生日** **"Is it a newspaper or a hug?" "Sports competition"**
Fourth-Year	手机下乡 敬酒 **是"报"还是"抱"** **"Cellphones in the countryside" "Toasting"**

Table 2 shows that second-year-and-above groups were required to do reading comprehension for three texts. The third was a text sample from the lower level (indicated in boldface in Table 2). The purpose for including one text sample from the adjacent lower group in the higher groups was to gauge whether a difference in reading-comprehension performance between the two adjacent groups for the same text sample would be detected. If so, we could ensure that the text sample used could differentiate learners at different reading levels.

The Reading Comprehension Test. The purpose of administering a reading-comprehension test was to gauge whether students in the four groups have varying reading abilities. The

results from this test could provide information on whether the students in the higher-level group possessed higher reading abilities than those in the lower level. This information could confirm that the four groups of participants from different grade levels were reading at different levels. This test used an existing test developed for the study of constructing an informal diagnostic reading assessment for college Chinese L2 learners (Yang, 2018). It was chosen because it was carefully analyzed for testing-item difficulty and discrimination. The test's reliability and validity were gauged based on previous testing results from three U.S. universities not included in this study. The test comprises six reading samples with 25 comprehension questions on literal and interpretive levels.

Data collection and scoring

Data were collected in the second semester of each grade level. The *Reading Task* was administered on Day 1, with students first asked to read two minutes of text orally (comprising two text samples for the first-year group and three for the higher-level groups). Students' voices were recorded on a computer during their oral readings. The instructor advised students to read the text orally as they would read it in class. If they encountered an unknown character, they could skip the character. They should not start reading until they hear the instructor say "start," nor stop unless they hear "stop." After finishing the oral reading, students were instructed to read the same text sample online silently. The computer recorded their reading performances automatically, including reading time and the results from their answers to reading-comprehension questions. On Day 2, students were required to complete the *Reading Comprehension Test*. The maximum time for the test was 45 minutes. For both the *Reading Task* and the *Reading Comprehension Test*, students were required to complete a set of multiple-choice questions. Each correct answer was worth one point. For statistical convenience, all raw scores then were converted to a 100-point scale.

To score oral-reading accuracy, we first identified and calculated miscues during oral reading, which were misread characters. In this study, four types of miscues were identified: 1) substitution (student using a familiar character to substitute the target character in the text); 2) insertion (student inserting words or phrases not presented in the text); 3) omission (student skipping characters or words during reading); and 4) misreading (student misreading a character in the text. Table 3 below are examples of the four types of miscues:

Table 3. *Four Types of Oral Reading Miscues*

Substitution	Insertion	Omission	Misreading
六口人 is read as 六只人. In this case, the measure word 口 is substituted with another measure word 只.	The given text is "一个哥哥、一个弟弟、一个妹妹"，but a student reads it as 一个哥哥、一个弟弟、一个妹妹、一个姐姐…" The student inserts the bold part.	When reading the text, students skip one or more characters. (Note: Students were instructed to skip the characters they did not know.)	Students read a character with totally wrong pronunciation, e.g., reading 生(shēng) as "shì," and 起(qǐ) as "qián."

Each character read accurately was assigned one point. For statistical convenience, all raw scores then were converted into a 100-point percentile. Tonal errors were not counted as errors in this study. For example, if a character should be read as the first tone, but the student read it as the second tone, no point would be deducted. We understand that in spoken Chinese, a change in a syllable's tone can change the meaning denoted by that syllable. However, in written Chinese, such confusion is impossible because virtually all syllables (including those with similar tones) are represented with different graphs—characters (Shen & Bear, 2000). The reason for excluding tonal errors is that in this study, participants were required to read characters out loud to themselves. During the oral reading, the participants visually saw the target characters first before pronouncing them. Thus, a tonal error for the target character produced by the learner is not likely to be associated with target character comprehension.

Statistical validation of instruments

Word frequency and sentence length for selected reading materials. Table 4 presents word frequency and sentence length of the text samples selected for this study. Only a full sentence with a sentence-ending punctuation mark (i.e., a period, exclamation mark, or question mark) was counted as a sentence (Please see Appendix A for a detailed example). Table 4 presented mean word frequency and mean sentence length of reading materials included in the *Reading Task* for each learning level. The data showed that texts' mean word frequency decreases as grade level advances, and texts' mean sentence length increases as grade level advances.

These data indicated that the difficulty level of reading materials at each grade level is different and increases as grade level advances.

Table 4. *Word Frequency and Sentence Length of Reading Materials for the Four Groups*

Reading Material	Character number	Mean word frequency	Mean sentence length (characters per sentence)
First-year			
我的星期三	214	.654836	17.58
你家里有谁？	103	.479955	14.71
Total mean	**158.5**	**.567396**	**16.15**
Second-year			
我的 13 岁生日	146	.565330	20.13
电脑问路	237	.510299	18.08
Total mean	**191.5**	**.537815**	**19.10**
Third-year			
是“报”还是“抱”	229	.542960	18.79
运动会	300	.479074	25.00
Total mean	**264.5**	**.511017**	**21.90**
Fourth-year			
手机下乡	326	.547691	22.30
敬酒	284	.418767	26.58
Total mean	**305**	**.483229**	**24.48**

Repeated reading materials. As we mentioned earlier, all three groups above first-year were required to read a text sample from the adjacent lower level group. The purpose was to gauge whether the material actually could differentiate students at a higher level from those at a lower level. Descriptive statistics for both oral reading accuracy and reading-comprehension scores on repeated reading were obtained from the two adjacent groups. Table 5 shows that the mean scores for both oral and silent reading accuracy were different across learning levels.

Independent sample t-tests were performed to detect group differences, the results of which indicated that a statistically significant difference existed between adjacent groups in both oral and silent reading performances.

Table 5. *T-Tests on Oral Reading Fluency and Reading Comprehension of Repeated Reading Materials for Adjacent Groups*

Reading Mode	Reading Material	Group	N	M	SD	Sig.
Oral Reading	你家里有谁?	First-year	20	82.54	17.41	.004*
	你家里有谁?	Second-year	20	94.80	4.88	
	我的 13 岁生日	Second-year	20	85.59	6.84	.000*
	我的 13 岁生日	Third-year	20	93.84	8.60	
	是“报”还是“抱”	Third-year	20	94.93	2.98	.004*
	是“报”还是“抱”	Fourth-year	20	97.18	1.29	
Silent Reading	你家里有谁?	First-year	20	77.00	15.72	.046*
	你家里有谁?	Second-year	20	90.81	14.79	
	我的 13 岁生日	Second-year	20	94.05	8.32	.000*
	我的 13 岁生日	Third-year	20	99.15	3.80	
	是“报”还是“抱”	Third-year	20	84.90	11.89	.011*
	是“报”还是“抱”	Fourth-year	20	94.10	9.83	

Note. * p <0.05

Reading Comprehension Test. The purpose of administering this test was to confirm that the participants from the four learning levels possess different reading abilities. Thus, we assume that each group performance on the reading-comprehension test was different and that the higher-level group would perform better than the lower-level group. To confirm this assumption, one-way analysis of variance (ANOVA), followed by a group comparison, was conducted. The results showed that students from each group performed differently on the *Reading*

Comprehension Test, with mean scores of 27.95, 56.55, 64.70, and 75.80 for the four levels, respectively. The differences between groups were statistically significant (Table 6), confirming that on average, participants from the four levels differ in their reading abilities.

Table 6. *One-Way ANOVA Group Comparisons on the Reading Comprehension Test*

Group	n	M	SD	Sig.
First-year	20	27.95	14.06	.000*
Second-year	20	56.55	13.21	.047*
Third-year	20	64.70	10.84	.048*
Fourth-year	20	75.80	10.28	

Note. *p < 0.05

Analyses and Results

Research Question 1: What is the silent reading speed across four learning levels when the comprehension rate falls within the range of instructional-level reading?

As we discussed in an earlier section, three levels of reading were defined in reading English: *independent, instructional, and frustration*. At the *instructional level*, silent reading comprehension should reach 70%-89% before instruction. This study adopted the scale established in English, which means that if we expect the silent reading-comprehension rate for each group within the range of 70%-89% prior to instruction, this material is suitable for class instruction. So, what corresponding reading speed should be aimed for at each learning level? To answer this question, participants' average silent reading speed and reading comprehension rates from the *Reading Task* were obtained. Table 7 reported students' silent reading speed and comprehension rates at each learning level.

Table 7. *Descriptive Statistics of Silent Reading Speed and Comprehension Rates Across Learning Groups*

Group	N	Mean SRS (CPM)	Mean SRC %
First-year	20	40	71.86
Second-year	20	63	81.69
Third-year	20	83	71.95
Fourth-year	20	97	70.86

Note SRS = silent reading speed (CPM = characters per minute);
SRC = silent reading-comprehension rate

The data from Table 7 confirmed that all reading materials selected for each group were at the *instructional level*, as the four groups' reading-comprehension rates were within the 70%-89% range. We observed that students gained silent reading speed as learning level advanced. The average reading speed is 40, 63, 83, and 97 for the four groups, respectively. For reading-comprehension rate, it was quite consistent across learning levels (around 71%), except for the second-year group (81.69%). The second-year group had a relatively higher reading-comprehension performance than the other groups. However, this is not this study's concern, as we looked for a comprehension range of 70%-89%. The second-year group's reading comprehension did not exceed this range. The relatively higher comprehension score could be that one of the reading texts for this group was relatively easier than the other text. In Table 2, we reported the statistics on second-year group-reading materials: 我的 13 岁生日 (My 13th Birthday) and 电脑问路 (Giving Directions by a Computer). We can tell that the text 我的 13 岁生日 has fewer characters and higher word frequency than the text 电脑问路. Furthermore, students are very familiar with the "birthday" topic. All these may contribute to better reading comprehension of this text, which brought up the overall reading-comprehension rate for the second-year group. Nonetheless, the second-year group's reading speed did not exceed that of the third-year group. We noticed that students' silent reading speed increased as grade level advanced when reading at the group's *instructional level*, but the increase in silent reading speed did not synchronize with reading-comprehension rate.

Research Question 2: What are corresponding oral reading fluency rates across four learning levels when the comprehension rate falls within the instructional level?

In English, it is reported that for *instructional-level* reading, oral reading fluency should be within the 90%-96% range to reach a comprehension rate of 70%-89% (Gillet & Temple, 1994). So, what was the picture for Chinese-as-a-second-language reading? Table 7 presented both oral reading speed (including inaccurately read characters) and oral reading fluency (characters accurately read per minute). The data showed, for the *instructional level,* that on average, the first-year group could sound out 48 characters, the second-year group 82, the third-year group 95, and the fourth-year group 96. This data showed that reading speed increased as learning level advanced for the first-year, second-year, and third-year groups. It is understandable that as learning level increases, the frequency of encountering characters also increases, which contributes to students' eye movement speed in character-recognition and allow them to name more characters per minute. However, this trend was not observed for the fourth-year group. Table 7 showed that the oral reading speed for the third-year group was 95 and for the fourth-year group, 96, i.e., the growth of oral reading speed for reading *instructional-level* materials almost stopped upon completion of third-year learning. Thus, we observed a plateau phenomenon.

Table 8. *Oral Reading Speed and Fluency Across Four Learning Levels*

Group	N	Mean ORS (CPM)	Mean (ORF) %
First-year	20	48	83.77
Second-year	20	82	87.88
Third-year	20	95	86.92
Fourth-year	20	96	87.71

Note ORS = oral reading speed (CPM = characters per minute);
ORF = oral reading fluency (accuracy rate of characters reading in one minute)

From Table 8, we also observed that when reading text at the *instructional level*, oral reading fluency rates for first-year to fourth-year groups were 83.77, 87.88, 86.92, and 87.71, respectively, which shows the reading fluency rate was relatively stable across learning levels with a range of 83% to 88%. Thus, compared with reading in English, at *instructional-level* reading, oral reading fluency in Chinese was much lower than in English, in which, based on the scale proposed by Gillet and Temple (1994), students' reading-comprehension rate reached 70%-89%, with oral reading fluency rate at 90%-96%. However, no group in Chinese had reached the 90% threshold.

Research Question 3: What is the relationship between oral reading fluency and silent reading comprehension across four learning levels?

To answer this question, Pearson correlation analyses were performed, with results presented in Table 9. We observed a positive mid-to-high correlation between oral reading fluency and reading comprehension from the first-year to third-year groups. The correlation coefficients were r = .75, r = .61, and r = .51, respectively. However, a trend was observed: Correlation strength between oral reading fluency and reading comprehension decreased as students' learning level increased. An interesting phenomenon we observed was that no correlation existed between oral reading fluency and reading comprehension for the fourth-year group. It seems that when students' language proficiency reached a certain level (completion of fourth-year learning in this study), the role of oral reading fluency becomes inconspicuous in reading comprehension.

Table 9. *Pearson Correlation Analyses Between Oral Reading Fluency and Silent Reading Comprehension*

Group	N	ORF %	SRC%	r	Sig.
First-year	20	83.77	71.86	.75	.000*
Second-year	20	87.88	81.69	.61**	.005*
Third-year	20	86.92	71.95	.51*	.014*
Fourth-year	20	87.71	70.86	.23	.323

Note. ORF = oral reading fluency rate; SRC = silent reading comprehension rate;
*p <. 05.

Discussion

This study investigated *instructional-level* oral reading fluency, silent reading comprehension, and their relationship among Chinese L2 classrooms across four learning levels. The results yield the following findings.

First, asynchronous development of silent reading speed and reading comprehension rates was detected across learning levels. When students read a text sample at their group *instructional level*, for first-year students, their reading speed was about 40 cpm and reached 97 cpm upon completion of their fourth-year level. This shows that students improved their character-recognition speed as learning advanced. Compared with lower-level learners, higher-level learners spent less time reading material with the same amount of characters despite the increasing difficulty level of text samples, including lower word frequency and more complex sentences. However, the increase in reading speed across grade levels does not synchronize with reading comprehension rate. Students' reading comprehension rate remains similar across all four levels, possibly because at a more advanced level, students read more difficult, complex, and longer texts, as they are required to have more comprehensive reading skills to engage in more complex cognitive activities, e.g., word segmentation, solving lexical ambiguities for processing multi-meaning words, and comprehending complex sentence structures (Shen, 2017). With silent reading, faster reading often does not correlate with better comprehension at an advanced level, as silent reading speed is not just an index of fluency, but also serves as a compensatory resource for reading comprehension. When reading a complex text, good readers will adjust reading speed and reread the text for deep comprehension (Wallot, O'Brien, Haussmann, Kloos, & Lyby, 2014). However, the increase in reading speed at more advanced levels, although having no direct correlation with reading comprehension, does not mean reading speed makes no contribution to reading comprehension. If students can read faster, they can shift more attention from character recognition to engage in text comprehension to avoid dropping comprehension rates.

Second, a plateau phenomenon of oral reading speed was observed at the fourth-year level. The data showed that when reading text at the *instructional level*, a linear progression in oral reading speed occurs with first-year to third-year levels, but not at the fourth-year level. Students' oral reading speed, from 48 characters per minute the first year, increased to 95 characters per minute at the third-year level, but very little increase occurred from the third-year

to the fourth-year level. This could be that at the *instructional level*, reading materials are challenging to students. They must maintain a comfortable oral reading speed to avoid making more mistakes, as faster reading speeds bring down reading-accuracy rates. At the advanced level (e.g., fourth year), students encounter more complicated vocabularies, including words with multiple meanings, requiring cognitive time to be allocated to determine how to group the constituent characters together for accurate word segmentation in the ongoing context before sounding out a word. Thus, we may not observe students' oral reading speed increasing significantly at this level. Further studies are needed to verify this plateau phenomenon.

We also observed that although oral reading speed increased for first to third-year group, the oral reading fluency remained relatively consistent across levels (a range of 83% to 88%). Two possible reasons explain this phenomenon. One is that students at each level were reading the materials at their own *instructional level,* but students in more advanced levels read more characters per minute, which introduced more chances of making character reading errors for per minute reading. The other is that students at more advanced levels gained more orthographic knowledge to guess the sound for a compound character based on its phonetic radical. Due to unreliable nature of a phonetic radical cuing the sound of a compound character, the guessing strategy would also increase the risk of making pronunciation errors for oral reading.

Third, oral reading fluency played a positive but complex role in reading comprehension. This study detected a positive mid-to-high correlation between oral reading fluency and reading comprehension for first- to third-year groups. The correlation strength started high and gradually dropped as grade level advanced. No correlation was detected for the fourth-year group. This is consistent with earlier studies in English. A study (Fuchs, Fuchs, Hamlett, Walz, & Germann, 1993) reported that relations between oral reading fluency and comprehension are stronger in elementary and intermediate learners than in older learners due to the complexity of reading texts at advanced levels. Another study among schoolchildren in second, fourth, and sixth grades reported that as students move through these grades and become more skilled readers, comprehension may have less to do with oral reading speed and accuracy and more to do with higher-level comprehension (Valencia, Smith, Reece, Li, Wixson, & Newman, 2010) because oral reading fluency requires only surface-level comprehension, but silent reading comprehension requires deep-level comprehension when materials get difficult at advanced levels. Based on this observation, we may assume that by the end of fourth-year study,

students have a better command of lower-level processing skills, such as character recognition; thus, their reading comprehension problems mainly lie in higher-order cognitive processes. Under such conditions, we do not see a correlation between oral reading fluency and reading comprehension. However, further studies in Chinese are needed to test and verify this assumption. It should be pointed out that no correlation between oral reading and reading comprehension at advanced levels does not mean that oral reading fluency is not important at advanced levels, but rather it means that it is critically important to reach an optimistic level of oral reading fluency for advanced learners so that they can shift their cognitive resources from character recognition to higher-level comprehension, such as lexical access, sentence integration, and meaning generation.

Fourth, strong evidence for proposing a Chinese L2 reading scale was obtained. In an earlier section, we explained the three-levels-of- reading model in English and how it serves as a benchmark for informal reading assessment. The scoring criteria for *instructional-level* reading are set as: oral reading fluency of 90%-96% and reading comprehension of 70%-89%. However, our study revealed a different picture for Chinese L2 learners. Students' oral reading fluency for *instructional-level* Chinese reading was much lower than that of English. Our data showed an oral reading fluency rate of 83.77% to 87.71% and a comprehension rate of 70%-89% for the first- to fourth-year groups. Three possible reasons can be used to explain slower oral reading-fluency rates in Chinese compared with English. First, with English being an alphabet-based language, it is possible that students could sound out an unknown word without actually knowing its meaning, based on sound-to-spelling correspondence rules. Therefore, students were able to reach an oral reading-fluency rate of 90%-96%, even though their reading comprehension remained within the 70%-89% range at the *instructional level* of reading. However, this is almost impossible when reading Chinese characters. Chinese is a nonalphabetic language that lacks sound-to-spelling correspondence, so it would be difficult for students to access the sound of the character without knowing the character's meaning. This concept is supported by a previous study that reported a strong correlation between character naming and knowing among U.S. learners of Chinese (Everson, 1998). Second, English has space boundaries between words, which is lacking in Chinese. Thus, the process of word segmentation while orally reading Chinese slows down reading speed. Third, a difference exists in perception span while orally reading Chinese vs. English. It has been reported that while reading English, native English readers can look at and process a word in the text that is two to three words to the right of the one that they are pronouncing (Inhoff, Solomon, Radach, &

Seymour, 2011). While reading in Chinese, native readers demonstrated that the perceptual span extended to only three characters (rather than words) to the right of the current fixation (Pan, Yan, & Laubrock, 2017).

Based on the data from this study, we now are able to propose a preliminary, and tentative scoring scale for the three levels of reading for Chinese L2 learners (Table 9):

Table 9. *Proposed scoring scale for three levels of reading for Chinese L2 learners*

Reading level	**Oral reading fluency (cpm)**	**Comprehension**
Independent level	89% and up	90% and up
Instructional level	83%-88%	70%-89%
Frustration level	Below 83%	Below 70%

Note. cpm = characters per minute

We should point out that the scale proposed above is suggestive rather than decisive, as this study used only two reading articles for each reading level and a relatively small sample size. Future studies with larger sample sizes and more reading material are needed to refine this proposed scale further. Nonetheless, we hope this scale will serve as a base point for furthering Chinese L2 classroom informal reading-assessment tools.

Pedagogical Implication

The results of this study suggested a couple of pedagogical implications. One is that classroom instructors may wish to use the proposed tentative reading scale as a reference point for three purposes. One is for making a screening decision to determine students' current reading level, such as to confirm whether students' reading performance is within the *instructional level*. If not, necessary adjustments could be made so that students can be placed in an appropriate learning level. The other is for diagnosing reading problems. This allows instructors to provide timely intervention by developing techniques to remediate students' reading problems. Another purpose is for monitoring students' daily progress in reading. The instructor can use the scale at certain time points during a semester to gauge whether students are making progress in their reading. If not, necessary adjustments in teaching content and methods can be made to

maximize students' reading-skills development. Apart from this, the proposed scale also can be used for the following instructional purposes:

Reading material selection for class instruction. Often, we need to use supplemental reading materials for our instruction, but how can we determine whether the material selected is at the *instruction-level*, which is suitable for students to learn in the classroom? Instructors may select a few students from low-, mid-, and high-grade standing from the class and administer an oral reading test using selected texts. If the average percentage in oral reading fluency is 84% to 88%, then the material may be suitable for instruction.

Reading comprehension test design for formative and summative assessment. In our daily instruction, instructors often need to design reading-comprehension tests for students to gauge their progress during the semester, and they wish to know how many reading texts should be included in a single test paper for a fixed exam time. If we wish to include material with *instructional-level* reading for instructional assessment, the instructor may use the silent reading time suggested in Table 6 as a reference point to decide how much materials should be included and how many minutes students may need to complete a certain test.

Reading-material selection for extensive reading. It is common knowledge that the development of reading skills is dependent on extensive reading, which can foster healthy reading behaviors, strong reading interest, and expanded vocabulary knowledge, which will improve reading proficiency. Extensive reading usually happens outside the classroom, as students read independently. Recommending appropriate reading material at the independent reading level is a key factor in ensuring reading success. Instructors may use the proposed oral reading fluency range of 89% and higher as a reference point to select reading materials for students. In doing so, the instructor can select a few students at different academic standings in the class to read a paragraph from each of the selected materials and calculate their average oral reading fluency rate, then a recommendation of reading materials for the class can be made based on the results of those students' oral reading fluency.

In using the proposed scale, we must bear in mind that reading difficulty not only is caused by linguistic factors, but also nonlinguistic factors such as readers' background knowledge and reading interest. Thus, in choosing reading materials, instructors also should consider such nonlinguistic factors by informally surveying students on these factors.

The other suggestion for pedagogical implication is adopting a fluency-based approach for oral reading instruction. The results of this study suggested a mid-to-high correlation between oral reading fluency and reading comprehension from first- to third-year groups. This correlation indicates that improve oral reading fluency can also facilitate reading comprehension directly in lower-level classes. Several obvious advantages to asking students to read text aloud have been reported (Shen & Jiang, 2013). It can help establish a sound-graph connection within a character and allows instructors to identify students' reading problems through oral-miscue analysis. Reading problems, such as character substitution, omission, insertion, reverse character order, mispronunciation and tonal errors, as well as inappropriate word segmentation, can only be identified during oral reading. In addition, oral reading requires that students keep their eyes on every character in the text as they sound it out loud, which increases visual exposure to characters' physical structure, thereby facilitating memorization of characters' graphic structure. Higher oral reading fluency indicates greater character-recognition ability. We must understand that only when students build a strong foundation in character recognition in their lower-level studies can they shift cognitive resources from character recognition toward sentence and paragraph processing for meaning comprehension of more complex texts when they enter advanced-level studies.

Developing oral reading fluency is not a simple matter of devoting more class time to students practicing oral reading, but rather requires a fluency-based approach to develop oral reading fluency (Wolf & Katzir-Cohen, 2001), which cannot be attained without acquiring a set of subskills: automatic sounding out of characters, the ability to recognize character structures, knowledge of character meanings, and word-segmentation ability. To sound out characters automatically, students must have strong *pinyin* skills so they can access sounds of unknown characters through the *pinyin*, then establish a strong connection between *pinyin* and characters. They must not be confused by the shapes of similar characters so they can assign sound and meaning precisely to the target characters when reading aloud. For context-based oral reading, students must know how to group constituent characters into words while reading to avoid reading sentences while using inappropriate prosody, which leads to comprehension difficulty. Thus, it is important that we adopt a fluency-based approach in oral reading instruction for lower-level Chinese L2 instruction, which considers developing subskills, such as connecting *pinyin* learning with meaningful words and expressions and incorporating character-structure analysis into the character-learning process. We need to ensure that daily learning

activities – such as practicing character typing by using the *pinyin* input method, reading aloud, and character-structure analyses – are not merely about daily learning content, but also integrated into formative and summative assessments in lower-level curricula to optimize students' oral reading fluency.

Conclusion

This exploratory study investigates the complex relationship and developmental trend of Chinese L2 oral reading speed and accuracy rates, silent reading speed and comprehension rates, and the relationship between oral reading fluency and reading comprehension among college learners of Chinese across four learning levels. Based on the information gathered in this study and predicated on the scale of *Three Reading Levels* proposed in English for the *Informal Reading Inventory* to assess classroom reading (Gillet &Temple, 1994; Gillet, Temple, Temple, & Crawford, 2012), a tentative scale of *Three Reading Levels* for Chinese L2 was proposed. One important difference between the tentative Chinese scale and the established English scale is that the oral reading-fluency rate at each reading level for Chinese is lower than that of English. Future studies with larger sample sizes and more reading texts to refine and verify the proposed scale are needed to make this scale an effective tool for assessing Chinese L2 classroom reading.

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Appendix A

Example of Sentence-Length Computation

*First year reading material Title: 你家里有谁？	# of sentence	# of characters
王先生的家在北京，他家里有六口人。	1	15
他们是爸爸、妈妈、一个哥哥、一个弟弟、一个妹妹，还有他。	1	22
王先生是老二。	1	6
他的哥哥已经结婚了，没有跟他的爸妈住一起。	1	19
王先生还没有结婚，可是他也没有跟爸妈住一起。	1	20
现在他在美国读书。	1	8
只有他的弟弟和爸妈住在一起。	1	13
Total	7	103

*The text is selected from https://collections.uiowa.edu/chinese/