*Forum for Linguistic Studies* 2024, 6(2), 2130.
https://doi.org/10.59400/fls.v6i2.2130

Article

# The effectiveness of a school-based phonics instructional material

**Minjie Chen[1], Guojie Yin[1,*], Wei Lun Wong[2], Mohamad Syafiq Ya Shak[3], Mairas Abdul Rahman[4], Mei Chew Lee[5]**

[1] Faculty of Foreign Languages, Mianyang Teachers' College, Mianyang 621000, P. R. China
[2] Faculty of Languages and Communication, Sultan Idris Education University, Tanjong Malim 35900, Malaysia
[3] Academy of Language Studies, Universiti Teknologi MARA Perak Branch Seri Iskandar Campus, Seri Iskandar 32610, Malaysia
[4] Faculty of Languages and Communication, Universiti Sultan Zainal Abidin, Kuala Nerus 21300, Malaysia
[5] Faculty of Science and Mathematics, Sultan Idris Education University, Tanjong Malim 35900, Malaysia
*** Corresponding author:** Guojie Yin, yaleygj@mtc.edu.cn

**CITATION**

Chen M, Yin G, Wong WL, et al. (2024). The effectiveness of a school-based phonics instructional material. Forum for Linguistic Studies. 6(2): 2130. https://doi.org/10.59400/fls.v6i2.2130

**ARTICLE INFO**

Received: 12 January 2024
Accepted: 7 February 2024
Available online: 29 February 2024



**Abstract:** The updated version of the national English curriculum for compulsory education was released in 2022. In this updated version, phonics was also required. Although studies about phonics were uprising again after the release of the new curriculum, most of the previous studies did not specify phonics instruction approach or obtain a larger sample size. Besides, previous studies called for a school-based phonics instructional material to enhance English as a foreign language (EFL) beginners' word recognition ability at word level. To bridge the gap, the researchers compiled a phonics instructional material based on synthetic phonics approach in light of the new national English curriculum and bottom-up reading model. To evaluate the effectiveness of such a phonics material, a number of 366 EFL students from three strata across two schools participated in this quasi-experiment via stratified random sampling technique. They experienced a pre-test, 16 weeks of training via the phonics material, a post-test as well as a delayed retention test, which was held three months later. The results of both independent *t*-test and paired samples t-test have indicated that the newly compiled phonics material can improve EFL students' word recognition ability up to 50% and that the knowledge was well-retained after a period of time as practices went on. The results have further implied that to better implement phonics instruction and to radically improve EFL students' reading ability, the solution might be to assign time in the extra-curriculum service to teach phonics via explicit and systematic synthetic phonics instruction tailored according to the school-based phonics material.

**Keywords:** EFL learners; phonics instruction; extra-curriculum service; school-based phonics material; bottom-up reading model

## 1. Introduction

Phonics was introduced into mainland China in the early 21st century and was first required in the national curriculum in 2011 (Huangpu, 2017). In the national curriculum of compulsory English education released in 2011, the basic phonetic knowledge requirement for primary school students who are from grade 1–6 is to get to know the basic English decoding rules. On the other hand, the advanced requirement for students from grade 7–9 is to vocalize unfamiliar vocabularies based on the decoding rules (Ministry of Education, 2011). To note that, in China, the compulsory education includes two education phases, namely, elementary education and secondary education. Since then, studies on phonics and its instructions became prevalent. Based on the data from China National Knowledge Infrastructure (CNKI), studies on phonics began to boom in 2011 and reached a peak in 2019. Then, the publication on phonics

had a decline trend until the year of 2022 when the latest version of the national curriculum was newly released by the Ministry of Education. In the newly updated national curriculum, phonetic knowledge requirement is levelled. The fundamental requirement for phonetic knowledge is to learn the basic decoding rules and try to spell vocabularies with acquired rules. The second level is to vocalize vocabularies with the aid of acquired decoding rules, whereas the third level is to vocalize unfamiliar words with phonics decoding rules and International Phonetic Symbol (IPA). However, the advanced level is targeted for students in secondary schools. As for elementary students, only phonics decoding rules is required. Since 2011, in most of the prevalent English text books published by different publishing house, phonics related content is included explicitly or implicitly in different approaches. In this vein, Blevins (2017) noted that phonics itself was not a teaching approach and there were different approaches to present and instruct it, namely: synthetic phonics instruction approach, analytic phonics approach as well as analogy approach. Thus, in those textbooks, for EFL students in China, with an eye to obtain fast effect of vocalizing words, word chunks instead of phonemes are presented; a matter which requires analogy instruction approach. Several other textbooks may present phonics contents inexplicitly with the title of "Look and say" or "Let's spell", which require students to discover the decoding rules by themselves (Tang, 2022). Only a few of the text books present phonics contents explicitly with single phonemes which requires synthetic phonics instruction approach. However, phonics content is not the focus of the textbook, the phonemes are not presented systematically or completely. In addition, previous studies indicated that in-service EFL teachers may be unable to identify phonics contents or unbale to teach phonics decoding rules explicitly or systematically which led to ineffective phonics instruction (Chen et al., 2022; Long, 2019; Li, 2021). Given that situation, to develop a phonics instructional guide as well as a school-based phonics instruction material for the teachers to teach phonics to EFL students in compulsory education phase is necessary. As for the present study, the latter one is the study focus. In other words, the purpose of the present study is to investigate the effectiveness of a school-based phonics instruction material which was developed based on the systematic synthetic phonics instruction approach. Such a phonics instruction mode or approach is the most suitable for EFL students who lack English environment and who are already accumulated English vocabularies (Papp, 2020). Thus, for the present study, the research question is: How effective is the newly compiled school-based phonics instruction material in assisting EFL students in word recognition.

## 2. Literature review

### 2.1. English phonics and reading

As defined, specifically, phonics refers to the correlation between letters and corresponding sounds. The regular pattern of the corresponding is known as phonics decoding rules, which forms the basis of early English reading (Blevins, 2017; ILA, 2020; Papp, 2020). Previous studies on phonetics in English speaking countries were based on Bottom-Up Reading Model which claimed that reading comprehension consists of series of sub-skills starting from alphabet level, phonetic level, word level, text level to the semantic level. To teach early English reading from alphabet and

phonetic level is essential for beginners. With the mastery of phonics decoding rules, those beginners can break the words into phonemes and turn the unfamiliar words into their listening vocabularies and get the meaning out of the context. During such a process, the first step is to decode the word and then to vocalize it. In other words, adept decoding skills enhance reading fluency which is a premise for reading comprehension. The ultimate purpose of early reading is reading comprehension. Based on this philosophy, the phonetic knowledge required by the newly revised national curriculum also serves the purpose of reading comprehension. For example, the advanced reading volume requirement for compulsory education is to reach 150,000 words. Also, students are required to understand explicit and inexplicit logic connections in the reading passage, to deeply understand its semantic meaning and implications in the passage. However, as Blevins (2017) noted, reading has two layers; the first is at word level and the second is at the text level. In this sense, word recognition goes before and serves text reading. In other words, English vocabulary plays a role in connecting phonics and text reading. Therefore, in China, from 2011 to 2023, most of the studies focus on the theme of phonics and vocabulary learning, such as Wang (2013), Hu (2015), Zeng (2016), Zhong (2017), He (2018), Gao (2019), Zhou (2020) and Li (2021). Those studies were conducted in the compulsory education level and all indicated the effectiveness of phonics instruction in aiding vocabulary learning. However, those studies and other related studies had their own limitations. First, they did not explicitly define the notion of phonics. Second, they did not distinguish the notion of phonics and phonics instruction. Just as Blevins (2017) and ILA (2019) clarified that phonics itself is not a teaching method; on the contrary, there are several methods to teach it. Given that, the above-mentioned previous studies also did not explicitly point out which teaching method they adopted in their study. This was because ILA (2019), Parker (2019) as well as Papp (2020) claimed that different phonics teaching approaches were based on different theories or philosophies and had their own instruction focus, weakness and strength. For instance, the analytic phonics instruction approach is not suitable for EFL students who lack accumulated vocabularies. besides, analogy phonics instruction approach is not the best approach for beginners, as this approach may hinder the cultivation of beginners' phonemic awareness (ILA, 2019). Accordingly, without pointing out which specific teaching approach was adopted in their study, the results of those study were not sound; a matter which further left a research gap to be filled. In the light of the Bottom-Up Reading Model, which considers phonics decoding rules lay the foundation for word recognition at word level, fluency and comprehension, with an eye to bridge the research gap, this study is specifically conducted study, based on systematic and explicit synthetic phonics instruction approach, the most appropriate for EFL beginners (Papp, 2020).

## 2.2. Theoretical foundation

The theory which underpins the present study is Bottom-Up Theory for early reading (Tsai and Huang, 2023). This theory views early reading as a sequential and progressive process that is best learned in stages, beginning with lower-level skills and progressing to higher-level components (Amadi, 2019). Gough (1972) is the primary

proponent of Bottom-Up Theory for early reading, who established a simple model of reading under this theory, which presupposes that all letters in print must be processed individually before the reader comprehends the meaning of the letter clusters (Redondo, 1997). In brief, before reading comprehension can be achieved, the alphabet and letter-sound relationship must be mastered separately, beginning with the smallest unit, which is known as the phoneme. Then the reading instruction should progress sequentially from the simplest to the most complex units may assist beginners in acquiring the automaticity of word recognition necessary to develop reading fluency, which is a prerequisite for reading comprehension (Aldhanhani, 2020). Therefore, this theory lays a foundation for explicit and systematic phonics instruction mode which is adopted in this study.

### 2.3. Introduction to the school-based phonics instruction material

As has been introduced, this school-based phonics instructional material is guided by Bottom-Up Theory for early reading, the contents are centered around systematic and explicit phonics approach. In the light of such approach, the phonics instruction material are divided into two chapters respectively. The first chapter aims to prepare learners to learn phonics. Because as Blevins (2017), ILA (2018), and Carroll et al. (2011) noted, alphabet recognition and phonemic awareness are two prerequisites for reading instruction. For EFL learners in China, they have already possessed phonemic awareness via learning Chinese Pinyin, before formal phonics instruction, they only need to learn alphabet. For all learners, naming and quickly recognizing letters is a vital step toward learning to read (Blevins, 2017; ILA, 2019). Both accuracy and reading speed reveal the extent to which students have mastered letter identities (Blevins, 2017). Additionally, when beginners get familiar with the alphabet, their curiosity may motivate them to learn more about the language, including letter sounds and how to write them, which can significantly improve their reading and spelling (Bear et al., 2020). Thus, in this chapter, the contents include upper-case and lower-case alphabet recognition as well as alphabet principles. According to Clemens et al. (2017), letter-name and sound fluency are two distinct techniques. The capacity to name letters is a critical component of the decoding process. Bear et al. (2020) underlined that the purpose of alphabet principle instruction is to assist beginners in developing an understanding of the relationship between printed letters and spoken sounds, whereas letter names are labels that should be taught after letter sounds.

The second chapter focuses on phonics instruction. Following the principle of systematic and explicit phonics instruction approach, short vowel sounds, long vowel sounds, other vowel sounds, digraph and blends as well as sight words are introduced respectively in different sections. Based on the above sections, drills and exercises are also provided in the material, because as ILA (2019) pointed out that one characteristics of systematic and explicit phonics instruction is to review and to practice already learned rules via drills and exercise.

## 3. Research method

In this section, the study context, research design, samples, and instruments are

introduced respectively.

### 3.1. Context

This study was conducted in Mianyang City, Sichuan Province in China. Primary school students from one public school and a private school were involved. In this study, the public elementary school is referred to as school "C", and the private school is referred to as school "Y". Permissions were granted by the principals of the two schools. Because the students in grade one needs more time to adapt to the environment and students in grade 6 are engaged in the process of applying for secondary school, they have not been included in the study. Since there are six grades in the elementary schools, grades one and two are considered as the lower grades, grades three and four are considered as the middle grades, and grades five and six are the higher grades. Thus, samples are drawn from grades two, three and five.

### 3.2. Research designs

With the purpose of evaluating the effectiveness of the school-based phonics instruction material, a quasi-experimental design has been adopted. After one intact class in grades two, three and five were drawn via a stratified random sampling technique. The students have then been given a valid and reliable pre-test. Then they have been assigned into an experimental group and control group based on their pre-test results. First, the scores of pre-test were rearranged from highest to lowest score. And then the test-takers were assigned into experimental and control group via even and odd numbers.

The experimental group has undertaken phonics instruction with the newly compiled school-based material while the control group has undertaken phonics instruction with their regular English textbook published by People's Education Printing House for 16 weeks. Then, a post-test has been conducted. On top of the mean comparison between the post-test results and pre-test results within each group, mean comparison between groups have also been conducted. In order to further assess the effectiveness of the material, the means of each group from the two schools have also been compared and reported. To compare the means between groups, an independent *t*-test has been adopted. To compare the means within groups, paired samples *t*-test has been utilized. In addition, to further investigate the internalization of students' knowledge, a delayed test has been arranged three months later. All the collected quantitative data have been analyzed by SPSS 27 and Microsoft Excel.

### 3.3. Samples

Since samples are drawn from two elementary schools respectively, the samples have been reported respectively. In general, a stratified random sampling technique has been adopted to select samples from grades two, three and five. For school C, one intact class has been randomly selected from each stratum, $N_2 = 57$, $N_3 = 58$ and $N_5 = 58$. Using a similar technique, one intact class has been randomly selected from each stratum, too in school Y: $N_2 = 62$, $N_3 = 62$ and $N_5 = 63$.

### 3.4. Instruments

For this study, there are three instruments for the pre-test, post-test as well as delayed test. As Creswell and Creswell (2018) suggested, using parallel tests may maximize the reliability of the study, thus, the three tests are similar, but different in layout and wording. The tests have been adapted from Nonsense Word Test and San Diego Quick Assessment by Blevins (2017). Specifically, the tests consist of four sections with full score of 127 points. Section one focuses on upper case letters recognition with full a score of 26 points. Section two focuses on lower case letters recognition with full a score of 26 points too. Section three still belongs to letter recognition, but the focus is on the sounds the letters stand for. The full score for section three is 25 points. Section four is word-reading assessment, which consists of phonics elements, such as short vowel sounds (10 points), long vowel sounds (10 points), other vowel sounds (10 points), digraphs and blends (10 points) as well as sight words (10 points). The full score of section four is 40 points. Before the formal study, the instruments have been piloted, and the reliability is 0.885 which is considered as acceptable. Furthermore, such instruments have been validated by four educators and two primary school teachers. In addition, the consistency of parallel tests in the pilot study also indicates a proper construct validity of the instruments.

## 4. Results

In this section, the findings of pre-test, post-test as well as delayed test have been reported to evaluate the effectiveness of school-based phonics instruction materials. Since the study have been conducted in three different strata within two schools, the findings are reported respectively according to different stratum.

As described above, school C and school Y have participated in this study. In the stratum of grade two, which is also known as stratum one, altogether, 119 participants have taken part in the pre-test and among them, 57 of them are from school C and 62 of them are from school Y. For stratum two, there are 58 and 62 participants in grade three from school C and school Y, respectively. In stratum three, altogether 121 valid tests have been returned and among those, 58 are from school C and the rest 63 are from school Y.

The full score of the whole test is 127 points. For stratum one, the average score of the pre-test is 61.73 which takes up less than 60% percent of the full score. Normally, the cutline of each test is 60% of the full score. For specific phonics-related knowledge, the students have done very well in alphabet recognition, which includes upper case and lower-case letters. The correct rate is up to 99 percent. As for sound discrimination section, short vowel sounds, long vowel sounds, other vowel sounds as well as digraph and blends, students have obtained a very low score and the correct rate has been less than 10%.

For stratum two, the test-takers have obtained an average score of 62.88 out of the full score 127. The total correct rate is just 49.5 percent, which is lower than the cutline 60 percent. As for specific phonics knowledge section, the students have done their best in upper and lower alphabet recognition. The correct rate for the two sections has been one hundred percent. However, they have performed alarmingly worse in long vowel sound section and digraph and blend section where the correct rates have

been 3 percent and 0.5 percent, respectively.

For stratum three, for the overall test, the test-takers have obtained an average score of 67.54, which indicates 53.1% of the correct rate. Such a correct rate is lower than the cut-off line 60%. Further, they have obtained a full score in alphabet recognition, including both upper case and lower case. On the contrary, they have performed comparatively worse in long vowel sounds, other vowel sounds, digraphs, and blends sections. The correct rates have been 9.6%, 5.5%, and 3.1%.

Based on the pre-test score, the test-takers have been assigned to experimental group and control group via even and odd number. To ensure the equality of the two groups, based on the assumed variance, the mean scores of control group and experimental group in pre-test have been compared via independent *t*-test and the results are reported in **Table 1**.

**Table 1.** Independent *t*-test results of both groups in pre-test in all strata from two schools.

| Strata | Sections | df | *t* | Mean difference | Std error difference | Sig. |
|---|---|---|---|---|---|---|
| | Upper case | 117 | −0.285 | −0.18 | −0.30 | 0.776 |
| | Lower case | 117 | 0.358 | 0.017 | 0.37 | 0.721 |
| | Sound discrimination | 117 | −0.026 | −0.574 | −0.006 | 0.979 |
| | Short vowel | 117 | −0.041 | 0.644 | −0.006 | 0.967 |
| One | Long vowel | 117 | 0.073 | 0.109 | 0.012 | 0.942 |
| | Other vowel | 117 | 0.038 | 0.007 | −0.005 | 0.970 |
| | Digraph and blend | 117 | −1.427 | 0.01 | 0.034 | 0.153 |
| | Sight words | 117 | 0.240 | −0.018 | 0.034 | 0.159 |
| | Total | 117 | 0.032 | 0.005 | 0.432 | 0.992 |
| | Upper case | 118 | −1.42 | 0.00 | - | 1 |
| | Lower case | 118 | 0.217 | 0.00 | - | 1 |
| | Sound discrimination | 118 | 0.00 | −0.033 | 0.235 | 0.888 |
| | Short vowel | 118 | 0.00 | −0.033 | 0.154 | 0.829 |
| Two | Long vowel | 118 | 0.073 | 0.00 | 0.163 | 1.00 |
| | Other vowel | 118 | 0.038 | 0.00 | 0.141 | 1.00 |
| | Digraph and blend | 118 | −1.427 | 0.833 | 0.04 | 0.407 |
| | Sight words | 118 | 0.240 | 0.300 | 0.167 | 0765 |
| | Total | 118 | 0.032 | 0.041 | 0.404 | 0.967 |
| | Upper case | 119 | - | - | - | - |
| | Lower case | 119 | - | - | - | - |
| | Sound discrimination | 119 | −0.104 | −0.021 | 0.201 | 0.981 |
| | Short vowel | 119 | 0.086 | 0.018 | 0.207 | 0.979 |
| Three | Long vowel | 119 | 0.060 | 0.016 | 0.263 | 0.950 |
| | Other vowel | 119 | 0.268 | 0.004 | 0.151 | 0.655 |
| | Digraph and blend | 119 | 0.042 | 0.01 | 0.125 | 0.962 |
| | Sight words | 119 | 0.046 | −0.018 | 0.391 | 0.944 |
| | Total | 119 | 0.063 | 0.005 | 0.642 | 0.815 |

Statistics in **Table 1** indicates that for stratum one, for the phonics-related skills in each section, the participants in the experimental and control groups possess similar phonics-related knowledge and skills in different specific aspects, such as upper- and lower-case alphabet recognition, sound discrimination, short vowel, long vowel, other vowel sound, digraphs, blends, and phonograms (mean difference = 0.18, 0.017, 0.574, 0.644, 0.109. 0.007, 0.01 and 0.018 with a $P$ value for each section that is greater than 0.05). This result implies the null hypothesis, $X_c = X_e$, is failed to be rejected. Thus, the two groups are considered equal at the initial stage of the experiment.

For stratum two, the statistics indicate that the test-takers in Stratum Two have obtained an average score of 62.88 out of the full score 127. The total correct rate is just 49.5 percent, which is lower than the cutline 60 percent. As for specific phonics knowledge section, they have done the best in upper and lower alphabet recognition. The correct rate for the two sections is one hundred percent. However, they have performed alarmingly worse in long vowel sound section, and digraph and blend section, in which the correct rates are 3 percent and 0.5 percent, respectively.

For stratum three, for the overall test, the test-takers have obtained an average score of 67.54, which indicates 53.1% of the correct rate. Such a correct rate is lower than the cut-off line 60%. Further, they have obtained a full score in alphabet recognition, including both upper case and lower case. On the contrary, they have performed comparatively worse in long vowel sound, other vowel sounds, and digraph and blend sections. The correct rates are 9.6%, 5.5% as well as 3.1%.

After the students of this stratum have been assigned into an experimental group and control group equally, they have been trained with the newly complied school-based phonics materials and conventional English textbook, respectively for 16 weeks. Then, they have been given a post-test to check their progress. Paired samples $t$-test has been utilized to compare the means. The null hypothesis is: $X_e = X_c$. The post-test results are presented as shown in **Table 2**.

Statistics in **Table 2** indicates that in stratum one, for the experimental group, their total mean score has been improved by about 49.7% (mean difference = 30.667 and $P < 0.001$). For specific knowledge sections, they have progressed, too. For example, they have made a progress in sound discrimination section, short vowel section, long vowel section, other vowels section, digraph and blend section as well as sight words section, respectively by: 29%, 62%, 65%, 58%, 71%, and 27% ($P < 0.001$). As for the upper case and lower-case alphabet recognition, the students in experimental group have also made a progress and the progress rate is about 8% ($P = 0.04$ and 0.08). Both the general and specific results imply that the null hypothesis $X_e = X_c$ is rejected that and the alternative hypothesis is accepted, which claims a significant improvement of the experimental group after training via the newly compiled school-based phonics material.

For the test-takers in stratum two, they have not made any progress in alphabet recognition; a matter which is worthy to discuss. As for other sections, the mean differences of each section and the $P$ value, which is less than 0.001, implies that the null hypothesis $X_e = X_c$ has been rejected and the alternative hypothesis is accepted. Hence, the statistics indicates a significant progress of the test-takers in the experimental group.

**Table 2.** Paired samples *t*-test results within the experimental groups in three strata from both schools.

| Strata | Sections | Mean of pretest | Mean of posttest | Mean difference | *t* | Sig. |
|---|---|---|---|---|---|---|
| | Upper case | 25.78 | 26 | −2.17 | −3.023 | 0.04 |
| | Lower case | 25.78 | 26 | −2.17 | −2.737 | 0.08 |
| | Sound discrimination | 5.38 | 7.32 | −1.933 | −4.598 | 0.00 |
| | Short vowel | 1.35 | 7.63 | −6.283 | −41.74 | 0.00 |
| One | Long vowel | 0.3 | 6.82 | −6.517 | −36.15 | 0.00 |
| | Other vowel | 0.32 | 6.07 | −5.750 | −56.5 | 0.00 |
| | Digraph and blend | 0.03 | 7.12 | −7.083 | −164.2 | 0.00 |
| | Sight words | 2.77 | 5.43 | −2.667 | −20.26 | 0.00 |
| | Total | 61.72 | 92.38 | −30.667 | −60.04 | 0.00 |
| | Upper case | 26 | 26 | 0.00 | - | 1 |
| | Lower case | 26 | 26 | 0.00 | - | 1 |
| Two | Sound discrimination | 5.38 | 7.32 | −1.933 | −5.511 | 0.00 |
| | Short vowel | 1.43 | 7.9 | −6.467 | −41.26 | 0.00 |
| | Long vowel | 0.3 | 6.87 | −6.567 | −35.56 | 0.00 |
| | Other vowel | 0.32 | 6.10 | −5.783 | −58.85 | 0.00 |
| | Digraph and blend | 0.03 | 7.32 | −7.283 | −115.1 | 0.00 |
| | Sight words | 3.42 | 5.77 | −2.350 | −14.94 | 0.00 |
| | Total | 62.88 | 93.27 | −30.383 | −54.60 | 0.00 |
| | Upper case | 26 | 26 | 0.00 | - | 1 |
| | Lower case | 26 | 26 | 0.00 | - | 1 |
| | Sound discrimination | 5.74 | 8.62 | −2.885 | −15.790 | 0.00 |
| | Short vowel | 2.07 | 9.51 | −7.443 | −45.71 | 0.00 |
| Three | Long vowel | 0.95 | 9.66 | −8.705 | −40.08 | 0.00 |
| | Other vowel | 0.57 | 8.05 | −7.475 | −59.79 | 0.00 |
| | Digraph and blend | 0.31 | 7.62 | −7.311 | −40.53 | 0.00 |
| | Sight words | 5.92 | 6.25 | −0.328 | −2.41 | 0.00 |
| | Total | 67.56 | 101.70 | −34.148 | −76.90 | 0.00 |

In stratum three, the experimental group have not made a progress in alphabet recognition. However, they have progressed in the full test as well as in other knowledge sections. This is because all the *P* values in those sections except in the upper case and lower-case alphabet recognition have been less than 0.001. That is why, the null hypothesis $X_{pre} = X_{post}$ Has been statistically rejected. Thus, there is a significant difference between the means of the pre-test and post-test within the experimental group.

However, the mean comparison within the experimental group cannot stand alone. The mean comparison between the experimental group and control group of the post-test is conducted via the independent *t*-test and the results are reported in **Table 3**.

**Table 3.** Independent *t*-test result of post-test between experimental and control group.

| Strata | Sections | Mean of control group | Mean of experimental group | Mean difference | *t* | Sig. |
|---|---|---|---|---|---|---|
| | Upper case | 26 | 26 | 0 | - | - |
| | Lower case | 26 | 26 | 0 | - | - |
| | Sound discrimination | 5.42 | 7.32 | −1.90 | −5.757 | 0.000 |
| | Short vowel | 1.38 | 7.63 | −6.25 | −40.54 | 0.000 |
| One | Long vowel | 0.45 | 6.82 | −6.367 | −34.89 | 0.000 |
| | Other vowel | 0.35 | 6.07 | −5.717 | −52.87 | 0.000 |
| | Digraph and blend | 0.23 | 7.12 | −6.883 | −89.55 | 0.000 |
| | Sight words | 2.93 | 5.43 | −2.50 | −17.72 | 0.000 |
| | Total | 62.77 | 92.38 | −29.617 | −66.56 | 0.000 |
| | Upper case | 26 | 26 | 0 | - | - |
| | Lower case | 26 | 26 | 0 | - | - |
| | Sound discrimination | 5.52 | 7.32 | −1.783 | −5.373 | 0.000 |
| | Short vowel | 1.4 | 7.9 | −6.500 | −39.5 | 0.000 |
| Two | Long vowel | 0.33 | 6.87 | −6.533 | −37.35 | 0.000 |
| | Other vowel | 0.35 | 6.10 | −05.767 | −52.48 | 0.000 |
| | Digraph and blend | 0.15 | 7.32 | −7.167 | −85.91 | 0.000 |
| | Sight words | 3.93 | 5.77 | −1.833 | −11.59 | 0.000 |
| | Total | 63.68 | 93.27 | −29.583 | −61.21 | 0.000 |
| | Upper case | 26 | 26 | 0 | - | - |
| | Lower case | 26 | 26 | 0 | - | - |
| | Sound discrimination | 5.75 | 8.62 | −2.873 | −14.48 | 0.000 |
| | Short vowel | 2.12 | 9.51 | −7.392 | −43.60 | 0.000 |
| Three | Long vowel | 1.00 | 9.66 | −8.656 | −44.56 | 0.000 |
| | Other vowel | 0.57 | 8.05 | −7.483 | −59.15 | 0.000 |
| | Digraph and blend | 0.55 | 7.62 | −7.073 | −38.54 | 0.000 |
| | Sight words | 6.40 | 6.25 | −0.154 | −0.413 | 0.000 |
| | Total | 68.38 | 101.07 | −33.322 | −55.56 | 0.000 |

Statistics in **Table 3** indicates that the students in the experimental group, stratum one, have performed better overall and in specific sections except for the alphabet recognition sections. For example, the students in the experimental group have exceeded students in the control group in short vowels section by 62%, in long vowel sounds section by 65%, in other vowel sounds by 57%, and in digraph and blend section by 25% ($P < 0.001$). Therefore, the null hypothesis has been rejected, which means there is a significant difference in the means of the two groups. In short, the experimental group indeed have performed better in post-test than the control group.

In stratum two, the experimental group have exceeded the control group in all the specific knowledge sections as well as in the overall tests except in the alphabet recognition section. Except for the upper case and lower-case alphabet recognition

section, the *P* value for the other sections and for the overall tests have been less than 0.001. This result has directly rejected the null hypothesis that $X_e = X_c$.

In stratum three, experimental group and control group have performed similarly in alphabet recognition. Both groups have obtained a full score in the upper- and lower-case alphabet recognition. For the overall test, the experimental group have exceeded the control group because the mean difference is 33.322 and $P < 0.001$ which rejected the null hypothesis. For other specific knowledge sections, regardless of the mean differences, the *P* values are all less than 0.001; a matter which provides evidence to support the progress made by the experimental group.

**Table 4.** Paired samples *t*-test results of between the pre and post-tests within the control group.

| Strata | Sections | Mean of Pretest | Mean of Posttest | Mean Difference | *t* | Sig. |
|---|---|---|---|---|---|---|
| One | Upper case | 25.77 | 26 | −0.233 | −0.305 | 0.003 |
| | Lower case | 25.817 | 26 | −0.1833 | −2.820 | 0.007 |
| | Sound discrimination | 5.383 | 5.417 | −0.033 | −1.426 | 0.159 |
| | Short vowel | 1.35 | 1.383 | −0.033 | −1.426 | 0.159 |
| | Long vowel | 0.300 | 0.45 | −0.1500 | −0.213 | 0.049 |
| | Other vowel | 0.317 | 0.35 | −0.0333 | −1.426 | 0.159 |
| | Digraph and blend | 0 | 0.23 | −0.2333 | −3.617 | 0.001 |
| | Sight words | 2.8 | 2.93 | −0.1333 | −2.654 | 0.01 |
| | Total | 61.733 | 62.77 | −1.0333 | −4.583 | 0.000 |
| Two | Upper case | 26 | 26 | 0 | - | 1 |
| | Lower case | 26 | 26 | 0 | - | 1 |
| | Sound discrimination | 5.35 | 5.53 | −0.033 | −1.794 | 0.078 |
| | Short vowel | 1.47 | 1.40 | −0.033 | 0.942 | 0.35 |
| | Long vowel | 0.30 | 0.33 | −0.1500 | −1.00 | 0.321 |
| | Other vowel | 0.30 | 0.33 | −0.0333 | −1.00 | 0.321 |
| | Digraph and blend | 0.07 | 0.15 | −0.2333 | −1.298 | 0.199 |
| | Sight words | 3.37 | 3.93 | −0.1333 | −3.233 | 0.002 |
| | Total | 62.87 | 63.48 | −1.0333 | −3.427 | 0.001 |
| Three | Upper case | 26 | 26 | 0 | - | 1 |
| | Lower case | 26 | 26 | 0 | - | 1 |
| | Sound discrimination | 5.72 | 5.75 | −0.033 | −1.000 | 1 |
| | Short vowel | 2.08 | 2.12 | −0.033 | −1.000 | 1 |
| | Long vowel | 0.97 | 1.00 | −0.033 | −1.000 | 0.159 |
| | Other vowel | 0.53 | 0.57 | −0.033 | −1.000 | 0.159 |
| | Digraph and blend | 0.32 | 0.55 | −0.2333 | −1.983 | 0.159 |
| | Sight words | 5.90 | 6.40 | −0.500 | −2.703 | 0.159 |
| | Total | 67.52 | 68.38 | −0.867 | −3.271 | 0.002 |

On top of that, to confirm the effectiveness of the training via the school-based material, paired samples *t*-test has been utilized to compare the means within the

control group of the pre and post-tests. The results are presented in **Table 4**.

In stratum one, very interestingly, the students in the control group have made a progress for the overall test. They have made a progress in specific knowledge aspects such as the upper and lower alphabet recognition, long vowel sounds, digraph and blend, as well as in sight words section, respectively by 0.89%, 0.7%, 1.5%, 2.3% and 1.3 ($P < 0.05$). On the contrary, they have had no progress in sound discrimination, short vowel sounds as well as in other vowel sounds ($P > 0.05$). Their progress is worthy of being discussed in the discussion section.

In stratum two, the control group have indeed made an overall progress by 1.6 percent and $P = 0.001$, which is less than 0.05. In addition, they have also made a progress in the sight words section. However, they have not made any progress in other knowledge sections, such as sound discrimination, short vowel, other vowels, and in digraph and blend section. Still, this phenomenon is worthy of being discussed later.

In stratum three, the control group has made progress in the overall test because the mean difference is 0.724 and the *P* value is 0.003, which rejects the null hypothesis that $X_{pre} = X_{post}$. This indicates that the control group indeed has made a slight progress after the training. Moreover, the control group as also made a slight progress in sight words section ($P = 0.012 < 0.005$). On the contrary, the control group has not made any progress in other sections.

By far, via paired samples *t*-test and independent t-test, the means within the experimental group, the control group, as well as within the means between the control group and experimental group of the post-test have been analyzed and reported. The results have all confirmed the significant progress, which the experimental group has made.

In short, based on the assumption that the experimental group and control group have been equivalent initially. The experimental groups in three strata have made a progress in the overall test, respectively by 49.7%, 48.3% and 50%. By comparison, although the control group in each stratum has also made a slight significant progress, the experimental group has significantly progressed more than the control group. Those results provide the evidence to support the effectiveness of the newly compiled phonics material.

## Results of the delayed-retention test

To make sure the participants in the experimental group internalize the phonic knowledge rather than simply remember them or memorize them mechanically in the tests and to consolidate the effectiveness of the training material, the delayed retention test has been arranged at the beginning of the next semester. Paired samples *t*-test result between the delayed test and post-test within the experimental group of each stratum are reported as in **Table 5**.

Paired samples *t*-test results indicate that the participants in stratums one and two have not made a significant progress in the delayed retention test because the *P* value is larger than 0.05 for stratum two. For stratum one, the means are the same. For stratum three, apparently, the participants have made a significant progress in the delayed retention test than in the post-test. All the above results indicate that the participants in the experimental group have retained the phonic knowledge and skills

well after the training.

**Table 5.** Paired samples *t*-test result within the experimental group between the post-test and delayed test.

| Stratum | Mean of delayed-test | Mean of posttest | Mean difference | *t* | df | Sig. |
|---|---|---|---|---|---|---|
| One | 92.38 | 92.38 | - | - | - | - |
| Two | 93.27 | 93.50 | −0.233 | −1.628 | 59 | 0.109 |
| Three | 101.87 | 101.70 | −0.075 | −2.198 | 60 | 0.032 |

## 5. Discussion

The purpose of this study is to evaluate the effectiveness of a newly compiled school-based phonics material for elementary school students in the light of the newly released national English curriculum. To reach such a purpose, a quasi-experimental design has been adopted. The experiments have been conducted in three strata respectively. The mean scores of the experimental group and control group have been compared via independent *t*-test and paired samples *t*-test. While reporting the results, there have been several results worthy to discuss. Furthermore, based on the literature review, the limitations of the previous studies are: the first, the previous studies were usually conducted in one specific school and in one stratum; the second, all the previous studies did not mention which phonics instruction approaches were adopted in their experiments. The above limitations left adequate room for the present study to conduct experiments. In this sense, the present study, which has been conducted across schools in three different strata is a new design which certainly yields new results in the similar domain.

First, in stratum one, overall, the participants have not made progress in the control group. However, they progressed in lower- and upper-case alphabet recognition. Such a phenomenon might be attributed to the official ban of English education before the elementary education phase. In other words, children should only start to learn English from the elementary school phase on. Usually, in grade one, the students are required to listen and speak. In grade two on, they have gradually started to learn to recognize the alphabet. In this study, the participants in stratum one have come from grade two, who have just started to learn the alphabets. That is why, they have not obtained a full score in alphabet recognition though they have made a significant progress in the post-test after being trained with the phonics material, which includes alphabet recognition contents. This result has not been reported by other studies by far. From this aspect, this is a new finding of this study.

Second, very interestingly, the participants in the experimental group of stratum two, who are actually from grade three, have made a progress in the total test and in other specific phonics knowledge sections, save the alphabet recognition section. The reason might be as described before that they have learned the alphabet in grade two, that is why, they performed very well in this section initially in the pre-test. Thus, there has been no room for further improvement in the post-test. Similar situation happens in the experimental group in Stratum Three. This explanation is in accordance with Brady (2009) that less improvement room is left when the learners already mastered related knowledge. Anyway, such a result has not been reported in any of other

previous studies in China via the search of CNKI; a matter which is considered as the largest and the most popular scholarly based data based in China.

The third aspects which is important to shed light on is the overall progress made by the control group. Results indicate that participants of the control group in all the three strata have made a progress in the overall test, although they have not made any progress in all the specific knowledge sections. This phenomenon is in line with that of the behaviorism in that the stimuli from the environment results in changes of a group behavior (Schunk, 2020). In the present study, when the participants have received stimuli (knowledge input), their knowledge base has surely progressed more or less. This implication of behaviorism also explains the phenomenon that loads of literature in the similar field obtained from CNKI and that the students have indeed made a progress after the phonics training regardless of specific phonics instruction approaches.

On top of those, the results of the delayed retention test are worthy of being discussed also. As stated above, none of the previous studies in investigating the effectiveness of phonics instructions included a delayed retention test in their research design. Thus, no data from previous literature were there to compare with in this sub-section. Therefore, this result is considered to be new in the phonics-related field.

The last, similarly, for all the strata in the two schools, the experimental group has progressed more than the control group in the overall test and in some specific knowledge sections. Those results have all provided evidence to support the effectiveness of the newly compiled phonics instruction material which is absolutely centered around systematic and explicit synthetic phonics instruction approach. From this aspect, these results of the present study have contributed experimental and empirical date to the existing body of literature in this domain.

## 6. Conclusions

In the light of behaviorism learning theory that learners' complex behavior can be shaped via the environmental stimuli and bottom-up reading model for the early reading, the researchers of the present study have intended to improve EFL beginners' vocabulary recognition capability via a newly compiled phonics instruction material. The latter approach is based on the explicit and systematic synthetic phonics instruction approach, which is considered the most appropriate approach for EFL learners who lack rich English language context. The experimental results of three strata across the two schools have indicated a positive effectiveness of the newly compiled phonics material, which has improved participants' performance overall by 49.6%, 48.3% and 50%, respectively. In other words, the effectiveness of the phonics training material is about 50%. Although, most of the results of the present study are considered new based on the literature review, this study also yields its own limitations. This study only includes one private school and one public elementary school. This is because the study subjects which may not be quite repetitive and the results might be generalized with cautious. However, this study comparatively includes more samples than previous studies conducted by other scholars. Plus, this study is explicitly based on a specific synthetic phonics instruction approach mode which in turn supports the previous study evidence from abroad that systematic and

explicit synthetic phonics instruction is suitable for EFL learners. Further, this study in turn provides sound empirical support to behaviorism learning theory as well as bottom-up early reading model. Thus, the researchers of this study humbly hope this quasi-experimental study could contribute to the existing body of literature to bridge the research gaps. It further helps to inspire more similar studies to look into phonics matters required by our national English curriculum to radically improve EFL learners' reading ability. To conclude, to better achieve the goal of improving elementary students' English early reading ability, to set extra teaching period in extra-curriculum service using such a newly compiled phonics teaching material which centers around systematic and explicit phonics approach.

**Author contributions:** Conceptualization, MC and GY; methodology, MC; software, MCL; validation, WLW, MSYS and MAR; formal analysis, MC; investigation, MSYS; resources, MCL; data curation, WLW; writing—original draft preparation, MC; writing—review and editing, MC and WLW; visualization, MAR; supervision, GY; project administration, MC; funding acquisition, MC. All authors have read and agreed to the published version of the manuscript.

**Acknowledgments:** "Improving EFL Students' Language Abilities Via Phonics Instruction" [Grant Number: QJZD20220628] from China Basic Foreign Language Education Research & Training Center; "Studies on the Development and Implementation of School-based Phonics Materials for After-school Service" [23WY082] from Sichuan Provincial Federation of Social Science; "The Development of a Phonics Instructional Guide Based on National English Curriculum for Compulsory Education" [QD2023A28] from Mianyang Teachers' University.

**Conflict of interest:** The authors declare no conflict of interest.

## References

Amadi, E. A. (2019). Bottom-up theory and phonics instruction: Implications for beginning reading. European Journal of Applied Linguistics Studies, 1(2), 89-100.

Aldhanhani, Z. R, & Abu-Ayyash, E. A. S. (2020). Theories and research on oral reading fluency: What is needed? Theory and Practice in Language Studies, 10(4), 379-388. http://dx.doi.org/10.17507/tpld.1004.05

Bear, R. D., Invernizzi, M., Templeton, S., & Johnston, F. (2020). Words their way, 6th ed. Pearson Education.

Blevins, W. (2017). Phonics from A to Z: A practical guide, 3rd ed. Scholastic.

Brady, S., Gillis, M., Smith, T., et al. (2009). First grade teachers' knowledge of phonological awareness and code concepts: Examining gains from an intensive form of professional development and corresponding teacher attitudes. Read Writ, 22(4), 425-455. https://doi.org/10.1007/s11145-009-9166-x

Chen, M. J., Goh, H. S., Soo, R. S., et al. (2022). Identification of content knowledge required for Chinese pre-service EFL teachers to teach phonics. World Journal of English Language, 8(12), 219-229. https://doi.org/10.5430/wjel.v12n8p219

Carroll, M. J., Crane, B. C., Duff, J. F., et al. (2011). Developing language and literacy: Effective intervention in the early years. John Wiley and Sons, Ltd.

Clemens, N. H., Lai, M. H. C., Burke, M., & Wu, J. Y. (2017). Interrelations of growth in letter naming and sound fluency in kindergarten and implications for subsequent reading fluency. School Psychology Review, 46(3), 272–287. https://doi.org/10.17105/SPR-2017-0032.V46-3

Creswell, J. W., & Creswell, D. J. (2018). Research design, 5th ed. Sage Publications.

Gao. Y. L. (2019). The application of phonics in teaching vocabularies in higher grades of primary schools [Master's thesis]. Yan'an University.

Gough, P. B. (1972). One second of reading. In: J. F. Kavanagh & I.G. Mattingly (Eds.). Language by ear and by eye: The relationship between speech and reading. M.I.T Press. pp. 331-358.

He, S. Q. (2018). An empirical study of the impact of phonics on the reading and writing of English vocabulary in primary schools [Master's thesis]. Shanghai Foreign Language University. China Academic Journal Electronic Publishing House.

Hu, Y. G. (2015). The application of phonics in improving pupils' spelling ability [Master's thesis]. Northwest Normal University.

Huangpu, H. T. (2017). Phonics in China for ten years. Chinese Youth, 2(4), 81-82.

International Literacy Association. (2018). Explaining phonics instruction: An educator's guide. Available online: https://literacyworldwide.org/docs/default-source/where-we-stand/ila-explaining-phonics-instruction-an-educators-guide.pdf (accessed on 23 July 2023).

International Literacy Association. (2019). Meeting the challenges of early literacy phonics instruction. Available online: https://www.literacyworldwide.org/docs/default-source/where-we-stand/ila-meeting-challenges-early-literacy-phonics-instruction.pdf (accessed on 23 July 2023).

Li. C. Y. (2021). Vocabulary teaching based on phonics in primary schools [Master's thesis]. Southwest University.

Long, Y. H. (2019). On the current situation and countermeasures of applying phonics to English teaching of rural middle schools-Take Jiujiang Middle School of Shuangliu District in Chengdu for example [Master's thesis]. Sichuan Normal University.

Ministry of Education. (2011). English curriculum for compulsory education. Beijing Normal University Publishing Group.

Ministry of Education. (2022). English curriculum for compulsory education. Beijing Normal University Publishing Group.

Papp, S. (2020). Phonics and literacy instruction for young learners in EFL. Part of the Cambridge papers in ELT series. Cambridge University Press.

Parker, S. (2019). A brief history of reading instruction. Available online: https://www.parkerphonics.com/post/a-brief-history-of-reading-instruction (accessed on 13 March 2023).

Redondo, M. (1997). Reading Models in Foreign Language Teaching. Revista Alicantina de Estudios Inglese,10, 139-161. https://doi.org/10.14198/raei.1997.10.11

Tang, L. (2022). To improve elementary students' reading abilities via phonics. Asia-pacific Education, 2022(18), 189-192.

Tsai, R. R., & Huang, S. C. (2023). EFL reading strategies used by high school students with different English proficiency. Forum for Linguistic Studies, 5(3), 1-17. https://doi.org/10.59400/fls.v5i3.1855

Wang, Y., (2013). The application of phonics in teaching English in primary school [Master's thesis]. Northwest University.

Zeng. Y. (2016). The application of phonics in teaching vocabularies in primary schools [Master's thesis]. Guangzhou University.

Zhong. X. (2017). The application of phonics in teaching vocabularies in primary schools [Master's thesis]. Guizhou Normal University.

Zhou. X. F. (2020). The application of phonics in teaching vocabularies in primary schools [Master's thesis]. Shandong Normal University.