DDL for EFL beginners: A report on student gains and views on paper-based concordancing and the role of L1

This study measured student gains in overall second language proficiency and in targeted vocabulary and grammar (noun and verb phrases) with pre- and post-tests in a 20-week data-driven learning program using a parallel Japanese-English concordancer and bilingual corpus. Beginner level engineering students at a Japanese university followed a four-step methodology, working in pairs in class and individually for homework. Collected feedback from students on computer- versus paper-based concordancing indicates a blending may be most effective. Student feedback on the role of the L1 in parallel concordancing indicates those using non-vetted computer-based concordancing rely most on the translation.

1. Introduction

1.1. DDL case study 2004-2010

Although the use of concordance-based data-driven learning (DDL) in the second language (L2) classroom has been largely limited to advanced level learners (Boulton 2010a), we have reported a number of successes in teaching grammar and vocabulary to beginner level engineering students. This program initially began as a four-week study in 2004 to investigate how to use DDL to develop vocabulary for communication (Chujo et al. 2006). In response to enthusiastic feedback from students, it was expanded to include basic concepts of phrase structures in a ten-week program in 2005 (Chujo & Oghigian 2006). The particular business-oriented vocabulary and grammatical structures were identified in previous studies as often appearing on the Test of English for International Communication (TOEIC) but not generally taught in Japanese junior or senior high school textbooks (Chujo 2003; Uchibori et al. 2006). Although the evaluation of the learning effect in this study was mainly based on learners’ impressions, we were able to discern from their feedback that this system was both meaningful and useful. The program was further expanded to twenty weeks (two semesters of ten weeks) from 2006 (Chujo & Oghigian 2007; Chujo & Oghigian 2008; Chujo et al. 2009; Oghigian & Chujo 2010), with pedagogic modifications made each year. Students do DDL exercises using the Paraconc parallel corpus tool (Barlow 2004) and a bilingual Japanese-English newspaper corpus (Utiyama & Isahara 2003). Students made significant gains in areas of the grammatical features test such as word classes, derivations, the structure of noun phrases, the structure of verb phrases, and multi-aspect (TOEIC-formatted) questions. As an on-going research project, we make modest gains each year, and the students continue to report that they find this method to be both enjoyable and effective. The purpose of this paper is to report student gains from the 2009 study, and to report student feedback on computer-based versus paper-based DDL and the role of the L1 in parallel concordancing in the 2010 study.

1.2. Computer- versus paper-based DDL

Various advantages and disadvantages have been reported in the literature regarding computer- and paper-based DDL (Leech 1997; Stevens 1995; Tomlinson 1998). Some advantages of computer-based exercises are that they are student-centered and student-controlled, there is a limitless supply of data, learning is inductive with the student as researcher, and that computer-based strategies can be applied elsewhere by students. Some advantages of paper-based exercises are that they save time, a potentially overwhelming task is limited to a specific focus, it may be easier for students to grasp the grammatical aspects of the lesson without the burden of also understanding the software and hardware tools, and that there is no need for time-consuming computer set-up or trouble-shooting. In addition, not all schools have facilities for computer-based learning, and not all teachers and students are comfortable with technology-based instruction (Boulton 2010b). Because students in our previous studies had made gains in using computer-based DDL, in this 2009 study, we were curious as to how students would respond to paper-based exercises. Therefore, students who were primarily using computer-based DDL were introduced to paper-based DDL tasks. In contrast, students in the 2010 study who were primarily using paper-
based tasks were introduced to computer-based tasks. Feedback from both groups and from the teacher was collected and analyzed.

1.3. The role of L1 in parallel concordancing

It has been noted that concordance lines can be overwhelming for beginner level learners (Tono 2003), and for this reason, students in this study use a bilingual corpus and parallel concordance tools, so they are able to see the translation. In the 2010 study, we asked students about the usefulness of having the Japanese translation in order to better understand the role of L1 in parallel concordancing. Student feedback was collected and analyzed.

2. The 2009 study

2.1. Participants

The participants were three groups of beginner level engineering students. Beginner level is defined as having an average TOEIC Bridge score of 60/100, which is approximately equivalent to 260-395 on the TOEIC. The study ran for two semesters for a total of 20 weeks, with weekly 90-minute classes in a CALL classroom. There were two DDL groups and one non-DDL group. DDL1 had 25 students and DDL2 had 14 students. Both DDL groups followed the same syllabus, and all DDL exercises were computer-based except for five lessons which included two paper-based tasks in each lesson.

The non-DDL group had 23 students and used a more traditional listening-focused CD-ROM program (called First Listening). This group was included in order to get a clearer understanding of the effect of the implicit and explicit instruction of basic grammatical knowledge (noun phrase structures and verb phrase structures). Both groups studied the same vocabulary using the same CALL program, and both DDL and non-DDL groups were given the same pre- and post-tests. In addition, students in the DDL2 group and the non-DDL group were at the same proficiency level; those in DDL1 were slightly higher.

2.2. Methodology and syllabus

The spring semester syllabus included (in this order) word classes, derivations and inflections, non-count nouns and various types of noun phrases (NPs). Various verb phrases (VPs) were taught in the fall semester. Each class had a vocabulary component and a DDL grammar component. The vocabulary was grouped into categories such as business, personnel, travel, and time, and students learned a total of 400 words over two semesters. In each class, students first used a CALL program to study twenty vocabulary items, seven of which were used as the focal point of the subsequent DDL lesson. The DDL grammar component had four steps. First, pairs of students followed carefully crafted guidelines to explore grammatical patterns in a Japanese-English newspaper corpus (Utiyama & Isahara 2003) using Paraconc, a parallel concordancer (Barlow 2004), to identify patterns and make hypotheses about the language. The Japanese-English newspaper corpus comprised 150,000 translation pairs from the Japanese language Yomiuri Shimbun (6.1 million Japanese morphemes) and the English language Daily Yomiuri (4.9 million English words), with these pairs automatically aligned. Second, the students confirmed or corrected these hypotheses based on the teacher’s explicit presentation of the grammar. Third, they did practice and production activities for consolidation, mainly as homework assignments. Finally, the teacher gave feedback on the homework tasks in the following lesson.

This syllabus is informed by Pienemann’s Processability Theory, which asserts that processing procedures are hierarchical, and a failure to master a low-level procedure blocks access to higher-level procedures (Pienemann 1998). For this reason, the syllabus is structured to address lexical concepts which include vocabulary and word classes, count and non-count nouns and derivations before introducing noun and verb phrases.

2.3. Sample material

An example of a guided student worksheet is shown in Figure 1. Because the students are at the beginner level, the instructions for using the text analysis tool are given in Japanese. In the
example, students are asked to view only 10 hits (rather than 500), and are given specific search instructions in the first and second exercises to search for a * visa and the * delay in order to find various pre-modifiers such as adjectives, nouns, genitives, and –ed participles used in this simple NP. By writing in the various answers, students infer the word class of the missing word and can see what common pre-modifiers appear with the vocabulary words visa and delay. In the third exercise, students search for uses of the adverb very which modify adjectives which in turn modify a noun. In the sample worksheet in Figure 1, the answers are given in parentheses.

Figure 2 shows a screenshot for this exercise from the Paraconc concordancer. These results are highlighted in color by the software. It is important to note that students are not asked to read or understand the entire concordance line, but to focus on the vocabulary item and the structure of the particular target grammar.

A sample of a paper-based lesson is shown in Figure 3. These 2009 students were given five or six computer-based tasks in each DDL lesson, and during the fall semester for five weeks, two paper-based tasks were added each week, for a total of ten paper-based tasks. In these lessons, students looked at paper-based color-printed concordance lines from a Japanese-English newspaper parallel corpus and were asked to circle the head noun and underline the noun phrase in the sample worksheet in Figure 1, and the answers are given in parentheses.

Some concordances were with Japanese translations, others were without.

Figure 2. Screenshot of computer-based parallel concordancing lines used for identifying noun phrases in a Japanese-English parallel newspaper corpus

Figure 3. Sample of a paper-based lesson for identifying noun phrases

For practice and consolidation, many different types of activities and exercises were used; three sample tasks are shown in Figure 4. In the learner production sample given in the third task, students supplied the missing verb phrase in English by looking at the Japanese sentence. The answers are given in parentheses. Although the in-class work was done in pairs, all follow-up work was completed individually.

2.4. Pre- and post-tests

Four different types of test questions for noun and verb phrases were used in the pre- and post-tests: identifying an NP or a VP using high frequency words (HFW), identifying an NP or a VP using more complex TOEIC-level vocabulary, producing an NP or a VP with HFW vocabulary, and understanding a more complex TOEIC-type NP or VP. Each question was controlled by word level (a HFW or TOEIC-level word), sentence length, and structural pattern. In total, there were 60 NP questions and 80 VP questions. In the spring semester, the NP test was given as the pre- and post-test, and in the fall semester, the VP test was given. The same tests were used for the pre- and post-test but the order of the questions was changed. Sample questions showing the four types of questions and answers for NPs are shown in Figure 5. This example shows the easiest NP pattern, which is the three-word pattern [determiner + adjective + noun].

Students were also asked to take a TOEIC Bridge test (http://www.ets.org/toeic_bridge), a simplified version of the TOEIC also administered by Educational Testing Service (ETS). The TOEIC Bridge test targets beginner and intermediate learners and is a paper-and-pencil test composed of 100 multiple-choice questions, requiring about one hour of testing time. In this study, a retired test that is available to the public was used. Students took the test during the first class in April 2009 to establish their existing English proficiency levels, and the same test again in the final class in December 2009 to measure the effectiveness of the DDL/CALL instruction in terms of an
Figure 5. Sample pre- and post-test questions

NP 1: Identifying NPs (HFW)

Underline all the noun phrases.

That small boy can play the piano very well.

NP 2: Identifying NPs (TOEIC words)

Underline all the noun phrases.

We are unable to meet the present demand.

NP 3: Producing NPs

Complete the sentence.

(The American coins) are very old.

NP 4: TOEIC-type NPs

Choose the best answer.

A husband and wife must respect each other in order to have a good [ (C)]

(A) marry (B) marrying (C) marriage (D) married

increase in scores. Takahashi et al. (2003) have shown that using the same test twice was reported not to have affected the results, since correct answers were not given to the students at any time, and because there was a sufficient interval between the pre- and post-tests.

2.5. Results from the pre- and post-tests

The gains for the NP pre- and post-tests are given in Table 1, which shows the vocabulary test, the four types of NP questions, the pre-test scores, post-test scores, and the gain between the pre-test and post-test. Since the number of test items for each question type varied, each test score is expressed as a percentage. The result of a paired t-test indicates that the gain in the vocabulary test of all three groups was statistically significant at the 1% level. This is not surprising since all three groups studied the same vocabulary material. The DDL classes made gains in all three types of NP questions (identifying and producing NPs) at the 1% level. The non-DDL class did not make gains in either identifying or producing noun phrases. The TOEIC-type test questions are at a much higher level of complexity, and only the DDL1 class – which had slightly higher proficiency – made gains at the 5% level, t (24) = 2.700, p < .05.

The average score increased for questions NP1, NP2, and NP3, which address various examples of the basic phrase structure of noun phrases. However, NP4 is much more complex. In order to answer this type of question, the students must have knowledge of how the elements within a phrase are grammatically related to one another, particularly to the head noun. An example question that involves the structure of an NP is shown below:

Example: Fred has a ______ knowledge of science.

(A) broaden (B) broadly (C) broadness (D) broad

To select the correct answer (D), students first have to recognize that the blank space must be filled by an adjective, and that an adjective may appear between a determiner and a noun. Further-

Table 1. Student scores (%) for vocabulary and NPs (first semester 2009)

<table>
<thead>
<tr>
<th>Category</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary test</td>
<td>64.8</td>
<td>95.4</td>
<td>30.6**</td>
<td>44.7</td>
<td>81.8</td>
<td>37.1**</td>
<td>51.0</td>
<td>87.3</td>
<td>36.3**</td>
</tr>
<tr>
<td>NP4: Identifying NP (HFW)</td>
<td>49.3</td>
<td>73.6</td>
<td>24.3**</td>
<td>32.4</td>
<td>60.5</td>
<td>28.1**</td>
<td>40.0</td>
<td>44.9</td>
<td>4.9</td>
</tr>
<tr>
<td>NP2: Identifying NP (TOEIC words)</td>
<td>39.7</td>
<td>89.6</td>
<td>49.9**</td>
<td>28.6</td>
<td>68.1</td>
<td>39.5**</td>
<td>33.9</td>
<td>41.7</td>
<td>7.8</td>
</tr>
<tr>
<td>NP3: Producing NP</td>
<td>54.1</td>
<td>73.6</td>
<td>19.5**</td>
<td>25.2</td>
<td>43.3</td>
<td>18.1**</td>
<td>34.5</td>
<td>35.9</td>
<td>1.4</td>
</tr>
<tr>
<td>NP4: TOEIC-type NP</td>
<td>54.7</td>
<td>65.1</td>
<td>10.4*</td>
<td>43.8</td>
<td>46.2</td>
<td>2.4</td>
<td>39.4</td>
<td>41.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>

* p < .05  ** p < .01

more, in order to eliminate incorrect answers, they must also possess knowledge of derivational suffixes such that some verbs have an -en ending, many adverbs end in -ly, and some nouns have identifiable noun endings such as -ess. Integrating these separate pieces of knowledge about different categories into a unified knowledge of phrase structure allows students to choose the correct answer. Since the spring DDL lessons covered only limited aspects of phrase structures, it was expected that more complex grammar taught in the second semester would improve this score.

The VP gains are shown in Table 2. Again, we can see that all three classes made significant gains on the vocabulary test. The DDL classes made gains in all three types of VP questions (identifying and producing VPs) at the 1% level. The non-DDL class made gains at the 1% level for producing VPs – t (22) = 3.401, p < .01 – but not in identifying them. For the TOEIC-type test questions, only the DDL1 class gained an increase of 11.0 points between the pre-test and post-test which was statistically significant at the 1% level: t (24) = 4.726, p < .01. The DDL2 class gained an average increase of 10.4 points which was statistically significant at the 5% level: t (13) = 2.931, p < .05. This is not surprising as the TOEIC-type questions represent much more complex language – for example, they include more phrasal elements such as adjective phrases and adverb phrases. Incorporating these types of phrases into the curriculum is currently under consideration.

These results are a validation of this method of grammar instruction for VPs which provide and repeat varieties of target structures with a clear explanation of the grammar, and allow beginner level students to apply this knowledge to many examples. However, the various phrase structures of VPs may be too numerous and complex to be covered in depth in one semester, thus instruction limited to one semester tends to be broad and shallow. In order to improve gains in complex VPs, it is necessary to either expand the instruction over two years, or to identify and
narrow the focus to particularly common TOEIC-type grammar items and modulate the instruction accordingly. For example, intransitive verbs such as seem and remain have not been taught in the curriculum in high school texts, although grammatical features and structures of practical English expressions using these verbs are found in TOEIC questions.

2.6. Results from the first and second TOEIC Bridge Tests

To see if the learners improved their overall English proficiency in this course, the scores of the two TOEIC Bridge tests for the three groups were also compared. Table 3 shows that all three classes made gains for the total score of the TOEIC Bridge test. The DDL1 class gained an average of 3.3 points from 69.2 to 72.5; t (24) = 2.923, p < .01; the DDL2 class gained an average of 4.8 points from 54.5 to 59.3; t (22) = 4.843, p < .01; and the non-DDL class gained an average increase of 6.2 points from 54.0 to 60.3; t (22) = 6.255, p < .01 at the conclusion of this experiment.

The difference between the two tests was significant, suggesting that all three groups improved their overall English proficiency on this measure. The non-DDL class, which was focused on listening and vocabulary instead of DDL grammar development, made greater gains overall, and in particular in the listening section at the 1% level: t (22) = 4.843, p < .01. The Listening CD-ROM used in this study was found to be highly effective for TOEIC score improvement by Takefuta et al. (2008), as confirmed in this case study. And an argument can be made that additional listening is important to making gains on tests such as TOEIC. Biber (2009) reports that clauses are used more often in conversation and phrases are used more often in writing. It would be interesting to measure the impact of this type of NP and VP instruction in writing samples; a parallel study is planned for 2011.

### Table 2. Student scores (%) for vocabulary and VPs (second semester 2009)

<table>
<thead>
<tr>
<th>Category</th>
<th>DDL + Vocabulary (Class 1) (n = 25)</th>
<th>DDL + Vocabulary (Class 2) (n = 14)</th>
<th>Listening + Vocabulary (n = 23)</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary test</td>
<td>58.9</td>
<td>87.3</td>
<td>28.3**</td>
<td>41.9</td>
<td>71.5</td>
<td>29.6**</td>
<td>42.3</td>
<td>66.9</td>
<td>24.6**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VP1: Identifying VP</td>
<td>39.1</td>
<td>91.5</td>
<td>52.4**</td>
<td>34.6</td>
<td>78.4</td>
<td>43.8**</td>
<td>21.6</td>
<td>24.1</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VP2: Identifying VP</td>
<td>44.9</td>
<td>85.5</td>
<td>40.6**</td>
<td>39.5</td>
<td>74.6</td>
<td>35.2**</td>
<td>26.2</td>
<td>25.1</td>
<td>-1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VP3: Producing VP</td>
<td>69.5</td>
<td>82.3</td>
<td>12.8**</td>
<td>45.0</td>
<td>64.1</td>
<td>19.1**</td>
<td>42.2</td>
<td>51.6</td>
<td>9.5**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VP4: TOEIC-type VP</td>
<td>54.2</td>
<td>65.2</td>
<td>11.0**</td>
<td>41.1</td>
<td>51.4</td>
<td>10.4*</td>
<td>41.3</td>
<td>38.9</td>
<td>-2.4</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*p < .05, **p < .01.

### Table 3. TOEIC Bridge test scores (%) for DDL and non-DDL groups (2009)

<table>
<thead>
<tr>
<th>Category</th>
<th>DDL + Vocabulary (Class 1) (n = 25)</th>
<th>DDL + Vocabulary (Class 2) (n = 14)</th>
<th>Listening + Vocabulary (n = 23)</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening section</td>
<td>34.0</td>
<td>35.8</td>
<td>1.9*</td>
<td>28.0</td>
<td>30.1</td>
<td>2.1*</td>
<td>26.9</td>
<td>31.4</td>
<td>4.6**</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Reading section</td>
<td>35.2</td>
<td>36.7</td>
<td>1.5</td>
<td>26.5</td>
<td>29.2</td>
<td>2.7*</td>
<td>27.2</td>
<td>28.8</td>
<td>1.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>69.2</td>
<td>72.5</td>
<td>3.3**</td>
<td>54.5</td>
<td>59.3</td>
<td>4.8**</td>
<td>54.0</td>
<td>60.3</td>
<td>6.2**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### 3. The 2010 study

#### 3.1. Participants

The participants of the 2010 DDL study were similar in proficiency level to the 2009 DDL1 students. Both the 2009 DDL group and the 2010 DDL group had 25 members. Both groups of students followed the same syllabus and methodology.

#### 3.2. Student feedback on paper-based versus computer-based DDL

Using open-ended comment questions on an anonymous paper-based questionnaire, we collected feedback from both the 2009 DDL students who used primarily computer-based lessons for two semesters and had only ten paper-based tasks, and the 2010 students who had only two computer-based lessons with eight computer-based tasks and the remainder as paper-based. Interestingly, in spite of the difference in contact time with computer or paper-based DDL, they had similar responses.

With regard to the advantages of using paper-based material, students reported that using this saved a lot of time and more tasks could be completed during class; that it was easier and quicker to understand the grammar (because the concordance results are presented to them); and that they did not have to worry about finding a different or wrong outcome since the handout provided the “correct results”. Students also found it easier and more immediate to write directly on paper, thus facilitating the task itself. They liked the fact that they could review at home, and provided the “correct results”. Students also found it easier and more immediate to write directly on paper, thus facilitating the task itself. They liked the fact that they could review at home, and generally felt that fewer mistakes made for a smoother class.

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the learning process, which allowed them to explore additional items or interests. They disliked the limited contexts given in the paper-based data compared to the computer-based concordance lines, but such truncation was needed to make them fit on the page. They commented that doing the search gave them time to think about the process, and to consider the target vocabulary and grammar more carefully. They appreciated being able to sort left and right, and realized it was easier to memorize spellings when using a computer because they were physically typing in the words. Some students also complained that underlining and circling on paper-based exercises was monotonous, and for these reasons preferred computer-based exercises.

From the teacher’s perspective, the advantages of paper-based lessons are that class time can be used to cover more tasks; concordance lines can be edited to control the focus by pre-selecting salient examples and deleting variations or exceptions; the time spent setting up and trouble-shooting computers and software is eliminated; and IT support from a teaching assistant is not required. The main disadvantages are that the exercises are not as interesting, powerful or motivating; students tend to mechanically underline and write down the target structures rather than become active learners; and they are not taught how to use corpus tools.

3.3. The role of L1 translation

We also asked the same two groups of students about how they used the L1 translation in the parallel corpus. Students were asked to fill out a questionnaire using a five-point rating scale from “strongly agree” (rating 5) to “strongly disagree” (rating 1). In order to grasp the assessment easily, results from a five-point rating scale are summarized into three scales as “Agree” (rating 5 + 4), “Neutral” (3), and “Disagree” (rating 2 + 1), as shown in Table 4.

We found that the 2009 students using the computer (and non-vetted concordance lines) reported that they depended more on the L1 translation than the 2010 students using paper-based materials. This is not surprising since paper-based exercises are edited to a certain extent, and students can look up explanations or definitions at home for the few exceptions they do not understand. Regarding the role of L1, 77% of the 2009 (computer-based DDL) students reported that they needed the translation to confirm the specific meaning of English words or sentences, and 69% reported they use the translation to grasp the general meaning. Students indicated that this is because words often have multiple and/or idiomatic meanings or they often have no idea of the meaning. Thus students perceive the Japanese translation as a sense of security.

4. Conclusion

Regarding language development, students following this DDL methodology have shown gains in previous years and continued to do so in this 2009 study, although the gains were generally in knowledge of the language areas covered – NPs and VPs. There is still room for improvement in the more complex TOEIC-type test questions which require students to bring together knowledge of more than one aspect of grammar. The findings suggest more complex grammatical structures as seen on TOEIC-type tests, particularly involving VPs which have various and complex structures, may not be within the scope of a one-year beginner level program. Regarding the use of computer-based DDL, since each has advantages and disadvantages, if a choice is available, a blending of the two might be beneficial. For example, it may be advantageous to begin with paper-based exercises to control the focus and then have students do follow-up computer-based DDL to find more examples and reinforce the learning (cf. Gabrialtos 2005). Student feedback on the role of L1 suggests students faced with non-vetted computer-based DDL use the parallel translation to confirm the meaning so that they can focus on the grammatical structure. It is hoped that the approach to grammar instruction outlined in this paper will further contribute to the steady and effective improvement of English education.

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References


