# NEW SOFTWARE TO HELP EFL STUDENTS SELF-CORRECT THEIR WRITING

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This paper describes the development of web-based software at a university in Spain to help students of EFL self-correct their free-form writing. The software makes use of an eighty-million-word corpus of English known to be correct as a normative corpus for error correction purposes. It was discovered that bigrams (two-word combinations of words) present in a student's writing but which are not found, or which are suspiciously rare, in the normative corpus are likely to contain errors. The program highlights such bigrams in compositions, and guidance is provided to help students decide if they have indeed made a mistake, and if so, how to correct it. A cohort of students who volunteered to trial the software for a month reported positively on their experience; it had helped them find mistakes in their own and their peers' writing and had greatly accelerated the self-correction process.

**Keywords:** Action Research, Computer-Assisted Language Learning, Corpus, Distance Learning, Online Teaching and Learning, Writing

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## IDENTIFICATION OF PROBLEM AREA

While it is clearly desirable for students to write as often and as much as they wish and to learn from their mistakes, correcting student compositions takes up a great deal of teachers' time; it may for example take a teacher ten minutes to find and give feedback on all the mistakes in a two-hundred-word composition written by a student at level B1 of the Common European Framework of Reference for Languages (CEFR) (2001). At one distance-learning university in Spain only twenty hours' teaching time per week is allocated to the five hundred students on the B1 level course in the Grado de Estudios Ingleses (a first degree course in English), so students are encouraged to self- and peer-correct. These students are adults of all ages many of whom have work and family obligations that mean they can only study in the evening or at weekends and cannot attend classes.

The students, who are aiming for level B2 of the CEFR, are given detailed guidance on self- and peer-correction. This guidance begins by encouraging students to check their writing with scrupulous care, to take the view that what they have written may be incorrect and, unless they are absolutely certain that what they have written is correct, to look at the error boxes and example sentences in their dictionaries. For example, the guidance suggests that at one stage in the correction process students should concentrate exclusively on the prepositions in their compositions. The student who has written **It depends of the weather* should check which preposition follows *depend* in the example sentences in the dictionaries; the absence of examples of *depend* followed by *of* and the presence of several examples in which the verb is followed by *on* will, it is hoped, trigger self-correction. Students are also encouraged to check online corpora such as *Webcorp* (n.d.) to see if they provide evidence which corroborates the way they have used words in their compositions.

Students understand that they need to eliminate errors from their writing: the CEFR descriptors state that at level B2 they should show, "Good grammatical control; occasional 'slips' or non-systematic errors …

may still occur, but they are rare and can often be corrected in retrospect". However, they frequently complain about the self-correction process which they find too time-consuming: if a teacher is not available, they want to have software which will accelerate the process.

In view of this situation, the action research question discussed below is: "What software can I provide which will enable my students to self-correct their free-form writing?"

## COLLECTION AND ORGANIZATION OF DATA

### Literature and Software Review

A number of studies suggesting that self-correction can be efficacious are usefully summarised in Lázaro Ibarrola (2013) who in her own study found that even unmotivated 16–17 year-old Spanish school students at level A2 of the CEFR who spent just a few minutes using dictionaries and textbooks were able to correct 44.8% of the errors in their free-form writing. Lee (1997) points out that "a crucial variable in error correction is recognising the existence of errors" and that low-level students may be unable to notice a significant percentage of errors. In view of Lázaro Ibarrola and Lee's findings, it seems likely that students who have chosen to study English at university aiming for level B2 of the CEFR will be able to self-correct more successfully, especially if they are aided in the task of error detection by suitable software.

Software that helps users detect and correct errors in word collocations are commonly referred to as grammar checkers. Grammar checkers have traditionally been built around tagging and parsing programs. As Tschichold (1999) explains, a high percentage of wrong tags has to be expected when the tagger is dealing with second language (L2) partly erroneous text. Since compositions written by lower-intermediate students can be very erroneous indeed, it is not surprising that grammar checkers based on tagging and parsing programs are of little help to B1 level students. Students who have used the Microsoft Word Grammar Checker, for example, report that it is frustrating and unhelpful for their purposes. It finds, for example, no mistakes in the sentence **Then he said us that he had always worked as waiter,* which in fact contains two mistakes (*said us* should be *told us*, and *as waiter* should be *as a waiter*). On other occasions, it misdiagnoses such as in the sentence **I'm very happy living hear.* The suggestion that the student change *living hear* to *living hears* or *livings hear* is distinctly unhelpful. The tagger is clearly labelling *hear* as a verb and *living* as its subject, and the parser is then indicating that there is a problem of agreement between the subject and verb. In fact, of course, the student has simply confused *hear* with its homophone *here* and should change *living hear* to *living here.* In light of such shortcomings, Lawley (2004) and Stapleton and Radia (2010) conclude that despite the high hopes deposited in such grammar checking software, the reality is not positive, with a high percentage of errors missed, and often no useful help offered to those it does detect. In a similar vein, Hernández García (2012) analysed other commercially available grammar checkers, finding them unsuitable for EFL students since they fail to detect the majority of mistakes, make unhelpful suggestions, and sometimes give rise to false alarms. Meanwhile in 2013 a group of students on the B1 level course organised a search for a reliable, affordable, web-based writing aid that would detect the errors in their free-form writing and reported that they found nothing satisfactory.

More promising than tagging and parsing, it seems, is an error detection method that divides a text into segments and then checks if each of the resulting segments occurs in a large corpus of written English which is known to be correct. So, for example, the sentence **My father is lawyer* can be divided into three segments: (a) *My father,* (b) *father is,* (c) *is lawyer*. Each of these segments of two words, known as bigrams, can then be searched for in a large corpus of accurate English. While *My father* and *father is* are likely to occur many times in the corpus, the bigram *is lawyer* is unlikely to occur and may therefore be a mistake. Variations on this approach are described in a number of studies (e.g., Briscoe, Medlock & Andersen, 2010; Chen, 2009; Chodrow & Leacock, 2000; More, 2006; Sjöbergh, 2005). Briscoe,

Medlock and Andersen (2010), for instance, are mainly concerned with the challenge of providing automated assessment of English as a Second Language (ESOL) examination scripts written in response to essay questions. They estimate the overall error rate of a script by counting the unigrams, bigrams, and trigrams of lexical terms that do not occur in a vast sample of approximately 500 billion words of English from the World Wide Web. They and their predecessors in the field report positive results for this method of error detection.

Meanwhile from a pedagogical point of view it does not seem desirable for corrections and improvements to be imported into a student's text in exchange for a click of the mouse; if no cognitive processing is required, the opportunity to learn from the mistake may be lost (Hernández García, 2012). More promising is the approach suggested by Gaskell and Cobb (2004) who report that lower intermediate level students successfully used a concordancer to correct their writing after the location of grammatical and collocational errors had been pointed out to them by a teacher. For example, when students who had written **in New Year's Eve* were told to check the preposition they were able to use the concordancer to correct to *on New Year's Eve*. The problem, highlighted by Stapleton and Radia (2010), is that this process requires the intervention of a teacher if students are to realise in the first place that there is a problem with the phrase **in New Year's Eve*.

### Student Interviews

Twenty-five students in the course were selected at random, contacted by telephone, and asked to reflect on how much time per week they devoted to the writing component of the course and how they spent that time. Answers were collected in a follow-up call a week later. Twenty of the 25 students reported that they spent between three and five hours a week on free-form writing and that it typically took them between 40 and 50 minutes to write an essay, but over two hours to correct the essay using the self-correction technique. Several took the opportunity to complain about how time-consuming they found this process of self-correction. Three confessed that in fact they sometimes did not write an essay at all since they found the self-correction procedure too laborious. One student said that she and her friends felt that studying grammar was a more productive way of spending the time. Four of the 25 students reported that a teacher, a friend, or a relative acting as a teacher, helped them by detecting the errors in their essays.

## INTERPRETATION OF RESULTS

The ability to write essays largely free of errors is very important to students aiming for level B2 of the CEFR. It would, therefore, clearly be beneficial for many students in this course if the self-correction procedure were less time-consuming; that is, if it were quicker and easier for them to find the mistakes in their free-form writing. The time saved in this way would enable them to write more essays. Specifically, it would be better if instead of spending three hours writing and self-correcting one essay, they could write two or three essays in the same time, provided they could detect and learn from more mistakes.

It is clearly essential, however, for the students to be able to trust the software they are using. Last (1992) pointed out that one of the key aspects of any learning system is that the relationship between tutor and learner should not be imperilled by anything which might cause the latter to lose confidence in the former; if the program finds itself unable to resolve a situation or does so with an incorrect or incomplete answer then the relationship of trust between learner and tutor (computer program) will be broken. A great deal of time is wasted and frustration occasioned if students cannot understand or cannot trust what the software is telling them. The need is to provide reliable, trustworthy software that quickly identifies student errors in a way they can easily understand. If it proves feasible, there are obvious advantages to making and controlling such software in the students' own institution.

## ACTION BASED ON DATA

It is not a complicated procedure to prepare a 'bigram' grammar checker along the lines suggested in Section 2.1 above. 80 million words were taken from the written component of the British National Corpus (BNC). The written component of the BNC contains extracts from a wide variety of genres including newspapers, periodicals, journals, books of fiction and non-fiction (both popular and academic), as well as (in much smaller degree) letters, memoranda and school and university essays. By computer analysis, it was discovered how often each word occurs in this corpus of 80 million words. The frequency of each bigram in the corpus was also discovered, as well as the number of times each bigram would be expected to occur in the corpus if words were distributed at random in text. All this information was stored in tables in the database of *Grammar Checker*, a web-based writing tool for students of EFL. Having first used the spell-check facility to ensure that all the words in their composition are correctly spelled, students then activate the "Pairs filter". This filter forms all the possible two-word combinations that occur in the composition. It does not however form a combination of two words when there is a punctuation mark between the words. So if, for example, a student has written, **Then he said us that he had always worked as waiter*, *Grammar Checker* divides the sentence into the two-word combinations shown in Table 1.

Table 1. *The ten bigrams in "*Then he said us that he had always worked as waiter"*

| Bigrams |
|---|
| 1. Then he |
| 2. he said |
| 3. said us |
| 4. us that |
| 5. that he |
| 6. he had |
| 7. had always |
| 8. always worked |
| 9. worked as |
| 10. as waiter |

It then looks up each of these combinations in the table in its database and supplies the information listed in Table 2.

Table 2. *Grammar Checker's Analysis of "*Then he said us that he had always worked as waiter"*

| Pair frequency | | Word 1 frequency | | Word 2 frequency | | Pair probability | Threshold |
|---|---|---|---|---|---|---|---|
| Then he | 4,706 | Then | 116,067 | he | 511,374 | 626.52 | 7.51 |
| he said | 24,630 | he | 511,374 | said | 166,263 | 897.47 | 31.9 |
| said us | 4 | said | 166,263 | us | 51,936 | 91.15 | 0.04 |
| us that | 1,489 | us | 51,936 | that | 863,445 | 473.36 | 3.15 |
| that he | 32,143 | that | 863,445 | he | 511,374 | 4,660.81 | 6.9 |
| he had | 43,421 | he | 511,374 | had | 383,011 | 2,067.46 | 21 |
| had always | 1,885 | had | 383,011 | always | 37,831 | 152.95 | 12.32 |
| always worked | 65 | always | 37,831 | worked | 10,726 | 4.28 | 15.19 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| worked as | 448 | worked | 10,726 | as | 601,271 | 6.08 | 6.58 |
| as waiter | 0 | as | 601,271 | waiter | 635 | 4.03 | 0 |

In the case of *Then he* for example this table shows that (a) the phrase *Then he* occurs 4,706 times in the corpus of 80 million words; (b) the word *Then* occurs 116,067 times in the corpus; (c) the word *he* occurs 511,374 times; (d) if words were distributed at random in text then, given the frequency of *Then* and *he*, we would expect the phrase *Then he* to occur 626.52 times in this corpus of 80 million words; (e) but in fact it occurs 7.51 times more often than that.

This 7.51 then, is an indication of the degree of collocational attraction between the two words. Any threshold number above 1 suggests that these words tend to be used together in this order; the higher the number, the greater the degree of collocational attraction. A threshold number below 1 suggests the opposite; the lower the number, the greater the degree of repulsion. So the student user knows that *Then he* occurs many (4,706) times in the corpus and that that number is much higher than would be expected if words were distributed at random in text. In combination these numbers (Pair frequency and Threshold) can be taken as a strong indication that the phrase is correct. In the case of *said us*, the numbers provide a strong indication that the phrase is incorrect. It only occurs 4 times and the threshold is very low (0.04); both *said* and *us* are high frequency words which seem to avoid each other's company.[1]

The other bigram in the sentence which has both a low pair frequency score and a low threshold number is *as waiter*. Written in accurate English, the sentence would read: *Then he told us that he had always worked as a waiter.* These changes introduce four new bigrams: *he told, told us, as a, a waiter*. See Table 3 for statistics on these bigrams. In each case we can see that there is a strong indication that the new combination is correct: both the Pair frequency and the Threshold numbers are high.

Table 3. *Grammar Checker's Analysis of "he told", "told us", "as a", "a waiter"*

| Pair frequency | | Word 1 frequency | | Word 2 frequency | | Pair probability | Threshold |
|---|---|---|---|---|---|---|---|
| he told | 3,277 | he | 511,374 | told | 31,546 | 170.28 | 19.24 |
| told us | 843 | told | 31,546 | us | 51,936 | 17.29 | 48.76 |
| as a | 83,841 | as | 601,271 | a | 1,923,612 | 12,208.88 | 6.87 |
| a waiter | 110 | a | 1,923,612 | waiter | 635 | 12.89 | 8.53 |

*Grammar Checker* alerts the student user to those bigrams which do not occur or only rarely occur in the corpus and which have low threshold numbers. Figure 1 shows Grammar Checker highlighting *said us* and *as waiter* in the sentence **Then he said us that he had always worked as waiter.*

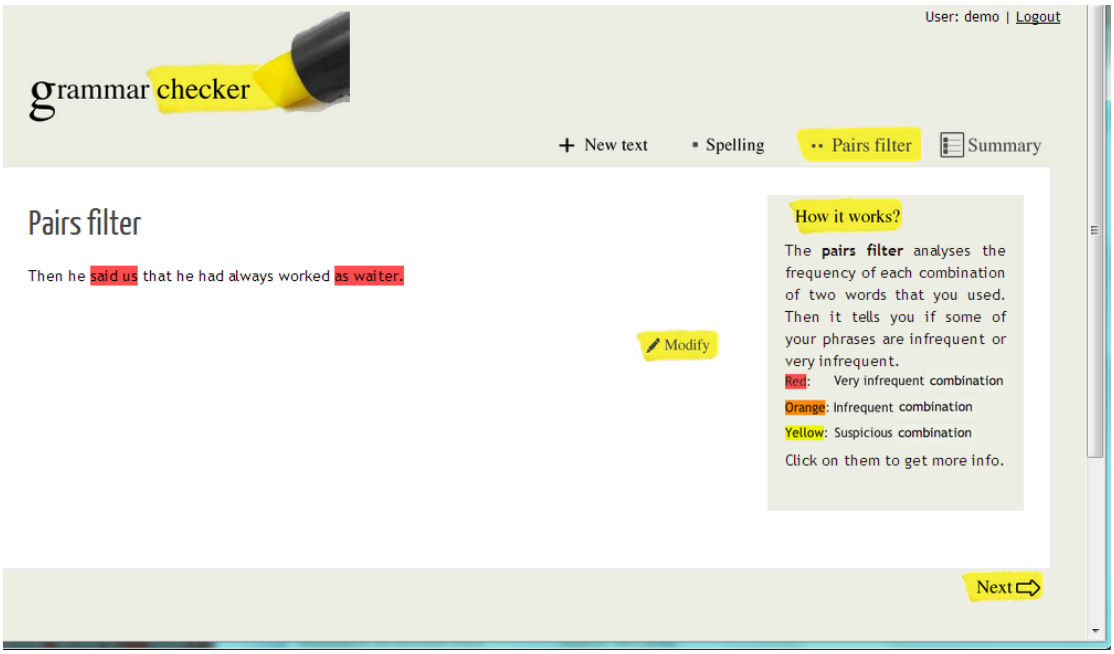


*Figure 1. Grammar Checker highlights very infrequent bigrams in a student's composition.*

Not all bigrams which do not occur or only rarely occur in the corpus and which have low threshold numbers are necessarily wrong. For example the numbers for the bigrams in the sentence: *Sometimes I behave like a child* are represented in Table 4. Despite having a low pair frequency (4) and a low threshold (0.51), the combination *I behave*, is not a mistake.

Table 4.*Grammar Checker's analysis of "Sometimes I behave like a child"*

| Pair frequency | | Word 1 frequency | | Word 2 frequency | | Pair probability | Threshold |
|---|---|---|---|---|---|---|---|
| Sometimes I | 497 | Sometimes | 17,592 | I | 472,967 | 87.83 | 5.66 |
| I behave | 4 | I | 472,967 | behave | 1,565 | 7.81 | 0.51 |
| behave like | 192 | behave | 1,565 | like | 108,064 | 1.79 | 107.26 |
| like a | 17,448 | like | 108,064 | a | 192,361 | 2194.25 | 7.95 |
| a child | 4,077 | a | 192,361 | child | 18,941 | 384.6 | 10.6 |

My analysis of a 10,000-word corpus of student writing suggested that there is approximately a 90% probability that bigrams contain mistakes if: (a) they do not occur in the corpus and the pair probability is 4 or above, or (b) they occur in the corpus and their threshold numbers are below 0 and 0.1. As Figure 1 demonstrates, *Grammar Checker* highlights such bigrams in red. Meanwhile, there is a 50% probability that bigrams contain mistakes if: (a) they occur in the corpus fewer than 500 times and their threshold numbers lie between 0.1 and 0.5. *Grammar Checker* highlights such bigrams in orange. Finally, there is approximately a 20% probability that bigrams contain mistakes if they occur fewer than 75 times in the corpus and their threshold numbers lie between 0.5 and 0.9. These bigrams are highlighted in yellow. Bigrams are highlighted in these different colours (red, orange, and yellow) so that students can prioritise those bigrams that are more likely to contain errors.

The explanation of how to use *Grammar Checker* (which appears on screen when students click on 'How to Use *Grammar Checker*') makes clear that bigrams are highlighted simply because they do not occur or only occur comparatively rarely in the large corpus of correct English, and not because they necessarily

contain mistakes. When students see which bigrams in their compositions have been highlighted, they should then look at each in turn and decide whether they (a) are sure the bigram is correct, (b) are sure it is wrong, or (c) are uncertain. If they are sure there is no mistake, they will take no further action. If they are sure there is a mistake, they will correct it. If they are unsure, students are encouraged to use their dictionaries and online corpora such as *Webcorp* to check how the words in the bigram are used.

A group of 20 volunteer students at level B1 used *Grammar Checker* for self- and peer-correction for a month. *Grammar Checker* was made available to them online and students were able to see the scores for every bigram in their compositions, not only those that had low Pair frequency and Threshold numbers. An online discussion forum was made available for participants to discuss their experiences of *Grammar Checker*; they were specifically encouraged to provide instances of *Grammar Checker* helping them to find mistakes and also of "false alarms" (when *Grammar Checker* highlighted a bigram that was correct) and other cases where it did not help or frustrated them in any way.

## ASSESSMENT AND REFLECTION

Discussion in the forum revealed that it was easy for learners to understand how *Grammar Checker* was analysing their writing and what it was telling them. Students reported that *Grammar Checker* enabled them to correct errors connected with the error types listed below in Table 5.

Table 5. *Types of error that Grammar Checker helped students correct*

| Error types |
|---|
| 1. Concord (*… *this people*). |
| 2. Conjugation (*A famer live in the country). |
| 3. Prepositions (*… *very fond on food*). |
| 4. Collocation (*… *wear hotter clothes*). |
| 5. Omission of words (**I want be lawyer*). |
| 6. Word order (*She is a woman rich). |
| 7. Misuse of words (*… *but not to much*). |

It did not detect errors connected with (a) false friends in certain contexts (for example, *Actually I am working in Madrid* where *At present* or *At the moment* rather than *Actually* might be correct); (b) concord such as **People who says* where both bigrams *People who* and *who says*) occur frequently in the corpus and have high threshold numbers but the trigram *People who says* does not; (c) some mistakes of tense (e.g. **I go home yesterday*).

The student volunteers reported lots of "false alarms", many associated with the words *and*, *but* and *or*; for example the bigram *and correct* (in the sentence *It was a normal and correct use*) was highlighted in yellow since it occurs 113 times in the corpus and has a threshold score of 0.94

In general however such false alarms were not seen as a problem. One participant said,

> It's not just that it was coloured in yellow so I knew there was only a small chance that it was wrong. It's also that I knew it was OK … The spell check facility in Microsoft Word highlights my surname. That is a false alarm because I have in fact spelled it correctly. But the highlighting is not a problem for me because I know I have spelled it correctly. I just ignore it. The same happens here. If *Grammar Checker* highlights a phrase like *and correct* and I know it is correct, then I take no notice. When it highlights a word pair and I don't know if it is correct or not, then I need to find out.

Other users reported that on many occasions they only needed to see a bigram highlighted to realise that they (or their partner if they were peer correcting) had made a mistake. Figure 2 shows one student's composition after activating the Pairs filter.


*Figure 2.* Screenshot of *Grammar Checker* showing the bigrams highlighted in a student's composition.

Using data from the server, it was possible to observe that the student corrected the mistakes highlighted in red almost immediately: *these day* was changed to *this day*; *had do* to *had done*; *before go* to *before going*, and; *in Sunday* to *on Sunday*. Meanwhile no change was made to the bigrams *shopping the* and *speaker said*; when contacted, the student confirmed that she had found abundant uses of both *the shopping the day before* and *the speaker said* on *Webcorp* (where the Advanced Search option allows the search of vast domains of correct English such as "British broadsheet newspapers" or "US newspapers" for example to see if the bigram or indeed a longer phrase is found).

Thirty compositions on the server were selected at random and analysed. A total of 230 errors in highlighted bigrams were corrected appropriately, 42 errors in highlighted bigrams were not corrected, and 29 were corrected inappropriately. (Meanwhile it was evident that other mistakes had been corrected even though *Grammar Checker* had been of no assistance in finding them).

Meanwhile, an unexpected benefit of using *Grammar Checker* was summarised by the student who wrote

> The software saved me a lot of time by telling me which bigrams in my composition are often used by the good writers; sometimes I was worried about things like whether to add an *s* to the verb after *people* and I saw from the numbers that I had got it right.

The twenty student volunteers who trialled *Grammar Checker* reported without exception that *Grammar Checker* accelerated the self-correction process; by highlighting the bigrams which were probably or possibly wrong, while at the same time confirming that others were frequently found in correct English, it made the self-correction procedure much quicker. The students reported that it now took them between 20 and 30 minutes rather than 2 hours to self-correct an essay. They also reported that they enjoyed the process more; one student said, "Now it's not just me and my essay—there's an external source of information telling me about each combination of words in my writing". The time saved by accelerating the self-correction procedure could be used to write and correct more essays.

## CONCLUSIONS

The new software, while far from perfect and still very much a prototype, clearly helps students self-correct their essays, not only, as was originally intended, by highlighting combinations of words which are especially likely to contain errors, but also by telling them which combinations are frequently used in English and by making the process more fun. Meanwhile, it seems that at present, *Grammar Checker* has three advantages over commercially-available software:

1. It is less ambitious in that it does not suggest to a student that a combination of words is definitely wrong; it merely says that it is rare. By not "over-reaching" and giving rise to "false alarms" in this way, *Grammar Checker* ensures that it does not break the relationship of trust between learner and tutor/computer; everything it tells the student is true.
2. It is transparent and explicit about what it does and how it does it; understanding how it works, students can better evaluate the significance of the information it gives them.
3. It does not make corrections available in return for the click of a mouse. Students must think for themselves: the aim is not merely to help students remove errors on one occasion, but to help them avoid the same mistake in the future.

It remains to be seen how and how much *Grammar Checker* can be improved. Strong possibilities are:

1. Increasing the size of the corpus whilst at the same time maintaining its balance so that it provides more information on the behaviour of less frequent words.
2. Limiting the analysis to words among, say, the 10,000 most frequently used to ensure that *Grammar Checker* has sufficient evidence of the words' behaviours.
3. Building a trigram filter to detect errors such as **People who says* where both bigrams *People who* and *who says* are accurate but the trigram **People who says* is not accurate.
4. Incorporating case sensitivity so that, for example, occurrences of *US* (meaning "The United States") are not conflated with the pronoun *us*.
5. Using student compositions uploaded to form a corpus of learner English which will allow specific hand-crafted feedback to be written for the most common errors.
6. Providing guidance on the kinds of errors that *Grammar Checker* does not detect.

It also remains to be seen how many students, which kinds, and at which levels will ultimately find an improved *Grammar Checker* useful. Attempts are being made to make *Grammar Checker* as user-friendly as possible with the hope that secondary school students as well as university students will make use of it. At present, teachers who, for example, have 25 students in a class may face 4 hours of extra work whenever they ask their students to write a 200-word composition. It seems then that in many cases, however hard-working and conscientious teachers may be, there will often be quite severe logistical limits to the number of written assignments that can be assigned and marked. Yet at the same time it may be that ambitious students would like to be able to write more often and learn from their mistakes. If so, then it becomes necessary to enable students to take on more of the burden of error detection and correction. The software described in this article is intended as a contribution towards making possible a purposeful and rewarding self-correction process.

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## NOTE

1. Scrutiny of the corpus shows that the 4 instances of *said us* are in fact instances of *said US* in, for example, phrases of the type "He said US foreign policy would …"

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