Teaching English Word Order with CorrectWriting Software

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Abstract. The article looks into the problem of using interactive computer technologies in technology-enhanced teaching English at a technical university. An electronic course "English Word Order" using CorrectWriting software for Moodle LMS was developed and used to teach students of various levels of education. The system of formative and summative assessments regarding the word order of English sentences was studied. The students' responses to CorrectWriting questions were analyzed using the Longest Common Subsequence algorithm, allowing determining misplaced, missing and extraneous words. During formative assessments, the students were offered automatic hints on how to fix their mistakes without having to wait for feedback from the teacher. The learning gains and the student survey prove the efficiency of the developed online course which helps to improve students' grammar skills during the classes and unsupervised work. The study also notes a positive role of electronic teaching materials in optimizing the technological and organizational support of the educational process. Further work on enhancing the developed course and software is outlined.

Keywords: E-learning · English as a second language · CorrectWriting · Computer-generated feedback · Formative assessments

1 Introduction

The nature of pedagogical activity is changing nowadays along with the rapid development of information technology. It penetrates deeply into our lives, and today one can hardly find any field of activity where a computer is not used to solve professional problems. This process dramatically accelerated during lockdowns caused by COVID-19 pandemic. Education has not remained indifferent to this change which brought profound transformation in the system of teaching and evaluating student progress. This completely applies to the process of teaching foreign languages.

Modern information technologies provide significant opportunities for improving the quality of training, so electronic teaching materials and Internet

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technologies are often used in foreign language teaching. The design of electronic educational resources aimed at the formation of relevant students' competencies is a topical issue due to the fact that this is one of the priority tasks in the activities of a foreign language teacher. The ability to quickly modernize and update the components of the educational process as well as to find new efficient ways of teaching is an important characteristic of the methodological literacy of a modern effective teacher [10,15,28]. The Internet offers great opportunities for carrying out such tasks. A big challenge for teachers is learning and growing professionally in order to use digital technologies to enhance students' learning. In spite of the fact that this has become a hot topic today most university students and teachers have a basic level of digital competence. Therefore the institutions of higher education are encouraged to focus on the development of students' and teachers' digital competence, create relevant learning strategies and use appropriate tools to improve the quality of education [32]. Some educators have made an attempt to analyze teachers' digital information skills and measure teachers' digital citizenship highlighting the factors that influence their development and the importance of their acquisition.

Teachers of foreign languages need to master information and communication technologies to be able to implement them in their teaching practice. They are faced not only with the task of choosing the most effective available Internet resources offered but also with the process of designing their own e-learning materials. This helps to optimize the educational process and contributes to the development of teachers' professional and creative activity which improves the quality of training and assessment.

2 Related Work

The use of information and communication technologies in teaching students foreign languages has been studied extensively, with a wide variety of approaches. A number of studies are focused on the use of such means as e-mail, social networks, IP telephony [7,8,19]. There have been research studies conducted on specific areas of online language learning strategies, including mobile learning, with their extensive opportunities to diversify and improve the learning process [13,16,17]. In recent years, a large number of teaching materials have appeared supporting the use of the Internet resources. In addition, many higher educational institutions are actively creating virtual educational environments by introducing programs for electronic support of courses in various disciplines [22,23,29]. Following the majority of experts who are exploring the ways of increasing the efficiency of teaching a foreign language by using multimedia technologies, it should be emphasized that the technologies can be successfully used in the formation of skills and communicative foreign-language competence, as well as information competence [1,6,14]. The main advantage is their enormous methodological and didactic potential, which includes the possibility of creating flexible and adaptive educational programs, quick feedback, a new mode of presentation, extensive training and assessment of the developed skills and abilities.

Knowledge assessment is an important component in the process of achieving desired learning goals. The use of digital technologies in teaching/learning English has given rise to new forms of assessing students' outcomes. Researchers have focused their efforts on analyzing effective assessment techniques which are essential for effective teaching and learning [9,30]. The main purposes of assessments are to facilitate learning, monitor students' success, enhance teaching [4,5,9]. Attention should be paid to a particular aspect: the use of timely feedback. This focus can be justified because of the importance of assessment and especially, of formative assessment which may improve outcomes. An urgent need to assess large numbers of university students makes computer-based assessments (CBAs) a helpful tool to support students' learning in higher education [18,20,21,27]. In spite of observing the comprehensive research in the field of knowledge online assessment [11,12,24,31,33], the relationships between applications of certain forms of knowledge online assessment and their influence on developing students' skills and communicative foreign-language competence are still insufficiently studied.

Motivated by all these ideas we have developed an online teaching assessment instrument for foreign language learning students. The research described in the article is part of the interdisciplinary project of the departments "Foreign languages" and "Software Engineering" in teaching a foreign language at a technical university. The authors created a set of formative and summative assessments for translating sentences from Russian into English to teach "English Word Order". It is based on CorrectWriting plug-in [26] developed at Software Engineering department for the popular learning management system Moodle [2].

3 The Online Course English Word Order

The developed online course "English Word Order" includes assessments for 9 Grammar categories: Statements, Adverbs with verbs in the statement, Negative sentences, General questions, Special questions, Tag questions, Alternative questions, Subject Questions and Reported speech questions. The word order practice is aimed at reinforcing main grammar constructions and vocabulary in the context of English Intermediate level communication. Each category contains 20 formative and 20 summative sentences to be translated from Russian into English. The example is shown in Fig. 1.

This practice is useful for developing grammar and translation skills for different sentence types. A student is given a chance to check the response immediately, to read the mistake messages, and correct the mistakes using the learned rules. Moodle is a modular learning platform for online and blended learning. One of the module types Moodle supports is "question type", allowing third-party developers to produce new kinds of advanced questions to be used by Moodle quizzes. One such module is the CorrectWriting question type, supporting open-answer short-text questions implemented in PHP programming language. It operates by breaking the sentence into lexemes – words and punctuation marks – and detects four kinds of mistakes using Damerau-Levenshtein editing distance and Longest Common Subsequence algorithm:

1. a typo (including a skipped or unnecessary delimiter);
2. a misplaced lexeme (word-order mistake);
3. an extraneous lexeme (it should not be in the answer)
4. an omitted lexeme (it should be in the answer).

The application can determine all the mistakes even if a student has made a few mistakes in one word (e.g. misplacing a word containing a typo).

To stimulate thinking and better grammar rules learning, each lexeme has a description, showing its role in the sentence that determines its place. It allows displaying a mistake message not as "'waited' is misplaced" but as "a predicate is misplaced". This stimulates thinking about the word-order rules, in this case about the place of the predicate. Suppose the sentence "Did it rain or snow last time?" was constructed by a student as "At last time it rain or snow". In this case the following mistakes will be displayed:

1. the auxiliary verb is missing;
2. "At" should not be in response;
3. the adverbial modifier of time misplaced.

The message quality depends on the description of lexical items provided by the question authors. If a student fails to fix the mistake using the mistake message, a number of hints is available to them if allowed by the teacher:

1. a hint "what it is" shows the word in which a mistake is made, for example "The predicate in your sentence is 'waited'";
2. a hint "where to place" gives the right word order, for example "First put the subject, then the predicate, then the adverbial modifier of time";
3. an image "where to place" hint shows where the lexeme should be placed (see Fig. 2).

A teacher can detract points for correcting the answer and using hints that makes sense in summative assessments. At the end of the exercise, if a student didn't provide a correct answer, CorrectWriting generates an image showing how to make the correct answer from student's response (see Fig. 3).

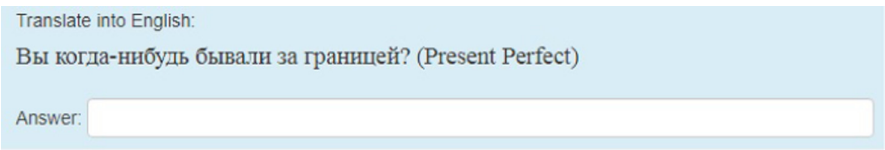

Fig. 1. An example of a question

CorrectWriting application provided such advantages as virtually unlimited learning time, the analysis of mistakes, the opportunity of revising the material, and self-study efficiency. It is restricted only by the number of formative



Fig. 2. A hint "where to place": a) when the word order is wrong; b) when the word is missing.

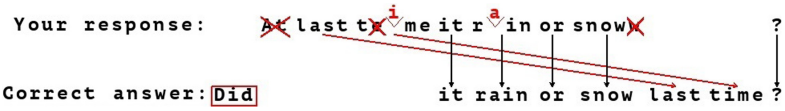

Fig. 3. The final picture of correcting the answer with different types of mistakes.

questions, but more questions can be added by the course authors each year. The training system gives a student the opportunity to not only check the correctness of translation, but also to correct the wrong answer, and to analyze the mistakes using the lexeme descriptions. The formative assessments blend seamlessly into the whole training system, technologically enhancing the way of presentation and revision of learning material. Students acquire knowledge on their own in a more familiar manner. Summative assessments allow conducting a continuous skills and knowledge evaluation. So this way of revising and testing students' knowledge provides an opportunity to change a delivery mode of classroom activities in terms of saving study time and using it for developing more productive skills.

4 Evaluation

We performed two kinds of evaluation for the created course:

1. the students' learning gains;
2. students' perceptions about the course.

4.1 Learning Gains

To evaluate the developed course, 45 students were offered to do a series of quizzes: 27 undergraduate Computer Science (CpS) students and 18 graduate Chemical Engineering (ChE) students. The average knowledge of the students could be evaluated at the levels of "good" and "satisfactory". It should be noted that the classroom hours in English at Volgograd State Technical University are limited to 2 h per week. The testing took place within the 1st term of studies in 2020. At first, the students were given the summative quizzes to measure their baseline performance. After that, the students were able to perform three formative quizzes provided with the hints feedback system during their homework. The number of students' attempts of taking formative quizzes were not limited,

with the students being able to improve their grammar skills in word order freely any time. At the end of the term, the second summative quiz (using the same questions) was taken by the students to measure their progress in improving the grammar skills of word order. It is important to note that the time for taking the formative quizzes was not limited whereas the summative quiz timing was limited as well as the number of attempts; during the summative quizzes the students were allowed to answer each question only once.

Table 1. Baseline performance and learning gains (LG)

Student group	Baseline grade		Absolute LG		Relative LG	
	Mean	Stddev	Mean	Stddev	Mean	Stddev
CpS, undergrad	3.52	1.48	2.9	1.77	42.9	23.8
ChE, graduate	3.18	1.42	3.48	1.61	49.34	18.45

Both groups of students had a similar average baseline performance, around 3 out of 10 points. We measured absolute learning gains as the difference between the grades for the second and the first attempts of the summative quiz (SG_2 and SG_1 respectively). However, absolute learning gains are not a good way to compare the progress of the students with different baseline performance as the students with better baseline have less points to acquire before reaching the maximum. So we calculated relative learning gains (RLG), showing the percent of remaining points the student gained (see (1) where 10 is the maximum grade).

$$RLG = \frac{SG_2 - SG_1}{10 - SG_1} \tag{1}$$

The results are shown in Table 1 and Figs. 4, 5 and 6. The two groups of students showed different behavior. Among the undergraduate CpS students, the students with the best baseline performance mostly ignored formative quizzes. They had the worst learning gains (including relative gains, so it cannot be attributed to their high base value), from 1/2 to 2 times worse than the others. One of the worst-performing students made a lot of formative-quiz attempts instead (15, which is about twice more than the other students) and also had the low learning gains. This situation shows that a large number of attempts can be a sign of ineffective usage of formative quizzes (his results are excluded from the plots to make them more readable). Among the other CpS students, the learning gains generally increased with the number of attempts. The dip in absolute learning gains around 4 attempts is caused by the better baseline performance of these students: in Fig. 6 you can see that this dip is significantly lower for relative gains.

Among the graduate ChE students, those who had the worst baseline performance chose to use formative quizzes less or ignore them. They, however, had relatively high learning gains that can be attributed to the other methods

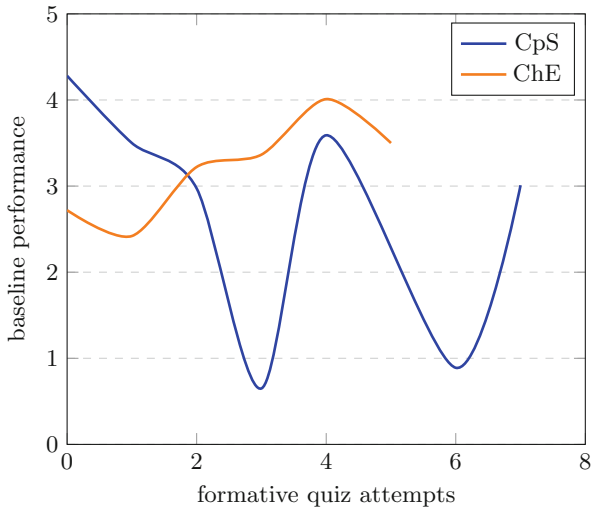

Fig. 4. Average baseline performance of students with different numbers of formative-quiz attempts

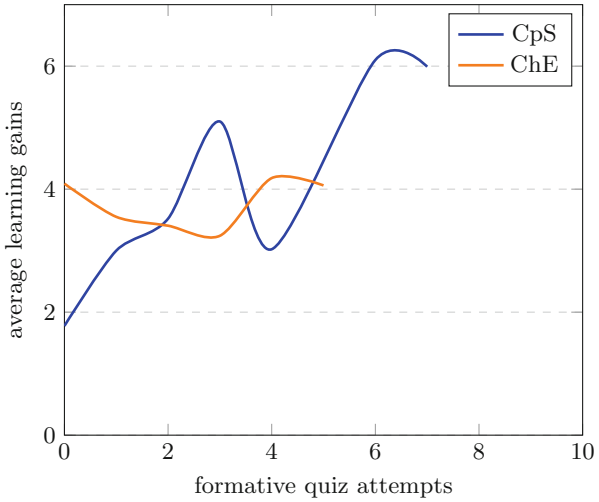

Fig. 5. Average absolute learning gains depending on formative-quiz attempts

of learning: graduate students are older and more proficient in self-education. The students who made less than 4 attempts of formative quizzes had the worst gains; however, the students who made 4 or more attempts had the best learning gains and the highest baseline performance: the best students trained and learned more. This is particularly evident considering the relative gains.

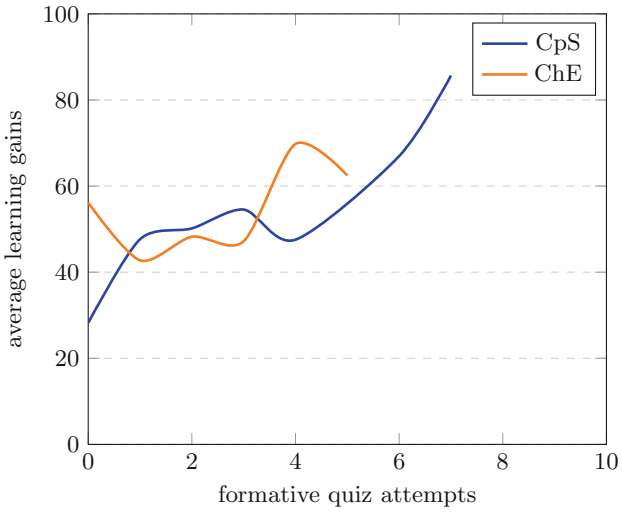

Fig. 6. Average relative learning gains depending on formative-quiz attempts

Nevertheless, the mistakes made by the students in the tests were caused not only by the word order: the necessity to choose the appropriate word and correct tense brought additional difficulties to the students. The authors see the room for improvement of these exercises by entering more words and phrases into the system, giving more hints in the tense choice and supplying the hint system with the theoretical background.

4.2 Students' Perception of the Course

We also evaluated the subjective perception of the developed e-learning course "English Word Order" by the students. The authors developed a questionnaire to find out the students' perceptions of it. The questionnaire contained 6 questions:

1. Do you find the course "English Word Order" useful?
2. Did you manage to improve your grammar skills?
3. How useful were the hints explaining the errors in your translation?
4. What skills do you think such kind of quizzes help improve?
5. Would you like to continue doing such quizzes?
6. Would you like to take part in developing such quizzes?

We asked 45 respondents, including undergraduate and graduate students from various faculties of Volgograd State Technical University who study English as a foreign language (see Table 2). Despite the fact that some researchers note that students may experience difficulties in using ICT for their learning, the results of the survey, in general, indicate the willingness of the respondents (70.5%) to further participate in them and improve their English language skills using the developed application.

Table 2. Survey results

Question number	Percentage of students replying positively
Question 1	91%
Question 2	78.9% (see Table 3 for details)
Question 3	69%
Question 4	See Table 4
Question 5	70.5%
Question 6	51%

Table 3. How much have your grammar skills been improved?

Skills improvement	Percentage of students
10%–39%	16%
40%–69%	33%
70%–89%	27%
90%–100%	2.9%

The results of the survey show that 51% of the respondents expressed the desire to take part in the creating similar tasks when their language proficiency improves. Overall, 91% of all the respondents thought that the developed online course positively: 69% agreed that such applications are useful, 22% thought they were very useful for improving grammar skills, while only 7% considered them not very useful. 78.9% of the participants believed that their grammatical skills improved after these exercises (see Table 3). The respondents were confident that this course allowed them to improve a number of skills, which we will indicate according to the degree of their popularity (see Table 4). The system of hints implemented by the authors of CorrectWriting found a positive response from the respondents: 69% of them noted the hints were useful.

Table 4. Which skills have been improved?

Skill	Percentage of students
Translation skills	75%
Grammar	73%
Independent work skills	50%
Vocabulary	23%
Motivation to learn a foreign language	19%
Computer using	16%
Reading	11%

5 Conclusions and Further Work

The results show that using CorrectWriting questions for formative and summative assessments enhances foreign-language teaching; this form of e-learning is methodologically appropriate. For undergraduate students, the learning gains generally increased with the number of the attempts of the formative quizzes; for graduate students only significant amount of attempts brought good gains. However, too many attempts (significantly more than the other students make) can be an indicator of misusing the quizzes and low learning gains. However, the lack of formative-quiz attempts can indicate learning problems only combined with a low initial performance.

In general, the joined efforts at the interdepartmental level in order to develop and use the electronic course "English Word Order" made it possible to create and analyze the positive learning experience. The survey results indicate the efficiency of this form of training and confirm that the introduction of training based on electronic educational resources can significantly diversify and optimize the educational process. Those findings are supported by the studies of Balci et al. [3], Stefanovic and Klochkova [25], also reporting positive effects of electronic educational resources on educational process. In our study, the training system with hints and mistake analysis allowed teachers to organize efficient self-study of students and save the class time for more sophisticated training (e.g. in communication skills). It also helped to support students during COVID-19 lockdowns.

The results of the study also indicate several areas for further improvement. They include:

- adding options for correct answers, taking into account synonymy and possible abbreviations;
- developing a unified system of descriptions of the word role in a sentence that would be used both in lecture material and in exercises;
- extending the functions of the language-checking software to account for word-formation errors and choosing the appropriate word form in English to make the displayed mistake messages more detailed and understandable.

However, the most difficult and laborious stage of compiling the formative and summative assessment base has already been completed that allows us to hope for their successful further use in the educational process.

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